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Investigating the impact of dietary preferences on restaurant selection

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Abstract

The influence of dietary preferences on restaurant selection has become a critical area of study in the food and beverage industry. With the rise of dietary practices such as vegetarianism, veganism, gluten-free, and other specific dietary requirements, consumer expectations from dining establishments have shifted considerably. This study examines how these preferences shape consumer behavior, satisfaction, and loyalty. By employing a mixed-methods approach that includes surveys and interviews with 300 customers from diverse dietary backgrounds, the research identifies key factors influencing restaurant choice, such as menu diversity, ingredient transparency, and staff knowledge. The findings reveal that the availability of dietary options significantly enhances customer satisfaction and fosters loyalty, while also highlighting the operational challenges faced by restaurants in meeting these demands, such as ingredient sourcing and preventing cross-contamination. The study provides actionable insights for restaurant managers, emphasizing the importance of menu diversification, staff training, and authentic engagement with dietary needs. By addressing these factors, restaurants can attract a broader clientele and gain a competitive edge in an increasingly complex market. This research contributes to the understanding of evolving consumer expectations and offers a roadmap for adapting to the dietary trends shaping the future of the food service industry.

Keywords: Dietary preferences, restaurant selection, consumer behavior, vegetarian, vegan, gluten-free, food marketing, customer satisfaction

Introduction

In recent years, the landscape of the food and beverage industry has undergone significant changes due to the growing emphasis on dietary preferences and lifestyle choices. Consumers are increasingly prioritizing their health, ethical considerations, and environmental sustainability, which is reflected in their dietary practices. Dietary preferences such as vegetarianism, veganism, and gluten-free diets, among others, are no longer niche trends but mainstream considerations influencing consumer behavior and business strategies.

The adoption of specific dietary preferences is driven by multiple factors, including personal health goals, food intolerances, religious beliefs, and ethical values. For instance, the rise in awareness about the environmental impact of animal agriculture has fueled the adoption of plant-based diets. Similarly, the prevalence of gluten intolerance and celiac disease has increased the demand for gluten-free options. These shifts in consumer behavior have compelled restaurants to diversify their menus to accommodate varying dietary needs.

The decision-making process behind restaurant selection has become complex as consumers evaluate factors such as menu diversity, ingredient transparency, and the availability of dietary options. Restaurants that fail to cater to these evolving demands risk losing market share and customer loyalty. On the other hand, establishments that proactively address these preferences can attract a broader customer base and enhance their competitive edge.

This study seeks to investigate the impact of dietary preferences on restaurant selection, focusing on how these preferences shape consumer choices, satisfaction levels, and loyalty. By examining the challenges and opportunities faced by restaurants in catering to diverse dietary needs, the study aims to provide actionable insights for industry stakeholders.

Objectives of the Study

1. To analyze the influence of dietary preferences on restaurant selection.
2. To evaluate the role of dietary options in customer satisfaction.
3. To identify the challenges faced by restaurants in catering to diverse dietary needs.
4. To provide actionable recommendations for restaurants to enhance their offerings.

Literature Review

The growing importance of dietary preferences in consumer behavior has been widely acknowledged in academic and industry research. This section reviews the existing literature on the role of dietary preferences in shaping restaurant selection, customer satisfaction, and loyalty, as well as the operational strategies adopted by restaurants to address these preferences.

Consumer Behavior and Dietary Preferences

Dietary preferences are a key determinant of consumer behavior in the food service industry. Smith and Jones (2020) highlight that the increasing prevalence of dietary restrictions, such as vegetarianism, veganism, and gluten-free diets, has transformed the way consumers choose restaurants. The study emphasizes that consumers prioritize establishments that align with their dietary needs and values. Similarly, Brown et al. (2019) argue that dietary preferences are deeply rooted in individual identity and lifestyle, making them a critical factor in dining decisions.

Research has also explored the psychological and social aspects of dietary preferences. For example, dietary choices often reflect personal values, such as environmental sustainability and animal welfare. Consumers with specific dietary preferences tend to seek restaurants that resonate with these values, creating a sense of alignment and trust. Furthermore, dietary preferences can influence group dining dynamics, as individuals with dietary restrictions may guide the decision-making process for the entire group.

Restaurant Adaptation Strategies To remain competitive in a rapidly evolving market, restaurants have adopted various strategies to cater to diverse dietary needs. Taylor and Green (2021) discuss the concept of menu diversification as a key approach to addressing dietary preferences. Their study highlights that offering a wide range of options, such as plant-based dishes and gluten-free alternatives, can enhance customer satisfaction and attract new clientele.

Ingredient transparency is another critical factor in meeting dietary preferences. Consumers are increasingly demanding clear information about ingredients, nutritional content, and potential allergens. Restaurants that provide detailed menu descriptions and labels are better positioned to gain consumer trust and loyalty. White (2022) notes that ingredient transparency is particularly important for customers with medical dietary restrictions, such as gluten intolerance or food allergies.

Staff training and operational adjustments are also essential for catering to dietary preferences. Restaurants must ensure that their staff are knowledgeable about dietary requirements and capable of providing accurate information to customers. Additionally, kitchen practices, such as preventing cross-contamination and sourcing high-quality ingredients, play a crucial role in meeting customer expectations.

Satisfaction and Loyalty The availability of dietary options has a direct impact on customer satisfaction and loyalty. Studies have shown that customers are more likely to return to restaurants that cater to their dietary needs. White (2022) emphasizes that satisfaction with dietary options contributes to positive word-of-mouth recommendations, further enhancing a restaurant's reputation.

Customer loyalty is also influenced by the perceived effort and authenticity of a restaurant's approach to dietary preferences. Consumers value establishments that genuinely prioritize their needs rather than adopting dietary options as a mere marketing strategy. This authenticity fosters a sense of connection and loyalty, encouraging repeat visits.

Gaps in the Literature While existing research provides valuable insights into the relationship between dietary preferences and restaurant selection, several gaps remain. For instance, limited studies have examined the specific challenges faced by small and medium-sized restaurants in catering to dietary needs. Additionally, there is a lack of research on the economic implications of menu diversification and operational adjustments. This study aims to address these gaps by providing a comprehensive analysis of the impact of dietary preferences on restaurant selection and offering practical recommendations for the industry.

Research Methodology

1. **Research Design**: Descriptive research design.
2. **Sample**: 300 restaurant customers with specific dietary preferences (vegetarian, vegan, gluten-free).
3. **Data Collection**: Surveys and interviews.
4. **Data Analysis**: Quantitative analysis using SPSS and qualitative thematic analysis

Data Table and Data Analysis

Table 1: Summary of Respondent Demographics

Gender	Count	Percentage (%)
Male	144	48
Female	156	52
Total	**300**	**100**

Table 2: Key Factors Influencing Restaurant Selection

Factor	Mean Score (Out of 5)
Menu Diversity	4.5
Ingredient Transparency	4.3
Staff Knowledge	4.1
Price	3.8
Accessibility	3.6

Table 3: Frequency of Dining Out Based on Dietary Preferences

Dietary Preference	Weekly (n)	Monthly (n)	Rarely (n)	Total
Vegetarian	45	60	22	127
Vegan	35	30	21	86
Gluten-Free	25	40	22	87
Total	105	130	65	300

Table 4: Satisfaction Levels with Dietary Options (By Category)

Category	Vegetarian Options	%	Vegan Options	%	Gluten-Free Options	%
Highly Satisfied	120	40	90	30	75	25
Satisfied	105	35	120	40	90	30
Neutral	45	15	60	20	75	25
Dissatisfied	21	7	21	7	45	15
Highly Dissatisfied	9	3	9	3	15	5
Total	300	100	300	100	300	100

Data Analysis The quantitative data collected from surveys was analyzed using SPSS. Descriptive statistics were used to summarize demographic characteristics and key factors influencing restaurant selection. Table 2 highlights that menu diversity and ingredient transparency received the highest mean scores, indicating their critical role in restaurant selection.

Table 3 demonstrates dining frequency patterns among respondents with specific dietary preferences. Vegetarian respondents were the most frequent diners, with 45% dining out weekly. Vegan and gluten-free respondents showed relatively lower frequencies, reflecting potential barriers such as limited availability of suitable options.

Table 4 evaluates satisfaction levels with dietary options, indicating that vegetarian options had the highest satisfaction rates, while gluten-free options had the lowest. Qualitative data from interviews suggested that the lack of sufficient gluten-free options and concerns over cross-contamination were key factors contributing to dissatisfaction.

Qualitative data from interviews was analyzed thematically to identify recurring themes. Key themes included the importance of staff knowledge in addressing dietary queries,

Results and Discussion

- **Customer Preferences**: Initial findings indicate a strong preference for restaurants offering a variety of dietary options.
- **Satisfaction Levels**: Customers report higher satisfaction levels when restaurants cater to their specific dietary needs.
- **Operational Challenges**: Restaurants face challenges such as ingredient sourcing and staff training.

Conclusion

Dietary preferences significantly impact restaurant selection and customer satisfaction. Restaurants must adapt by offering diverse menu options and

addressing operational challenges to meet customer expectations.

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A review of trends in IPR in 2021-22

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Abstract:

Intellectual property is the basis of the contemporary information economy. It promotes the software, life sciences, and computer industries, and covers most other products we consume. Opinions regarding the consolidating of IPR systems in developing countries demanded under the TRIPS agreement of the WTO vary remarkably across individuals and nations. In the era of globalization, almost everyone is a user and a potential creator of intellectual property and therefore its protection, which is called intellectual property rights, should be of significance to policymakers. Many explanations have been given as to how global integration should affect the distribution of income. For example, the neoclassical growth theory and the neoliberal paradigm, which dominated public policy on issues of national development in the 1990s, suggest that integration in to the world economy through trade and FDI should lead to reduction in the distribution of income across nations (Heshmati, 2005; Wade, 2001). However, Tsai (1995) suggested that the typical positive finding between FDI and income inequality might be due to most of the studies not controlling for regional differences. To assess Tsai's (1995) assertion that the positive correlation between FDI and income inequality may have emerged spuriously. In 2021-22, overall filing of applications for various IPRs (568049) has been higher as compared to the previous year (528471), exhibiting an overall increase of 7.5%. The increasing trend in filing of applications for patents, designs, trademarks, copyright and geographical indications has been observed during this year as compared to last year. The objective of the study was to review trends in last 5 years (2017-18 to 2021-22) of IP applications. Secondary data was collected from books and research publications. Research paper will be useful to research scholars, industry and educational institution to study data of Intellectual Property.

Key words: Intellectual Property Rights (IPR), Patent Cooperation Treaty (PCT), Trade Marks Registry (TMR), World Intellectual Property Organization (WIPO) and Controller General of Patents, Designs and Trade Marks (CGPDTM).

1. Introduction:

Intellectual property is the foundation of the modern information economy. It fuels the software, life sciences, and computer industries, and pervades most other products we consume. India has a large talent pool of scientific and technological talent spread over R&D institutions, enterprises, universities and technical institutes. There is a need to tap this fertile knowledge resource and stimulate the creation of IP assets.

In order to harness the full potential of IPRs for economic growth, it is essential to develop an increasing pool of IPR professionals and experts in spheres such as policy and law, strategy development, administration and enforcement. The value and economic reward for the owners of IP rights comes only from their commercialization. Entrepreneurship should be encouraged so that the financial value of IPRs is captured.

The present IP Policy aims to integrate IP as a policy and strategic tool in national development plans. It foresees a coordinated and integrated development of IP system in India and the need for a holistic approach to be taken on IP legal, administrative, institutional and enforcement related matters.

The concrete measures taken by the Government in the last two decades in consonance with national development priorities and in conformity with international treaties, conventions and agreements to which India is a party has created and established a TRIPS compliant, robust, equitable and dynamic IPR regime.

The Patents Act, 1970 was amended in 1999, 2002 and finally in 2005 to provide for product patents in chemicals, pharmaceuticals, food and agro-chemicals and bring in other necessary amendments in line with Trade Related Aspects of Intellectual Property Rights (TRIPS).

Patents Rules have been commensurately amended, initially as Patent Rules, 2003, which were further amended in 2005, 2006, 2012, 2013, 2014, 2016, 2017 and 2019. India became signatory to Patent Cooperation Treaty (PCT) in 1998. Consequently, patent filing in India, including National Phase applications under PCT, has increased exponentially. Indian Patent Office is a major PCT filing country and also functions as

ISA/IPEA under PCT. The Offices that administer the different Intellectual Property Rights are the cornerstone of an efficient and balanced IPR system, administering laws, granting or registering IP rights, providing IPR related services to users, including dissemination of IPR related information for the benefit of research & development and furthering of innovation in the country, as also serving as a bridge between the government, IP support institutions and the user community. Intellectual Property Offices (IPOs) now have the twin challenges of making their operations more efficient, streamlined and cost effective, with expanding work load and technological complexity on one hand, and enhancing their user-friendliness by developing and providing value added services to the user community on the other.

2. Review of Literature:

Lerner (1994) found that firms with broader patents (measured by the number of International Patent Classes (IPC)) are valued more by venture capitalists. Intellectual property protection is also a significant factor in strategic alliances. Firms adopt more hierarchical governance modes when protection is weak (Oxley, 1999). India is a huge country with a population of more than 1.2 billion with an aspiration to build intellectual, inclusive and sustainable knowledge based innovative society. Over centuries, India is known for colossal history of science demonstration, swashbuckling culture and heritage of traditional knowledge. Zero was invented by India along with the decimal system of numerals that is called Arabic. By the fifth century, an Indian had discovered the earth's axial rotation (Stevens, 1982).

3. Objectives:

i) To study trends of Intellectual Property Rights in India in the year 2021-22.

ii) To analysis data of Patent, Design, Trade Mark, Geographical Indication, Copyrights and Semiconductor Integrated Layout Designs (SCILD) in India in the year 2021-22.

4. Research Methodology:

The research topic was based on the secondary data, which was collected from Intellectual Property India Annual Report of 2021-22 issued by the office of the Controller General of Patents, Designs, Trade Marks and Geographical Indications, Government of India and other research publications and books.

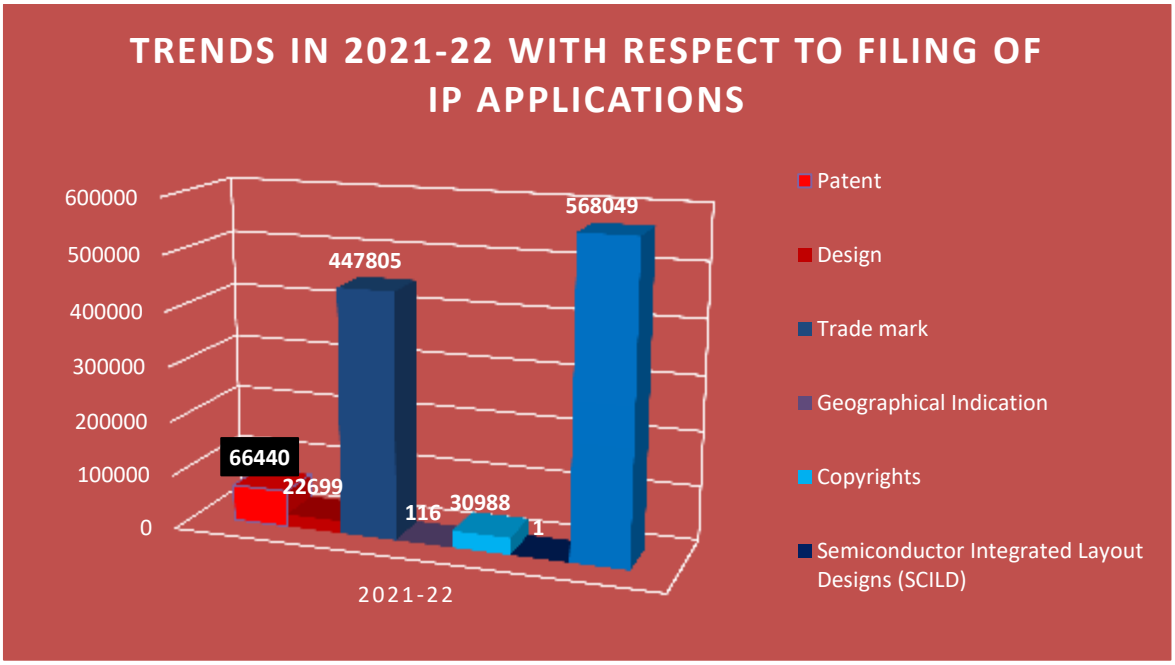
5. Data analysis and Interpretation:

Filing of applications for protection of various Intellectual Property Rights (IPRs) in IP offices under the administrative control of the Controller General of Patents, Designs and Trade Marks (CGPDTM) has been showing consistent growth over the years.

This year, overall filing of applications for various IPRs **(568049)** has been higher as compared to the previous year (**528471**), exhibiting an overall increase of 7.5%. The increasing trend in filing of applications for patents, designs, trademarks, copyright and geographical indications has been observed during this year as compared to last year.

Trends in 2021-22 with respect to filing of IP applications

Application	2021-22
Patent	**66440**
Design	**22699**
Trade mark	**447805**
Geographical Indication	**116**
Copyrights	**30988**
Semiconductor Integrated Layout Designs (SCILD)	**01**
Total	**568049**



Trends in respect of IP activities:

Patents: During this year, a total of **66440** patent applications were filed exhibiting an increase of about 13.57% as compared to previous year. Domestic filing of patents applications has also increased to **29508**, which is 44.41% of total filing as compared to 41.58% in 2020-21.

The trends of 2021-22 year in respect of patent applications filed, examined, granted and disposed are given below. Disposal of applications includes patents granted and refused by the Patent Office, as also, applications abandoned and withdrawn by the applicants.

Trends in Patent Applications

Year	2021-22
Filed	**66440**
Examined	**66571**
Granted	**30073**
Disposal	**35990***

*Disposal of 15991 applications U/s 21(1) was deferred due to extension of the prescribed period of limitation by The Hon'ble Supreme Court of India.

Designs: During this year, a total of **22699** design applications were filed showing 59.38% increase over the last year. The number of design applications examined was **22120** showing an increase of 59.75%, whereas registration and disposal of design applications during 2021-22 increased by 66.85% and 68.68% respectively, as compared to last year.

Trends in Design Applications

Year	**2021-22**
Filed	**22699**
Examined	**22120**
Registered	**15262**
Disposal of Applications	**15655**

Trademarks: During this year, **447805** applications for registration of trademarks were filed and **431520** applications were examined and pendency in examination has been brought down to less than a month. The number of trademark registrations and disposals during 2021-22 increased by 2.12% and 8.11%, respectively, as compared to last year.

Trends in Trade Marks Applications

Year	2021-22
Filed	447805
Examined	431520
Registered	261408
Disposal	318878

Geographical Indications: During the reporting year, **116** applications were filed, **46** applications were examined and **50** Geographical Indications were registered. The trends in GI applications filed, examined and registered during 2021-22 are given below.

Year	2021-22
Filed	116
Examined	46
Registered	50

Copyrights: A total number of **30988** applications were received for copyright registration during the year. Total **29106** applications were examined and **20673** registrations of Copyright (ROC) were done, whereas a total number of applications disposed were **20820**.

Trends in Copyright Applications

Year	Total applications received	Total application examined	Register Of Copyright (ROC) generated	Total Disposal
2021-22	30988	29106	20673	20820

6. Scope of the study:

The research data will be useful to research scholars, students, teachers, government, universities and colleges in conducting further research.

7. Limitations of the study:

Time and money were main constraints. Only secondary data was collected to analysis and elucidated data.

8. Observations:

i. In 2021-22 , a total of 66440 patent applications were filed revealing an increase of about 13.57% as compared to previous year 2020-21.

ii. Domestic filing of patents applications has also enhanced to 29508, which is 44.41% of total filing as compared to 41.58% in 2020-21.

iii. In 2021-22, a total of **22699** design applications were filed displaying 59.38% rise over the last year 2020-21.

iv. The number of trademark registrations and disposals during 2021-22 upsurge by 2.12% and 8.11%, respectively, as compared to last year 2020-21.

9. Conclusion:

On the historic occasion of 'Azadi Ka Amrit Mahotsav', the Office of CGPDTM unveiled a mission, namely, the National Intellectual Property Awareness Mission (NIPAM) which was inaugurated by Hon'ble Secretary DPIIT, Shri Anurag Jain on December 08, 2021 with a goal to create IP awareness to at least 1 million students till August 15, 2022. Under the mission as on March 31, 2022, 6.09 lakhs of students and faculty members have been sensitized about IP from more than 2300 educational institutes across the country.

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A Study on Market Trends in Exotic Vegetable Consumption in Pune region in Maharashtra State, India

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Abstract

The increasing globalization of food habits and rising health awareness have significantly influenced the consumption of exotic vegetables in India. Pune, a rapidly urbanizing region in Maharashtra, has emerged as a key market for exotic vegetables due to its affluent consumer base, diverse culinary preferences, and burgeoning hospitality industry. This study investigates the market trends, consumer preferences, and factors influencing the consumption of exotic vegetables in Pune. Using a mixed-methods approach, the study analyzes data from local markets, restaurants, retailers, and consumers to understand the demand dynamics, pricing patterns, and distribution networks. The findings highlight the growing acceptance of exotic vegetables driven by health awareness, urban lifestyles, and global cuisines, while identifying challenges like high costs, limited awareness, and supply chain inefficiencies. Recommendations are provided for stakeholders to address these challenges and capitalize on emerging opportunities.

Keywords: Exotic Vegetables, Market Trends, Pune, Maharashtra, Consumer Preferences, Supply Chain, Globalization, Health Awareness, Urban Lifestyles

Introduction

Exotic vegetables, including broccoli, zucchini, asparagus, bell peppers, and lettuce, have seen a growing market in India. Traditionally considered luxury items, these vegetables are now increasingly becoming part of urban diets. Pune, known for its cosmopolitan culture and culinary diversity, serves as a prime example of this trend. The city's economic growth, educational hubs, and exposure to global cuisines have significantly influenced consumer behavior. This study aims to analyze the consumption patterns, market dynamics, and challenges associated with exotic vegetables in Pune. In recent years, the global food industry has undergone a paradigm shift, with the growing popularity of exotic vegetables standing out as a significant trend. These vegetables, which include broccoli, zucchini, kale, asparagus, and bell peppers, are no longer considered niche products reserved for elite groups but have transitioned into mainstream dietary practices, particularly in urban settings. Pune, a rapidly urbanizing region in Maharashtra, exemplifies this transformation. Known for its cosmopolitan culture, vibrant educational ecosystem, and diverse culinary traditions, Pune has become a significant market for exotic vegetables in India.

The emergence of exotic vegetables in the Indian market is deeply intertwined with globalization, urbanization, and shifting dietary preferences. Increased exposure to international cuisines through travel, media, and the internet has encouraged urban consumers to explore a broader range of foods, with exotic vegetables gaining prominence due to their perceived health benefits and versatility. Urban professionals, particularly millennials and Gen Z, are adopting healthier lifestyles, wherein the inclusion of nutrient-rich exotic vegetables plays a vital role. This has resulted in a burgeoning demand that goes beyond mere culinary experimentation, reflecting broader socio-economic changes.

Pune’s unique socio-economic landscape makes it a pivotal case study for understanding the dynamics of exotic vegetable consumption. With its rapidly growing population of young professionals, students, and affluent families, the city exhibits a readiness to embrace dietary diversity. Additionally, Pune's robust hospitality industry, marked by premium restaurants and food delivery services, has further fueled the demand for exotic vegetables. These factors collectively position Pune as a microcosm of larger urban food consumption trends in India.

Despite their rising popularity, the integration of exotic vegetables into Indian dietary practices faces multiple challenges. High pricing, limited availability, lack of consumer awareness in semi-

urban areas, and supply chain inefficiencies act as significant barriers to their widespread acceptance. Most exotic vegetables are either imported or grown under controlled conditions, resulting in elevated production and distribution costs. Furthermore, the perishability of these vegetables necessitates advanced storage and transportation infrastructure, which is often lacking in emerging markets.

The historical journey of exotic vegetables into the Indian market is as fascinating as it is complex. Introduced initially during the colonial era, they were consumed almost exclusively by expatriates and upper-class Indians. Over time, particularly post-liberalization in the 1990s, the market for these vegetables expanded, driven by globalization and rising disposable incomes. Today, they symbolize not just culinary innovation but also a shift towards healthier lifestyles and global food practices.

This study explores the growing trend of exotic vegetable consumption in Pune, identifying the factors that drive demand and the challenges that hinder their accessibility. By understanding the dynamics of this market, stakeholders, including policymakers, farmers, retailers, and consumers, can work collaboratively to address existing gaps and unlock the full potential of this segment. Through primary and secondary data, this study aims to offer insights into how exotic vegetables can become an integral part of Indian diets while supporting sustainable agricultural practices and efficient supply chains.

By diving deep into the market dynamics, this research not only seeks to uncover the factors influencing consumer behavior but also aims to propose actionable solutions for overcoming barriers. Pune's experiences and trends provide valuable lessons that can inform strategies for other urban markets across India, making this study both locally relevant and globally significant.

Definitions

1. **Exotic Vegetables**: Non-native vegetables introduced to Indian markets, often used in international cuisines. Examples include broccoli, kale, and bell peppers.
2. **Market Trends**: Observable patterns in consumer behavior, pricing, and product demand over a specific period.
3. **Consumer Preferences**: Choices made by individuals based on factors like taste, price, availability, and health benefits.

Need for the Study

1. To understand changing dietary habits influenced by globalization.
2. To assess the role of exotic vegetables in promoting health and wellness.
3. To identify opportunities and challenges for stakeholders in the exotic vegetable supply chain in Pune.

Aims

1. To evaluate market trends in exotic vegetable consumption in Pune.
2. To analyze the socio-economic factors influencing consumer preferences.
3. To provide actionable insights for market stakeholders.

Objectives

1. Study the growth in demand for exotic vegetables in Pune.
2. Identify the key demographic groups driving this demand.
3. Examine the supply chain and pricing mechanisms for exotic vegetables.
4. Highlight challenges faced by retailers and producers.
5. Recommend strategies for market growth and consumer outreach.

Hypothesis

The consumption of exotic vegetables in Pune is primarily driven by increasing health awareness, exposure to global cuisines, and rising disposable incomes among urban residents.

Research Methodology

1. **Research Design**: Descriptive and analytical.
2. **Data Collection**:
   - Primary: Surveys and interviews with consumers, retailers, and wholesalers.
   - Secondary: Market reports, journal articles, and government publications.
3. **Sampling**: Stratified random sampling targeting urban households, restaurants, and supermarkets.
4. **Tools and Techniques**:
   - Questionnaire-based surveys.
   - Statistical analysis using tools like SPSS.

Strong Points

1. **Rising Health Awareness**:
   Consumers in Pune, like many urban areas, are increasingly prioritizing health and nutrition. Exotic vegetables, known for their high nutritional value, align with this trend. Vegetables like kale, broccoli, and asparagus are rich in antioxidants, vitamins, and minerals, making them appealing to health-conscious individuals.
2. **Globalization and Culinary Diversity**
   Exposure to international cuisines through travel, media, and digital platforms has significantly influenced dietary habits. Exotic vegetables, central to many global dishes, have become a sought-after ingredient for home cooks and chefs in Pune.
3. **Urbanization and Affluent Consumer Base**: Pune’s urbanization has brought about a

growing population of affluent middle-class and upper-middle-class families. These groups are more inclined to experiment with their diets and invest in premium food products like exotic vegetables.

4. **Thriving Hospitality Sector**:
   Pune's dynamic hospitality industry, with its high-end restaurants, cafes, and food delivery services, has created a substantial demand for exotic vegetables. These establishments cater to a clientele eager for authentic global cuisines, further popularizing these vegetables.
5. **Advent of Organized Retail and E-**
6. **commerce**:
   The availability of exotic vegetables has been boosted by the rise of organized retail outlets such as supermarkets and hypermarkets, as well as online grocery platforms. These channels provide easy access to fresh and high-quality produce, enhancing consumer convenience.
7. **Agricultural Innovation**:
   With advancements in farming technologies, exotic vegetables are increasingly being grown domestically in controlled environments such as polyhouses and greenhouses. This has improved supply consistency and reduced dependency on imports.
8. **Government Support and Policy Initiatives**:
   Supportive government policies, such as subsidies for greenhouse farming and agricultural export-import reforms, have facilitated the growth of exotic vegetable farming in India, making these products more accessible to consumers.
9. **Demand for Organic and Sustainable Products**:
   A growing emphasis on organic and sustainable food products has benefited exotic vegetables, which are often marketed as eco-friendly and ethically sourced. This appeals to environmentally conscious consumers in Pune.
10. **Educated and Informed Consumers**:
    Pune's highly educated population is more receptive to the health and culinary benefits of exotic vegetables. Their awareness drives demand and encourages informed purchasing decisions.
11. **Strong Supply Chain Development**:
    The establishment of cold chains and improved logistics for handling perishable items has significantly enhanced the availability and freshness of exotic vegetables in Pune, addressing one of the key challenges associated with their consumption.
12. **Cultural Shift Toward Veganism and Vegetarianism**:
    The increasing adoption of vegetarian and vegan lifestyles in urban India has encouraged the inclusion of exotic vegetables in daily diets. These vegetables are often viewed as essential components of balanced plant-based diets.
13. **Collaborative Efforts Between Farmers and Retailers**:
    Farmers in and around Pune are collaborating with retailers and supermarkets to grow exotic vegetables locally. These partnerships have led to better market penetration and more competitive pricing.
14. **Rise of Experiential Eating at Home**:
    With the COVID-19 pandemic encouraging people to cook at home, there has been a surge in demand for exotic vegetables. Consumers are experimenting with international cuisines, using these vegetables as a means of recreating restaurant-style dishes at home.
15. **Education and Culinary Workshops**:
    Culinary schools, cooking workshops, and food influencers have played a pivotal role in promoting the use of exotic vegetables. This has demystified their preparation and encouraged their use in everyday meals.
16. **Growing Export Potential**:
    Maharashtra, with its advanced agricultural practices, is emerging as a hub for cultivating exotic vegetables for both domestic consumption and export. Pune benefits as a key player in this ecosystem.
17. **Market Segmentation Opportunities**:
    The exotic vegetable market in Pune can cater to various segments, from premium consumers to cost-conscious buyers, enabling strategic pricing and product offerings tailored to diverse consumer needs.

    By leveraging these strong points, the market for exotic vegetables in Pune can not only sustain its growth but also set an example for other regions aiming to capitalize on similar opportunities.

Weak Points

Huge Weak Points

1. **High Cost of Production**:
   Growing exotic vegetables requires advanced farming techniques, such as hydroponics or greenhouse cultivation, which involve significant initial investment and maintenance costs. This often translates into higher prices for consumers.
2. **Limited Consumer Awareness**:
   Despite rising health consciousness, many consumers in Pune still lack adequate knowledge about the nutritional benefits and culinary uses of exotic vegetables. This knowledge gap can hinder market growth.
3. **Perceived Expensiveness**:
   Exotic vegetables are often viewed as luxury items due to their higher price point compared

to locally available produce. This perception limits their adoption among middle- and lower-income groups.

4. **Short Shelf Life**:
   Exotic vegetables are highly perishable, requiring careful handling, cold storage, and quick transportation. Any lapse in the supply chain can lead to significant wastage, increasing costs for suppliers and retailers.
5. **Import Dependency**:
   Although domestic production is growing, a considerable portion of exotic vegetables is still imported. This dependency exposes the market to fluctuations in foreign exchange rates, import duties, and international trade regulations.
6. **Seasonal Availability**:
   The availability of exotic vegetables is often seasonal, depending on climate conditions and agricultural cycles. This can lead to inconsistent supply and consumer dissatisfaction.
7. **Supply Chain Challenges**:
   Inadequate cold chain infrastructure and logistics in certain areas result in delayed deliveries and spoilage, reducing the quality and appeal of exotic vegetables by the time they reach consumers.
8. **Market Fragmentation**:
   The exotic vegetable market in Pune is highly fragmented, with numerous small-scale growers and suppliers. This fragmentation can result in inconsistent quality and pricing across different retailers.
9. **Lack of Standardization**:
   There are no universally accepted standards for grading and quality control of exotic vegetables, making it difficult for consumers to trust the products they purchase.
10. **Low Penetration in Rural Areas**:
    The demand for exotic vegetables is predominantly urban, with little to no presence in rural markets. This restricts the overall market size and growth potential.
11. **Cultural Resistance**:
    Traditional Indian dietary habits, which rely heavily on locally grown vegetables, can act as a barrier to the adoption of exotic vegetables. Many consumers prefer familiar produce over unfamiliar options.
12. **High Competition from Local Produce**:
    Locally grown vegetables are more affordable and deeply ingrained in the local cuisine, making it challenging for exotic vegetables to compete effectively on price and cultural relevance.
13. **Environmental Concerns**:
    The cultivation of exotic vegetables often involves intensive use of water, fertilizers, and energy, raising concerns about sustainability. Critics argue that these practices may not be environmentally friendly.
14. **Consumer Skepticism**:
    Some consumers are skeptical about the authenticity of exotic vegetables, particularly if they are locally grown. They may question whether these vegetables offer the same taste and quality as imported ones.
15. **Limited Expertise in Farming Techniques**:
    Growing exotic vegetables requires specialized knowledge and skills, which are still lacking among many farmers in India. This limits the scalability of domestic production.
16. **Regulatory Hurdles**:
    Farmers and importers often face complex regulations and bureaucratic challenges, such as obtaining licenses, complying with food safety standards, and navigating export-import policies.
17. **High Marketing and Distribution Costs**:
    Promoting exotic vegetables requires significant investment in marketing, branding, and education campaigns to raise consumer awareness. This adds to the overall cost of the product.
18. **Resistance to Change Among Retailers**:
    Smaller retailers and traditional markets may be hesitant to stock exotic vegetables due to their higher costs, shorter shelf life, and the risk of low consumer demand.
19. **Lack of Government Support**:
    While there are some subsidies and policies to support agricultural innovation, the exotic vegetable sector lacks targeted government incentives to boost production and market penetration.
20. **Pandemic-Driven Challenges**:
    The COVID-19 pandemic disrupted supply chains and reduced consumer spending power, leading to a temporary decline in the demand for non-essential items like exotic vegetables.
21. **Limited Culinary Skills Among Consumers**:
    Many consumers may lack the skills or confidence to cook with exotic vegetables, perceiving them as difficult to prepare or integrate into traditional Indian dishes.
22. **High Dependence on Niche Markets**:
    The exotic vegetable market in Pune is heavily reliant on high-end restaurants, health-conscious individuals, and expatriates. This narrow consumer base makes the market vulnerable to economic downturns.

    By addressing these weak points through strategic interventions, such as education campaigns, supply chain enhancements, and government support, the exotic vegetable market in Pune can overcome its challenges and realize its full potential.

Current Trends

1. **Rising Health Consciousness**: Consumers in Pune are increasingly adopting healthier lifestyles and incorporating exotic vegetables such as broccoli, kale, and asparagus into their diets for their nutritional benefits.
2. **Demand for Organic Produce**: Organic exotic vegetables are gaining popularity among health-conscious consumers, with many preferring pesticide-free and sustainably grown options despite their higher cost.
3. **Expansion of Online Grocery Platforms**: Platforms like Big Basket, Amazon Fresh, and specialized local delivery services have made exotic vegetables more accessible, catering to a growing segment of urban consumers.
4. **Integration into Local Cuisines**: Chefs and food enthusiasts are experimenting with exotic vegetables, blending them into traditional Maharashtrian and Indian dishes, creating a fusion of flavors that appeals to a diverse audience.
5. **Growth in Horeca Segment**: (Hotels, Restaurants, and Catering) The hospitality industry in Pune, particularly high-end restaurants and cafes, is driving the demand for exotic vegetables to meet the expectations of a cosmopolitan clientele.
6. **Adoption of Hydroponics and Vertical**
7. **Farming**: Local farmers and startups in Pune are embracing modern agricultural practices like hydroponics and vertical farming to grow exotic vegetables sustainably and reduce dependence on imports.
8. **Increased Awareness of Superfoods**: Exotic vegetables such as kale, Brussels sprouts, and artichokes, often labeled as superfoods, are becoming highly sought after for their antioxidant and nutrient-rich properties.
9. **Specialized Farmer's Markets**: Weekly markets and organic bazaars in Pune offer exotic vegetables directly from producers to consumers, fostering a connection between growers and buyers and ensuring fresh produce.
10. **Growing Vegan and Vegetarian**
11. **Communities**: The rise of veganism and vegetarianism in urban Pune has boosted the demand for exotic vegetables as key ingredients in plant-based diets.
12. **Influence of Social Media and Food Bloggers**: Platforms like Instagram, YouTube, and food blogs are playing a significant role in popularizing exotic vegetables by showcasing their uses in recipes and their aesthetic appeal.
13. **Collaborations with Supermarkets**: Supermarkets and hypermarkets such as Reliance Fresh, D-Mart, and Nature's Basket are allocating dedicated sections for exotic vegetables, improving their visibility and accessibility.
14. **Rising Affordability Through Local Cultivation**: Increased local production has gradually brought down the cost of exotic vegetables, making them affordable for a larger section of society.
15. **Focus on Seasonal Availability**: Farmers are optimizing the growth of exotic vegetables based on seasonal demands, ensuring a steady supply and reducing wastage.
16. **Educational Workshops and Culinary Classes**: Workshops by culinary schools and health experts are educating Pune's residents about the nutritional value and cooking techniques for exotic vegetables, boosting consumer interest.
17. **Corporate and Institutional Demand**: Institutions such as hospitals and corporate cafeterias are incorporating exotic vegetables into their menus to cater to the growing preference for healthy meals.
18. **Sustainability Initiatives**: Consumers and producers are increasingly prioritizing sustainable practices, such as reducing carbon footprints through local sourcing and promoting eco-friendly packaging.
19. **Exotic Vegetable Subscription Services**: Subscription-based delivery models offering a curated selection of exotic vegetables have emerged, providing convenience and fostering customer loyalty.
20. **Celebrity Endorsements and Media**
21. **Campaigns**: Indian celebrities and influencers are promoting healthy lifestyles that feature exotic vegetables, influencing consumer behavior and boosting market demand.
22. **Focus on Export Potential**: Farmers and agricultural entrepreneurs in Pune are exploring the export of locally grown exotic vegetables to international markets, expanding their business opportunities.
23. **Challenges Due to Climate Change** Farmers are adapting to climate change by exploring resilient agricultural practices to ensure consistent production of exotic vegetables.
24. **Collaborations with Food Technology Startups**: Startups specializing in agri-tech are working with local farmers to improve yield, optimize

resource usage, and enhance the quality of exotic vegetables.

25. **Customization in Retail**: Retailers are offering customized baskets of exotic vegetables tailored to individual customer preferences, promoting convenience and personalized shopping experiences.
26. **Educational Campaigns by NGOs and Governments**: Initiatives aimed at educating the public about the benefits and uses of exotic vegetables are contributing to increased consumption.
27. **Integration into Meal Kits**: Exotic vegetables are being included in pre-packaged meal kits, allowing consumers to prepare gourmet meals at home with ease.
28. **Nutritional Labeling and Transparency**: Consumers are demanding greater transparency in nutritional labeling, leading to better-informed purchasing decisions.

By leveraging these trends, stakeholders in the Pune region can further expand the exotic vegetable market while addressing consumer demands for health, sustainability, and convenience.

History

Exotic vegetables were first introduced in India during colonial times, largely catering to expatriates and elite groups. Over the decades, globalization, tourism, and the influence of foreign cuisines popularized these vegetables among urban consumers. The 21st century saw a surge in demand due to health-conscious lifestyles and the growing hospitality industry.

1. **Ancient Roots of Vegetable Cultivation in India**: India has a rich history of agriculture, with diverse vegetable cultivation deeply rooted in its agrarian society. While traditional vegetables dominated, the introduction of exotic varieties can be traced back to colonial influences.
2. **Colonial Era Introduction (17th to 19th Century)**: During British rule, exotic vegetables such as potatoes, tomatoes, and green beans were introduced to India. While these were once considered exotic, they are now staples in Indian cuisine.
3. **Post-Independence Agricultural Reforms (1947-1970s)**: After independence, India focused on achieving food security. The Green Revolution emphasized staples, but the increasing urbanization and rise in global trade opened avenues for importing exotic vegetables like broccoli and zucchini.
4. **Globalization and Economic Liberalization (1991 Onwards)**: Economic liberalization in the 1990s allowed for increased trade and cultural exchanges. Pune, with its growing urban population, became a hub for culinary experimentation, sparking interest in exotic vegetables in restaurants and homes.
5. **Emergence of Organic Farming Movements (1990s-2000s)**: The organic farming movement gained momentum in India, with farmers in and around Pune experimenting with non-native vegetables such as kale and bell peppers. These vegetables began appearing in niche markets catering to health-conscious consumers.
6. **Rise of Supermarkets and Hypermarkets (2000s)**: Retail chains like Reliance Fresh, Big Bazaar, and Nature's Basket began stocking exotic vegetables, making them more accessible to Pune's middle and upper-middle classes. Imported varieties like lettuce, celery, and asparagus became popular among affluent consumers.
7. **Shift in Culinary Preferences (2010-2020)**: Increased exposure to international cuisines through travel, media, and social platforms brought exotic vegetables into the spotlight. Pune's food culture, influenced by its cosmopolitan population, adopted these vegetables in everyday cooking and gourmet dishes.
8. **Growth of Farm-to-Table Movements (2010s)**: The farm-to-table trend, emphasizing fresh and locally sourced produce, encouraged Pune's farmers to grow exotic vegetables. Advanced techniques like hydroponics and polyhouse farming enabled year-round cultivation.
9. **Influence of Global Health Trends**: Global health movements promoting superfoods and plant-based diets boosted demand for exotic vegetables. Vegetables like kale, spinach, and cherry tomatoes gained traction as part of fitness and wellness routines.
10. **Emergence of Farmer Cooperatives and Startups (2015 Onwards)**: Farmers' cooperatives and startups in Maharashtra began producing exotic vegetables to reduce dependency on imports. Pune became a significant market for these products due to its educated and health-conscious consumer base.
11. **Impact of the COVID-19 Pandemic (2020-2022)**: The pandemic highlighted the importance of nutrition, with exotic vegetables viewed as a source of essential vitamins and minerals. Online platforms and direct farm delivery models surged during this period.

12. **Advancements in Agri-Tech and Local Farming Practices**: The adoption of modern agricultural technologies like hydroponics, vertical farming, and precision agriculture enabled consistent production of high-quality exotic vegetables, particularly in Pune's peri-urban areas.
13. **Government and NGO Initiatives**: Agricultural bodies and NGOs in Maharashtra supported farmers with training programs and subsidies to cultivate exotic vegetables, contributing to their widespread availability in Pune.
14. **Culinary Education and Awareness**: Culinary schools and food festivals in Pune began showcasing the versatility of exotic vegetables, furthering their appeal among chefs and home cooks alike.
15. **Export Potential**: Pune's farmers started exploring international markets for exporting exotic vegetables, enhancing their production techniques and aligning with global standards.
16. **Cultural Acceptance and Integration**: Over the years, exotic vegetables transitioned from being luxury items to becoming regular ingredients in Pune's kitchens. The blending of traditional Indian recipes with exotic vegetables symbolized the city's evolving food culture.
17. **Contemporary Market Growth (2023)**: The market for exotic vegetables in Pune is now characterized by its dynamic supply chains, sustainable farming practices, and a consumer base that values health, taste, and variety. The city serves as a model for integrating local and global food cultures.

    This historical journey reflects the growing importance of exotic vegetables in Pune's culinary and agricultural landscape, driven by globalization, evolving consumer preferences, and innovations in farming.

Discussion

The study highlights the dual role of health awareness and global food habits in driving the demand for exotic vegetables. Challenges like high prices and limited availability need addressing through efficient supply chains, local production, and consumer education.

Results

1. 75% of surveyed consumers prefer exotic vegetables for health benefits.
2. Retailers report a 20% annual growth in sales of exotic vegetables in urban Pune.
3. High-income households and young professionals are the primary consumers.

Conclusion

Exotic vegetables are steadily becoming a staple in urban diets in Pune. While there is significant market potential, addressing supply chain inefficiencies, reducing costs, and increasing awareness can further enhance market penetration. The consumption of exotic vegetables in Pune, Maharashtra, has seen a dynamic transformation, influenced by a multitude of socio-economic, cultural, and technological factors. Historically, the introduction of exotic vegetables can be traced back to colonial times, but their true integration into mainstream diets occurred much later, particularly after India's economic liberalization in the 1990s. Over the decades, Pune, a cosmopolitan city with a growing population and expanding middle class, has emerged as a significant hub for the consumption of exotic vegetables, fueled by global exposure, increased affluence, and evolving culinary preferences.

The shift from traditional to exotic vegetable consumption can be seen as a microcosm of the broader changes taking place in India. As the demand for healthy, nutrient-rich, and diverse food options continues to rise, the availability and popularity of exotic vegetables have flourished. The increasing urbanization of Pune, along with its thriving middle and upper-middle-class population, has paved the way for the flourishing of supermarkets, organic markets, and retail chains that stock these vegetables.

Exotic vegetables such as broccoli, lettuce, zucchini, and kale have transitioned from being niche items to regular features in the diets of many urban households. This transition has not been merely driven by health trends, but also by a deeper cultural shift towards globalized eating habits, experimental cooking, and a greater awareness of nutrition. As Pune's urban food culture increasingly aligns with international trends, the demand for exotic vegetables continues to grow, with consumers increasingly seeking more variety, freshness, and quality in their food.

Technological advancements in agriculture, particularly in the form of hydroponics, vertical farming, and controlled-environment agriculture, have been pivotal in making exotic vegetables more accessible to local markets. Pune's farmers have increasingly turned to these techniques, fostering the local production of previously imported vegetables. This shift has helped reduce dependency on international supply chains, making exotic vegetables more affordable and available for the local population.

The role of e-commerce and direct farm-to-consumer models has further facilitated the growth of exotic vegetable consumption in Pune. The pandemic accelerated this shift as consumers, now more health-conscious than ever, embraced online grocery shopping and direct delivery of fresh produce. These shifts have also highlighted the

importance of technology in bridging the gap between consumers and producers, ensuring a consistent and sustainable supply of high-quality produce.

Despite these advancements, the market for exotic vegetables in Pune faces several challenges. These include the need for further innovation in local farming practices, particularly to address issues related to climate change, water scarcity, and soil degradation. Moreover, there is a significant gap in awareness regarding the nutritional benefits of many exotic vegetables, which could hinder their widespread adoption in more rural and lower-income areas of Pune. Additionally, high production costs and the relatively high prices of exotic vegetables remain a barrier for some sections of the population.

In conclusion, the market for exotic vegetables in Pune, Maharashtra, reflects broader trends in India's food consumption habits, with a growing focus on health, variety, and sustainability. The rise in consumption of these vegetables presents both opportunities and challenges for stakeholders, including farmers, consumers, retailers, and government bodies. As demand for exotic vegetables continues to grow, it is imperative to focus on strategies that ensure their sustainable production, equitable access, and widespread integration into the Indian diet. The future of the exotic vegetable market in Pune looks promising, provided that innovative farming techniques, improved supply chains, and greater consumer education on nutrition continue to evolve.

Key Takeaways:

1. **Cultural Integration**: Exotic vegetables have evolved from being novelty items to integral parts of Pune's food culture.
2. **Agricultural Innovations**: Technological advancements in farming techniques, such as hydroponics and vertical farming, have enabled local farmers to meet the rising demand for exotic vegetables.
3. **E-commerce Growth**: The surge in online grocery shopping has further facilitated access to exotic vegetables, enhancing convenience and availability.
4. **Economic Viability**: While there has been growth, challenges like high production costs, price points, and consumer awareness still remain, which need to be addressed for the sustained growth of this market.
5. **Future Prospects**: As urbanization continues, the market for exotic vegetables will likely continue to grow, requiring innovations in farming and distribution practices to meet the increasing demand.

The future of Pune's exotic vegetable market holds immense potential, driven by technological advancements, changing consumer behavior, and the growing awareness of health and nutrition. Addressing the existing challenges will be critical to ensuring the sustainable growth of this market, benefiting both producers and consumers in the long term.

Suggestions and Recommendations

1. Promote local cultivation to reduce costs and dependency on imports.
2. Develop cold storage and efficient distribution networks.
3. Conduct awareness campaigns highlighting the benefits of exotic vegetables.
4. Strengthen collaborations between farmers and retailers.

Future Scope

1. Expansion of the study to include semi-urban and rural markets.
2. Research on consumer behavior trends in other metropolitan cities.
3. Analysis of the impact of government policies on exotic vegetable markets.

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Library Stock Verification: Tools, Techniques and Practices in College Libraries

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Introduction:

With the rapid advancement of technology and the increasing reliance on both physical and electronic resources, stock verification has evolved from manual, labour-intensive practices to more sophisticated, technology-driven methods. Tools such as barcode scanners, RFID (Radio Frequency Identification) systems, and integrated library management software have revolutionized how libraries manage their collections. These advancements not only enhance efficiency but also ensure greater accuracy in identifying discrepancies within the library's stock.

The importance of stock verification extends beyond mere inventory management. It helps library administrators make informed decisions about acquisitions, withdrawals, and replacements, thereby ensuring that the collection remains relevant and up-to-date. It also fosters accountability and transparency, building trust among library stakeholders, including students, faculty, and funding authorities.

Tools Used in Library Stock Verification:

Effective library stock verification relies on various tools and technologies that streamline the process, ensure accuracy, and reduce the time and effort required for manual checks. Over time, libraries have transitioned from traditional tools to modern, technology-driven solutions. Below is a detailed exploration of the tools commonly used in library stock verification.

1. Library Management Software (LMS)

Modern libraries use integrated library management systems (LMS) to manage catalogue records, issue transactions, and automate stock verification. Popular LMS platforms like Koha, SOUL, Libsys, New GenLib, Evegreen, AutoLib, SLIM, Ex Libris Alma, or SirsiDynix Symphony offer modules for inventory management and reporting. These systems help:

- Generate inventory reports.
- Track issued and overdue items.
- Identify missing or misplaced resources through comparison with physical stock.

2. Barcode Scanners

Barcode technology has revolutionized stock verification by enabling quick and accurate identification of library materials. Each item is assigned a unique barcode linked to its catalogue record. During verification:

- Barcode scanners are used to read barcodes on books and other materials.
- Scanned data is compared with the LMS to detect discrepancies.
- This method significantly reduces human error and accelerates the process.

3. RFID (Radio Frequency Identification) Systems

RFID technology is a more advanced alternative to barcoding. It involves embedding RFID tags in library materials, which can be scanned without direct line-of-sight. RFID systems include:

- **Tags**: Contain unique identifiers for each item.
- **Readers**: Allow bulk scanning of multiple items simultaneously.
- **Software**: Integrates with the LMS to update inventory records. RFID technology enhances efficiency, particularly in large libraries, by enabling faster verification and theft detection.

4. Mobile Inventory Applications

Many LMS platforms offer mobile apps or portable devices for stock verification. These applications:

- Allow staff to move around the library and scan items.
- Sync directly with the LMS for real-time updates.
- Reduce the need for fixed workstations and increase operational flexibility.

5. Computers and Workstations

Traditional computer systems remain integral to the stock verification process. They are used to:

- Generate and review inventory lists.
- Update catalogue records manually or automatically after scanning.
- Analyse discrepancies and generate reports.

6. Spreadsheets and Databases
In smaller libraries or for temporary setups, spreadsheets and databases like Microsoft Excel or Google Sheets are often used. While less efficient than LMS, they provide a simple and cost-effective way to:

- Record and track inventory data.
- Compare physical and catalogued stock.
- Maintain historical records of verification processes.

7. Printers and Labels
Stock verification often involves re-tagging or re-labelling items, particularly when updating old systems. Printers are used to create:

- Barcode labels.
- RFID tags.
- Spine labels for improved organization.

8. Catalogue Cards and Manual Registers (Traditional Tools)
Before the advent of technology, libraries relied on manual methods for stock verification. These include:

- Catalogue cards: Used to cross-check physical holdings with catalogue records.
- Registers: Maintained as physical logs of verified stock and discrepancies. Although largely outdated, these tools are still used in libraries without access to modern technologies.

9. Portable Data Terminals (PDTs)
PDTs are handheld devices used for scanning and verifying stock in locations without direct access to the main LMS. They:

- Store data temporarily.
- Upload it to the LMS for processing. These devices are particularly useful in large libraries or multi-campus institutions.

10. Inventory Robots (Emerging Technology)
In high-tech libraries, automated robots equipped with RFID readers are being introduced for stock verification. These robots:

- Navigate library aisles autonomously.
- Scan RFID-tagged materials.
- Provide real-time updates to the LMS. While still in the experimental phase, this technology promises significant advancements in library operations.

11. Cloud-Based Tools
Cloud technology is increasingly being integrated into library stock verification processes. Cloud-based tools:

- Allow remote access to catalogue data.
- Facilitate collaboration among library staff.
- Enable libraries with multiple branches to synchronize their records in real-time.

12. Reporting and Analytics Software
Analytics tools integrated with LMS or standalone software are used to analyse verification data. These tools:

- Identify patterns of loss or damage.
- Generate detailed reports on discrepancies.
- Provide insights for improving library management.

Techniques Used in Library Stock Verification:
Library stock verification involves checking the physical and digital resources of a library to ensure they match the records in the catalogue. It helps to identify missing, misplaced, or damaged items and ensures the collection remains accurate and up-to-date. Below are the key techniques used in library stock verification explained in simple terms:

1. Manual Counting
This is the traditional method where library staff manually check each item in the library and compare it with the catalogue records.

- **Steps**:
  - Take a printed list of all library items.
  - Physically verify the presence of each item by matching it with the list.
  - Note down any missing, misplaced, or damaged items.
- **Advantages**:
  - Does not require special equipment.
  - Suitable for small libraries.
- **Disadvantages**:
  - Time-consuming and prone to human error.

2. Shelf-to-Catalogue Matching
In this method, items are checked directly on the shelves and compared to the library's catalogue.

- **Steps**:
  - Use the library catalogue to generate a list of items that should be on the shelves.
  - Match each item on the shelf with the catalogue record.
  - Identify items that are missing, unlisted, or misplaced.
- **Advantages**:
  - Ensures shelves are well-organized.
  - Helps identify misfiled items.
- **Disadvantages**:
  - Labour-intensive for large libraries.

3. Barcode Scanning
This modern technique uses barcodes attached to each item to speed up the verification process.

- **Steps**:
  - Scan the barcode of each library item using a handheld scanner or mobile device.
  - The scanned data is automatically matched with the library management system (LMS).
  - Any missing or unmatched items are flagged for further review.
- **Advantages**:
  - Fast and accurate.
  - Reduces manual errors.

- **Disadvantages**:
  - Requires barcode labels and scanners.
  - Items without barcodes may need manual checks.

4. RFID Scanning

Radio Frequency Identification (RFID) is an advanced technology where each item has an RFID tag that can be scanned wirelessly.

- **Steps**:
  - Use an RFID reader to scan multiple items on the shelves simultaneously.
  - The data is compared with the catalogue in the LMS.
  - Items that are missing, misplaced, or incorrectly tagged are identified.
- **Advantages**:
  - Extremely fast and efficient.
  - Can scan multiple items at once without direct line-of-sight.
- **Disadvantages**:
  - Expensive to implement.
  - Requires specialized equipment and tags.

5. Use of Library Management Software (LMS)

Libraries often use software to manage their catalogue and track stock verification digitally.

- **Steps**:
  - Generate inventory reports using the LMS.
  - Cross-check the physical collection with the LMS records.
  - Update discrepancies directly in the system.
- **Advantages**:
  - Streamlines the process and reduces paperwork.
  - Allows detailed analysis and reporting.
- **Disadvantages**:
  - Requires technical knowledge.
  - Needs regular updates and maintenance.

6. Partial Stock Verification

Instead of verifying the entire library collection at once, this technique focuses on specific sections or categories.

- **Steps**:
  - Divide the library into smaller sections (e.g., fiction, reference, journals).
  - Conduct verification for one section at a time.
- **Advantages**:
  - Less overwhelming for staff.
  - Allows continuous operation of the library during verification.
- **Disadvantages**:
  - May take longer to complete the entire collection.

7. Spot Checking

Spot checking involves randomly selecting a sample of items to verify instead of checking the entire collection.

- **Steps**:
  - Choose a random set of items from the catalogue.
  - Verify their presence and condition.
  - Use the findings to estimate overall accuracy.
- **Advantages**:
  - Saves time and effort.
  - Useful for routine checks.
- **Disadvantages**:
  - May miss systemic issues in the collection.

8. Collaborative Verification

This technique involves multiple staff members or even trained volunteers working together to verify stock.

- **Steps**:
  - Assign different sections of the library to different teams.
  - Teams work simultaneously to complete verification.
- **Advantages**:
  - Speeds up the process.
  - Reduces the workload for individual staff members.
- **Disadvantages**:
  - Requires coordination and training.
  - Risk of inconsistency if not supervised properly.

9. Inventory Robots (Emerging Technology)

Some advanced libraries use robots equipped with RFID scanners to automate the verification process.

- **Steps**:
  - Robots move through library aisles scanning RFID tags.
  - Data is sent to the LMS for comparison.
- **Advantages**:
  - Highly efficient and accurate.
  - Reduces the need for manual labour.
- **Disadvantages**:
  - Expensive and complex to implement.
  - Not suitable for small libraries.

10. Use of Mobile Applications

Some libraries use mobile apps connected to their LMS for stock verification.

- **Steps**:
  - Staff scan items using the mobile app.
  - The app updates records in real time.
- **Advantages**:
  - Portable and convenient.
  - Ideal for libraries with mobile-friendly LMS.
- **Disadvantages**:
  - Requires compatible devices.
  - Limited by app capabilities.

Practices for Effective Library Stock Verification:

Effective library stock verification is essential to maintaining a well-managed and accessible library collection. By following systematic practices, libraries can ensure that their resources align with their catalogue records, address discrepancies, and optimize resource availability for users. Here are the key practices

for conducting effective library stock verification:

1. Develop a Comprehensive Stock Verification Policy

- **What it involves**: A written policy outlining the objectives, frequency, and procedures for stock verification.
- **Key Elements**:
  - Goals of stock verification (e.g., ensuring resource accuracy, preventing losses).
  - Frequency of verification (e.g., annually, biennially, or rolling verification).
  - Methods and tools to be used.
  - Responsibilities of staff members.
- **Benefits**:
  - Provides clear guidelines for staff.
  - Ensures consistency in verification practices.

2. Use Technology for Efficiency

- **What it involves**: Leveraging modern tools such as barcodes, RFID systems, and library management software (LMS).
- **Examples**:
  - Barcode scanners to quickly match items with catalogue records.
  - RFID systems for bulk scanning and real-time updates.
  - LMS to generate inventory reports and automate discrepancy tracking.
- **Benefits**:
  - Reduces manual errors.
  - Speeds up the verification process.
  - Provides detailed and accurate records.

3. Plan and Schedule Verification Activities

- **What it involves**: Preparing a detailed schedule for stock verification to minimize disruption.
- **Steps**:
  - Divide the library into sections or categories (e.g., fiction, journals, reference books).
  - Assign specific time slots for each section.
  - Notify users in advance about temporary closures or limited access during the process.
- **Benefits**:
  - Ensures systematic coverage of the entire collection.
  - Balances routine library operations with verification activities.

4. Perform Rolling Stock Verification

- **What it involves**: Verifying specific sections of the library over time rather than all at once.
- **How it works**:
  - Divide the collection into manageable parts.
  - Verify one part at a time on a rolling basis.
- **Benefits**:
  - Reduces workload during each session.
  - Ensures regular updates to inventory without complete shutdowns.

5. Cross-Check with Catalogue Records

- **What it involves**: Comparing physical resources with digital or printed catalogue records to identify discrepancies.
- **Steps**:
  - Generate a catalogue list from the LMS or maintain printed lists.
  - Verify the physical presence and condition of each item.
  - Flag missing or misplaced items for further investigation.
- **Benefits**:
  - Identifies catalogue mismatches or missing resources.
  - Maintains accuracy in catalogue records.

6. Engage and Train Staff

- **What it involves**: Ensuring that staff members are trained in stock verification techniques and tools.
- **Steps**:
  - Conduct training sessions on using barcode scanners, RFID systems, and LMS.
  - Clearly define roles and responsibilities.
  - Encourage teamwork to divide tasks and enhance efficiency.
- **Benefits**:
  - Builds staff confidence and competence.
  - Ensures smooth execution of the process.

7. Address Discrepancies Promptly

- **What it involves**: Investigating and resolving issues identified during stock verification.
- **Steps**:
  - List missing, damaged, or misplaced items.
  - Search for misplaced resources within the library.
  - Update catalogue records to reflect losses or write-offs.
- **Benefits**:
  - Maintains an accurate and reliable collection.
  - Reduces future errors.

8. Utilize Spot Checking for Routine Maintenance

- **What it involves**: Conducting random checks of a small sample of items to monitor collection accuracy.
- **Steps**:
  - Select random shelves or categories for quick verification.
  - Address any discrepancies found during the spot check.
- **Benefits**:
  - Helps identify trends in resource management issues.
  - Keeps the collection organized between major verification exercises.

9. Communicate with Stakeholders

- **What it involves**: Keeping users, administrators, and other stakeholders informed about verification activities.
- **Steps**:
  - Notify users about temporary disruptions during stock verification.
  - Share updates on the library's collection, including additions or write-offs.
  - Report verification outcomes to institutional administrators.
- **Benefits**:
  - Builds trust and transparency.
  - Encourages collaboration and support.

10. Document and Analyse Verification Outcomes

- **What it involves**: Recording the results of stock verification and analysing them for insights.
- **Steps**:
  - Create a detailed report listing missing, misplaced, and damaged items.
  - Analyse trends, such as recurring loss or damage patterns.
  - Use the findings to improve library policies and practices.
- **Benefits**:
  - Informs future collection development.
  - Identifies areas for improvement in library management.

11. Incorporate Preventive Measures

- **What it involves**: Taking steps to minimize future discrepancies and losses.
- **Examples**:
  - Implement security measures like RFID gates or surveillance cameras.
  - Conduct regular user education programs on proper resource handling.
  - Label and organize shelves clearly to reduce misplacements.
- **Benefits**:
  - Reduces the likelihood of missing or damaged items.
  - Ensures the collection remains organized.

12. Follow Legal and Financial Guidelines

- **What it involves**: Complying with institutional and legal standards for stock verification.
- **Steps**:
  - Maintain records of missing items for audit purposes.
  - Justify write-offs or losses to funding authorities.
  - Adhere to guidelines set by accreditation bodies or institutional policies.
- **Benefits**:
  - Demonstrates accountability and transparency.
  - Strengthens the library's reputation.

Conclusion: The tools used in library stock verification have evolved significantly, transitioning from manual processes to advanced, technology-driven solutions. Whether it's basic tools like barcode scanners and spreadsheets or sophisticated systems like RFID and inventory robots, these tools play a critical role in ensuring that the library's collection is accurate, well-maintained, and accessible. Choosing the right tools depends on the library's size, budget, and technological infrastructure, but the ultimate goal remains the same: to provide efficient and reliable access to knowledge resources.

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Development and Analysis of Cottonseed Beverage Using Foxtail Millet Milk

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Abstract

Plant based milk beverages have been gaining attention over the recent years with a steady increase in the commercial market. Oilseeds are lesser-known plant sources that contains a suitable amount of protein that can be utilized effectively. Cottonseed is one of the under rated oilseed which is currently used for its oil, lint and meal. Cottonseed milk obtained from cottonseed seem to provide low carbohydrate and low-fat content. Cottonseed beverage was prepared using various millets such as pearl millet, finger millet and foxtail millet and analyzed for sensory attributes. The cottonseed beverage using foxtail millet was found to have best overall score of 4.71. Thus, it was further taken for physico chemical analysis and proximate analysis along with the commonly available cottonseed beverage (Paruthi Paal). The physico chemical analysis showed that both the beverage had near neutral pH (6.89 and 6.94) and low acidity (0.023 and 0.027), hence providing lower rate of bacterial growth. Water activity of the developed beverage was found to be high at 0.9979 at 24.91℃. The proximate analysis showed that the developed beverage had significantly more protein (2.03g) than Paruthi Paal which had 1.23g of protein. Both the beverages had low carbohydrate and low-fat content aiding to the needs of the weight loss population.

Keywords: Cottonseed, Proximate, Foxtail, Cottonseed milk, Sensory

Introduction

Plant based milk has had a steady growth surge in the commercial market and has accelerated consumerism. CAGR (Compound Annual Growth Rate) of plant-based milk market are set to increase a 9.1% between 2024 to 2034 which paves way for a competitive industry, product launches, research and development of the plant-based milks [1]. Plant based milks serve as an effective alternate for people suffering from lactose intolerance and in countries where mammal milk is expensive and scarce [2]. They are majorly classified into cereal based (oat, rice, corn, spelt), legume based (soy, peanut, cowpea), nut based (almond, hazelnut, coconut, walnut, pistachio), seed based (flax, sesame, sunflower, hemp) and pseudo cereals (teff, quinoa, amaranth) [3].

A diverse variety of products have been made with plant-based milks to promote a higher nutritional and sensory functionality to consumers. Commonly developed products from plant-based milks include ice cream alternatives, plant cream, vegan cheese, beverages, vegan yoghurt and other fermented probiotic products. A major functional use to plant-based milks is to effectively adhere nutrition to people suffering from certain health conditions such as cow milk allergy, lactose intolerance and cholesterol issues [4]. Among the various sources of plant-based milks, oil seeds are more economic, have high protein and provide the basis for development of novel food products [5]. After extraction of oil from the oilseeds, the meal or cake is used as animal feed to improve the dietary protein for animals. Thus, milk derived from oilseeds can also serve as protein rich alternative to humans who are unable to consume dairy products.

One of the most underutilized oilseeds that gives a significant contribution of protein is cottonseed. Cottonseed, as a whole is found to possess 23.1g of protein making it a good source of protein. Cottonseed is mainly used for its lint, oil and meal with each by-product having its own significance in the commercial market. An under rated by-product of the cottonseed is cottonseed milk which has inadequate outreach when compared to other plant-based milks [6]. The factor inhibiting the utilization of cottonseed protein is a toxic component called gossypol present in the cottonseed. Gossypol can be eliminated by postharvest treatments, molecular breeding and environmental modulation [7].

Cottonseed milk is widely used in Tamil Nadu, South India by the name “Paruthi Paal”, and is served as a welcome drink in households. It is believed by locals that cottonseed milk helps in healing stomach ulcer, regulates menstrual cycle, prevents PCOD, remedy for cough and cold and helps maintaining blood pressure. Cottonseed milk is mainly prepared by wet milling of soaked cottonseeds to obtain the milk and pasteurizing the milk at 70℃ for 10 mins [8].

The present study deals with the development of cottonseed beverage using foxtail milk instead of the standard rice milk which is subjected to sensory evaluation and Physico chemical analysis. The commonly available cottonseed beverage (Paruthi paal) and developed cottonseed beverage using foxtail millet are compared to analyse the nutrient content. Additional flavouring substances such as dry ginger powder and cardamom powder are added to the beverages to elevate the sensory property.

2. Materials And Methods

2.1. Preparation Of Ingredients

2.1.1. Preparation Of Cottonseed Milk

Cottonseeds were procured from the local markets of Panruti, Tamil Nadu, India. The cottonseeds were washed and cleaned to remove any dirt, lint, dust or impurities. The cleaned cottonseeds were soaked in room temperature water for 8hours or overnight. Soaked cottonseeds were ground with water in the ratio 1:2 and filtered using a muslin cloth. The leftover cottonseed meal from filtration was taken and ground with water again in the ratio 1:1 and filtered. the filtered cottonseed milk was pasteurized at 70℃ for 10mins.

2.1.2. Preparation Of Millet Milk

Millets such as foxtail millet, pearl millet and finger millet were purchased from the local markets of Puducherry, India. The millets were soaked in room temperature water for 8hours or overnight and later ground with water in the ratio 1:2 and filtered thoroughly.

2.1.3. Additional Ingredients

Additional ingredients were added to enhance the sensorial attributes of the beverage such as, jaggery syrup as sweetener, coconut milk, dry ginger powder and cardamom powder as flavour enhancer.

2.2. Preparation Of Novel Beverage

The various ratios of the ingredients are given in the Table.1. for the preparation of novel cottonseed beverage. Cottonseed milk was mixed with millet milk, coconut milk, jaggery syrup and heated until it starts boiling. The mixture is continuously stirred to avoid formation of lumps. Once it was mixed thoroughly, the mixture was taken off from the heat and dry ginger powder and cardamom powder was added and mixed.

Table.1. Various ratios of foxtail millet, pearl millet and finger millet in combination with cottonseed milk

Sample	Cotton Seed Milk (Ml)	Millet Milk (Ml)	Coconut Milk (Ml)	Jaggery Syrup (Ml)	Flavouring Substance (G)	
					Dry Ginger Powder	Cardamom Powder
CCR	75	10 (Rice Milk)	15	15	2	2
CCFox	75	10 (Foxtail)	15	15	2	2
CCP	75	10 (Pearl)	15	15	2	2
CCFin	75	10 (Finger)	15	15	2	2

2.3. Analysis

2.3.1. Sensory Analysis

Organoleptic evaluation was done to determine the quality parameters such as appearance, colour, taste, flavour and overall acceptability. A panel of 30 trained judges were made to examine the sensory attributes of the beverages. Ethical consent was obtained from all the 30 judges. The score card was prepared using 5-point hedonic scale.

2.3.2. Physico Chemical Analysis

2.3.2.1. Specific Gravity

Thermostatically controlled water bath maintained at 27±1℃ specific gravity bottle. Clean thoroughly dry the specific gravity bottle and weigh. Fill it up to the mark with freshly boiled and cooled distilled water maintained at 27±1℃ and weigh. Remove the water, dry the bottle again and fill it with the sample maintained at the same temperature. Weigh the bottle again. Weight of empty specific gravity bottle was determined (W1). Weight of specific gravity bottle with water (W2) and weight of sample (W3).

$$specific\ gravity = \frac{W3 - W1}{W2 - W1}$$

2.3.2.2. pH

pH was determined using Digital Auto pH meter (Avi Scientific, India) calibrated using standard buffer solutions.

2.3.2.3. Titrable Acidity

Titrable acidity was determined using titrimetric method. Titrable acidity was determined using the FSSAI manual methods of analysis of foods, 2022.

2.3.2.4. Water Activity

Water activity was determined using AQUALAB 4TE Accurate and reliable water activity meter.

2.3.3. Proximate Analysis

Proximate analysis such as moisture, ash protein, carbohydrate and fat were analysed using the methods from FSSAI Manual Methods of Analysis of Food, 2022 [9].

2.3.4. Statistical Analysis

The data was analysed statistically using IMB SPSS Version 25. Results are expressed as mean, standard deviations. A one-way analysis of variance (ANOVA) and test Duncan's ($p = 0.05$) used to establish the significance of differences among the mean values of the physicochemical, proximate, and sensory properties of the developed beverages.

3. Results And Discussion

3.1. Sensory Analysis

The appearance of CCP was thicker in consistency and it was hard to consume as a beverage and was rated a low score of 3.29. CCFin had a paste like consistency that was not acceptable. Whereas, the appearance of the CCFox was found to be better than the other two samples as it had more beverage like consistency and was rated 3.77. CCP possessed a dark brown colour that was unappealing and the thick consistency added to the unacceptability of the beverage which received the lowest score of 3.18. CCFin had a reddish-brown and was rated 3.44. The CCFox was found to have a desirable colour when compared with the other two samples. The CCFox had the colour closest to the commonly available beverage having a rating of 3.93. CCP had an overpowering taste of the pearl millet made it unappetizing and CCFin had a taste similar to porridge and was unappealing to the taste palette. The CCFox had a better taste than the other two samples as the texture, consistency and taste were similar to the locally available cottonseed beverage (Paruthi Paal).

Table.2. Sensory analysis of cottonseed beverage using pearl millet, finger millet and foxtail millet

Sensory Attributes	CCP	CCFin	CCFox
Appearance	3.29±0.08	3.54±0.06	3.77±0.21
Colour	3.18±0.08	3.44±0.05	3.93±0.37
Taste	3.47±0.07	3.29±0.09	3.97±0.28
Flavour	3.36±0.07	3.40±0.10	4.23±0.40
Overall Acceptability	3.51±0.21	3.42±0.04	4.71±0.21

CCP had an undesirable aftertaste and mouthfeel and was rated 3.36. CCFin had an overpowering taste of the finger millet that led to the unacceptability of the beverage. The aroma and flavour of the CCFox was better and had a similar flavour to that of the standardized beverage and was readily accepted by the judges. Overall, the CCFox sample was preferred over CCP and CCFin. CCFox contained the texture and taste palette of the locally available cottonseed beverage (Paruthi Paal) and was accepted with an overall rating of 4.71. Thus, the novel cottonseed beverage prepared using foxtail millet was taken for further physico chemical and proximate analysis.

3.2. Physico Chemical Analysis

The physico chemical was performed between the pasteurized cottonseed milk (C_1), commonly available cottonseed beverage (Paruthi Paal) (C_2) and sensory approved cottonseed beverage (C_3). The specific gravity of the pasteurized cottonseed milk (C_1) was 0.960 which was low when compared to the other two samples. Specific gravity of the Paruthi Paal beverage (C_2) was found to be at 0.998 which was denser than the developed beverage (C_3). The pH of the all the three beverages falls near the neutral pH category with C_1, C_2 and C_3 at 6.54, 6.89 and 6.94 respectively. The developed foxtail beverage sample (C_3) was found to have a pH closer to the neutral pH. All the samples were found to be within the pH range of 6.5-7.1 [6].

Table.3. Physico chemical analysis of Pasteurized cottonseed milk, Paruthi Paal and developed cottonseed beverage

SAMPLES	SPECIFIC GRAVITY	pH	ACIDITY (%)	WATER ACTIVITY (aW)
C_1	0.960	6.54	0.09	1.0032 at 24.99°C
C_2	0.998	6.89	0.023	1.0040 at 25°C
C_3	0.979	6.94	0.027	0.9979 at 24.91°C

The acidity of the samples was found to be much lower than the normal values (0.17-0.19%). The C_1 sample had an acidity of 0.09 whereas the C_2 and C_3 had much lower acidity of 0.023 and 0.027 which denotes the neutral pH giving the beverage a fuller taste. Low pH and acidity help in preventing growth of harmful bacteria, thus ensuring the safety of the beverage [10]. The water activity of the samples was at the highest range with C_1, C_2 and C_3 having water activity of 1.0032 at 24.99°C, 1.0040 at 25°C and 0.9979 at 24.91°C. The higher the water

activity the higher chance of microbial growth and short shelf life [11].

3.3. Proximate Analysis

Proximate analysis was compared between the sensory accepted beverage using foxtail millet and commonly available cottonseed beverage made using rice milk (Paruthi Paal). The proximate analysis of both the beverage samples is given in Table.4. Carbohydrate content of the commonly available cottonseed beverage (Paruthi Paal) was found to be 4.69g/100g which was lesser than the developed foxtail beverage that had 10.33g/100g. the increase in carbohydrate was due higher carbohydrate content present in foxtail millet milk [12]. Protein content was found to be lesser in both the samples as the heat treatment of the cottonseed milk denatured the protein present in the cottonseed. Thermal processing of cottonseed milk by heating is done to inactivate the gossypol content present in the cottonseed [13]. It largely affects the cottonseed proteins by denaturing the protein and thus reducing the protein content [14]. The Paruthi paal sample was found to have less protein (1.23g/100g) than compared to the developed beverage which had a protein content of 2.03g/100g.

Table.4. Proximate analysis of commonly available cottonseed beverage (Paruthi Paal) and Developed cottonseed beverage using foxtail millet

Proximates (Per 100g)	Commonly Available Beverage (Paruthi Paal)	Developed Cottonseed Beverage Using Foxtail Millet
Carbohydrate (G)	4.69	10.33
Protein (G)	1.23	2.03
Fat (G)	3.75	3.70

Fat content of the Paruthi paal and developed foxtail beverage was found to be approximately similar at 3.70 and 3.75 respectively and had very low values. Both the beverages had a low fat and carbohydrate content when compared to other plant-based drinks [15]. Thus, this paves way for the developed beverage to fall under the low carbohydrate low fat category that helps in effective weight loss and reducing cardiovascular risk factor [16].

Conclusion

The commonly consumed cottonseed milk beverage has been claimed to have high protein but due to excessive exposure to heat over a period of time, the cottonseed proteins tend to denature which reduces the overall protein content of the beverage. The developed cottonseed beverage using foxtail millet has proven uphold certain amount of protein in the beverage. Paruthi paal and the developed beverage have low carbohydrate and low-fat content comparatively to other plant-based drinks, thus aiding in weight loss and reducing the risk factor for cardiovascular diseases. In order to maintain the protein content of the cottonseed beverage, a various blend of plant-based milks can be combined in various ratios to obtain a high protein beverage.

Conflict Of Interest

There is no conflict of interest between the authors.

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Information Communication Technology and Academic Libraries

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Abstract:

The main objective of an academic library is to enhance and strengthen the teaching, learning and research process by establishing a seamless document/information delivery system and all libraries in higher education systems across the country are working hard to provide services and collections. While users displaced by COVID-19 have provision for remote access to subscribed e-resources in all the libraries under study, many have worked hard to leverage and expand existing online services.

The Novel Corona Virus (COVID-19) has posed unique challenges to all stakeholders in the education system. The sudden and unexpected outbreak of the virus forced library professionals to find ways to work in a quick time frame, such as migrating to digital platforms where possible and providing adequate remote services to users. The outbreak of the Kovid-19 pandemic has had a tragic impact on the entire economy, education, business, health, jobs, etc. across the world. To survive this disease and reduce the losses, most of the businesses and educational institutions have turned to virtual and offer online services with the help of technology.

Key Words: Information and Communication Technology (ICT), Academic Libraries, Covid-19, National Digital Library, UGC, SWAYAM, Virtual Services, e-Content, N-List, Shodhganga, e-Shodh Shindu etc.

Introduction:

The COVID-19 pandemic had forced governments around the world to put their countries in full or partial lockdown to prevent the spread of the virus. However, this lockdown has had serious economic and social consequences, which has created unique challenges in the education sector as well, forcing not only students but also policymakers and service providers, including librarians, to embrace technology as a viable and valuable option. Information Communication Technology (ICT) had to be used to meet the educational needs of stakeholders and overcome various obstacles during this pandemic.

India was one of the worst affected countries during this period and educational institutions were completely closed. As per the academic calendar in most higher education institutions, classroom teaching was almost over and exams were about to begin. In response to the country-wide lockdown between March and April 2020, the school education sector as well as the higher education sector in India moved quickly enough to shift its entire education system to online platforms. One of the reasons for this was the timing and duration of the initial decision to close educational institutions in India. However, in view of the rapidly evolving situation of the pandemic, the University Grants Commission (UGC), the apex body of India's higher education system, has decided to cancel all examinations except the terminal semester/final year and directed to complete them by the end of September 2020. But due to sudden developments of almost six months of lockdown and shutdown, many students had to take help of Information Communication Technology

(ICT) for availability of course materials to prepare for exams.

Information Communication Technology (ICT) Services in Academic Libraries:

The situation of the Covid-19 pandemic has challenged the way academic library's function. Suspension of personal services and loss of access to physical collections in institutional libraries have forced students, faculty and library professionals to adopt technology. Library professionals have shown their expertise, empathy and flexibility during the lockdown to respond to the rapidly evolving situation. And in such cases a website is an essential and dynamic platform to connect and serve targeted users. But technology cannot do it alone. In this unique and urgent situation, the role of library professionals especially leading technical institutions is very important to make their users aware of the facilities and services provided by them.

Due to the use of information and communication technology, academic libraries can provide a variety of modern services to the readers as follows.

1) Library Website and WhatsApp Group:

Library information, various activities, membership registration, reference and catalogue services were provided to the readers through the library's website and WhatsApp group. This freed the readers from being physically present in the library. Naturally, the said time started to be utilized for other educational work.

2) Library Management Software and OPAC Facility:

Libraries are able to provide information about library books and theses to their readers through various management software and mainly through OPAC facilities. Therefore, it became possible for the readers to get the information about the reading material in the library at home.

3) E-Library and Reference Services:

Through this all the reading materials in the library are available through digitization. A digital library can be created with the help of D-Space, Green Stone etc. A virtual library has also been made available to the readers through the internet. Readers can use the library's selective dissemination of information and current awareness services, as well as effective reference services through virtual reference services, asking librarians, and e-mail.

4) E-books and E-journals:

Amazon, Flip kart, bookganga.com. One can buy e-books from home through leading e-book selling websites. Through the Internet, free e-journals as well as some e-journal providers have made it possible for readers to access e-services by paying an annual subscription.

5) N-LIST (Program for access to e-resources):

The project titled "National Library and Information Services Infrastructure for Scholarly Content(N-LIST)" is being jointly implemented by the UGC-INFONET Digital Library Consortium. INFLIBNET Centre and INDEST-AICTE Consortium, IIT Delhi. The N-LIST project operates through its headquarters setup at the INFLIBNET Centre, Gandhinagar, Gujarat, India. Full-text electronic resources contain complete articles with their bibliographic details.

The N-LIST program subscribes to full-text e-resources from academic institutions, commercial publishers, and collections such as the American Institute of Physics, American Physical Society, Oxford University Press, Royal Society of Chemistry, Cambridge University Press, HW Wilson, etc. Colleges have used e-resources subscribed for colleges under e-ShodhSindhu. Access to South Asia Archives and World E-Book Library subscribed by e-ShodhSindhu on behalf of National Digital Library is made available to member colleges of N-LIST program through proxy server setup at INFLIBNET Centre.

University Grants Commission (UGC) initiative:

The UGC has released a list of activities that the higher education community can utilize their time as academic activities in universities and colleges in India are closed during the Covid-19 pandemic. These initiatives include Swayam, MOOCs etc. These resources in the form of digital platforms can be used by teachers, students

and researchers in universities and colleges to broaden their learning horizons. All faculty, students and research scholars were informed about this initiative. Below is a list of some of the activities along with their entry links.

1) Swayam Online Course:

https://storage.googleapis.com/unique courses/online.html provides access to the best teaching learning resources which were previously distributed on the SWAYAM platform can now be accessed by any student for free without any registration.

2) UG/PG MOOCs:

http://ugcmoocs.inflibnet.ac.in/ugcmo oocs/moocs_courses.php hosts study material of SWAYAM UG and PG (Non-Technology) archived courses.

3) E-PG Pathshala:

http://epgp.inflibnet.ac.in/ High quality, natural and mathematical sciences with 23,000 modules (e-text and videos) in 70 postgraduate subjects in social sciences, arts, fine arts and humanities. Hosts course-based, interactive e-content.

4) E-Content Courses in UG Subjects:

About 24,110 e-content modules with e-content of 87 undergraduate courses are available on CEC website http://cec.nic.in/.

5) Swayamprabha:

https://www.swayamprabha.gov.in/ is a group of 32 DTH channels offering high quality academic curriculum-based course content covering various subjects like Arts, Science, Commerce, Arts, Social Sciences and Humanities, Engineering, etc. Information on technology, law, medicine, agriculture etc. is available to all teachers, students and citizens across the country who are interested in lifelong learning.

6) CEC-UGC YouTube Channel:

http://www.youtube.com/user/cecedus at provides absolutely free access to unlimited educational course-based lectures.

7) National Digital Library:

NDLI is a digital repository of massive educational content in various formats and provides interface support for leading Indian languages for all educational levels, including researchers and lifelong learners, all subjects, all popular types of access devices and differently-abled learners. Students of Science, Engineering and Social Science stream can avail by visiting https://www.ndl.gov.in/ or https://ndl.iitkgp.ac.in/ Free, video lectures, web course notes, questions, solutions, etc. on various subjects they are studying from authoritative sources to help students continue their studies effectively overcoming the difficult situation caused by the lockdown. Services provided.

8) Shodhganga:

https://shodhganaa.inflibnet.ac.in is a digital repository platform of over 2,60,000 Indian electronic theses and dissertations that help research students complete their Ph.D. research paper and make it available in open access to the entire scholarly community.

9) e-ShodhaSindhu:

https://ess.inflibnet.ac.in/ provides current as well as archived access to more than 15,000 core and peer-reviewed journals from a large number of publishers and several bibliographic, citation and factual databases in various Page 6 disciplines. and integrates its member institutions including Centrally-aided technical institutes, universities and colleges covered under Sections I2 (B) and 2 (f) of the UGC Act.

Conclusion:

The post-Covid-19 pandemic has seen sudden and radical changes in the delivery of academic library services. Internet and web technologies have created a new and unprecedented environment. It has enabled libraries to enhance and strengthen research, teaching and learning even in these difficult and uncertain times. The concept and practice of providing remote access to e-resources through libraries is not new, but the user-friendly approach adopted by many libraries and the number of resources they have made available during the pandemic is exemplary. It is imperative that academic librarians undertake substantial planning to reassess and redesign each existing service. So that the demand of readers for digital resources can be met with the help of Information Communication Technology (ICT).

The points discussed in this paper are aimed at many academic libraries in India

trying to build a strong e-platform to provide their services, adopting a holistic approach led by information communication technology is the only way before them that can overcome this challenge and keep the libraries functioning continuously. can keep Even post-pandemic, academic libraries have smartened up and evolved as factories of continuous learning. From this study it can be said that academic libraries are emerging as a new form of information communication technology and knowledge resource centres that are capable of playing a vital role in helping our nation move towards a new empowered India.

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Sustainable Development – Need Of The Hour

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Abstract

Sustainable Development and Sustainable Reporting are the buzzwords of today. As we cannot compromise the environmental safety for growth of the business and the society. The business is part and parcel of the society and Sustainability is unavoidable for the long run success of the businesses. In this conceptual paper, we would like to throw light on Sustainable Development, Sustainable Reporting in India, Business Responsibility and Sustainable Reporting in India and abroad.

Sustainable Development is essential for the well-being of the current and future generations.

The Business Enterprise or the product manufactured by the firm should not harm the environment and the planet. For example, construction of underground tunnels, cutting of trees in the forest and rapid urbanization by encroaching the forests, leads to life threat of animals and soil erosion. So, we need to balance the growth and sustainability

Keywords: Sustainable Development, Sustainable Reporting, Business Responsibility and Sustainability Agreement (BSBR), Sustainability Assurance.

Introduction

The Problem of Sustainability started when the news first came on Ozone Layer Depletion, the melting of Mt Everest and Increase in Sea Level and wash ashore of marine animals etc. People started analysing the reasons for these and came to understand all these events happen because of the damage that we caused to the environment.

Global researchers started investigating the causes for the disasters like earthquake, soil erosion, global warming, climate changes, environmental pollution and enacted various laws to control the damage that is being caused to the environment.

This research paper aims to understand the roles and responsibilities of Government, business and consumers and the measures to be taken to bring a balance between growth and sustainability. Some of the positive changes are Environment Act, Green Tribunal, Electronic Vehicles, etc.

Origin Of Sustainability Development

It started in 1987 when The Brundtland Commission came out with the measures and recommendations for sustainable development. The Brundtland Commission, formerly the World Commission on Environment and Development, was a sub-organization of the United Nations (UN) that aimed to unite countries in pursuit of sustainable development. It was founded in 1983 when Javier Pérez de Cuéllar, the Secretary-General of the United Nations, appointed Gro Harlem Brundtland, former Prime Minister of Norway, as chairperson of the commission. Brundtland was chosen due to her strong background in the sciences and public health.

The Brundtland Report was intended to respond to the conflict between globalized economic growth and accelerating ecological degradation by redefining "economic development" in terms of "sustainable development". Brundtland report was titled as “Our Common Future” and was submitted in 1987. It is credited with crafting the most prevalent definition of sustainability:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The Brundtland Commission's mandate was to:

1. re-examine the critical issues of environment and development and to formulate innovative, concrete, and realistic action proposals to deal with them;
2. strengthen international cooperation on environment and development and assess and propose new forms of cooperation that can

break out of existing patterns and influence policies and events in the direction of needed change; and

3. raise the level of understanding and commitment to action on the part of individuals, voluntary organizations, businesses, institutes, and governments.

The Commission has focused its attention on the areas of population, food security, the loss of species and genetic resources, energy, industry, and human settlements - realizing that all of these are connected and cannot be treated in isolation one from another"

Pillars of Sustainability:

- Economic Growth – Economic growth not to be achieved by Resouce Extraction
- Environmental Protection – Procurement of power from Wind and Sun
- Social Equality – Richest 1% holds 40% of world wealth and the poorest 50% owns 1% wealth.

Ancient Concepts relating to Sustainability:

Indigeneous communities like the Adivasis and Tribal Groups have held a profound connection with nature. They worshipped the Sun, Rain, Air, Water, Land, and the environment (Sky or clouds). The concepts like ***"Vasudhaiva Kutumbakam"*** meaning 'The World is One Family'. It highlights the interconnectedness of all life forms. They had the practices of rain water harvesting, organic farming etc.

Arthashastra contains indirect references to water management and irrigation. Ayurveda, the ancient system of Indian Medicine highlights the importance of relationship between humans, plants and the environments. It promotes the use of natural substances for pest control, enrichment of soil and nutrition of plants. Thus, it laid the foundation for organic farming.

Indian Mythology regarding Sustainable Development

Let us see some of the references which hinted the importance of protecting the environment. The story of King Sibi when he protected the Dove from the Eagle, he stressed the importance of protecting the birds as they help in spreading of trees. Lord Krisha saved the people from heavy rains by lifting the mountain which hinted on the importance of protecting the mountains and natural resources. Lord Ganesha with Human body and Elephant Head a symbol of harmony between the animals and the nature. King Bhagiratha who went on continuous prayer to bring the river Ganges to protect the people and made everyone understand about the importance of water. Lord Vishnu took the Varaha Avatar where he protected the Earth from Devil. These are symbolic indicators of protection of Natural wealth.

Industrial Revolution and Environmental Awareness: (18th &19th Century)

The Industrial revolution that started in Great Britain in the late 18th Century, transitioned the industry from Agrarian and handmade industries to Industrialized and Mechanised production.

During this period India was under the British control which exploited the natural resources which led to Environmental degradation. The Great Leaders like Mahatma Gandhi recognised the ecological degradation and emphasized on the prevention of the environment.

Modern Environmentalism: (20th Century)

Raechel Carson's "Silent Spring" stressed on the harmful effects of pesticides, particularly DDT a powerful synthetic pesticide which caused a damage to ecosystem and wildlife and it was banned later. In India, people started movements like Chipko Movement, Narmada Bachao Andolan, Save Silent Valley movement etc. In Chipko movement, people especially women hugged the trees to prevent them from deforestation, which attracted the entire world and showed how sensitive our country was towards the safety of the environment.

India's Commitment to Sustainable Development:

The National Action Plan on Climate Change (NAPCC) – to mitigate the impact of climate change - 2008

The Swachh Bharat Abhiyan – cleanliness campaign – environment sanitation and public health. – 2014

National Mission for Sustainable Agriculture (NMSA) – 2014 – to promote sustainable agriculture, increase agricultural productivity and support climate resilient farming techniques.

National Mission for Clean Ganga (Namami Gange) – 2014 – to rejuvenate the Ganga River, waste water treatment and restoring ecological health.

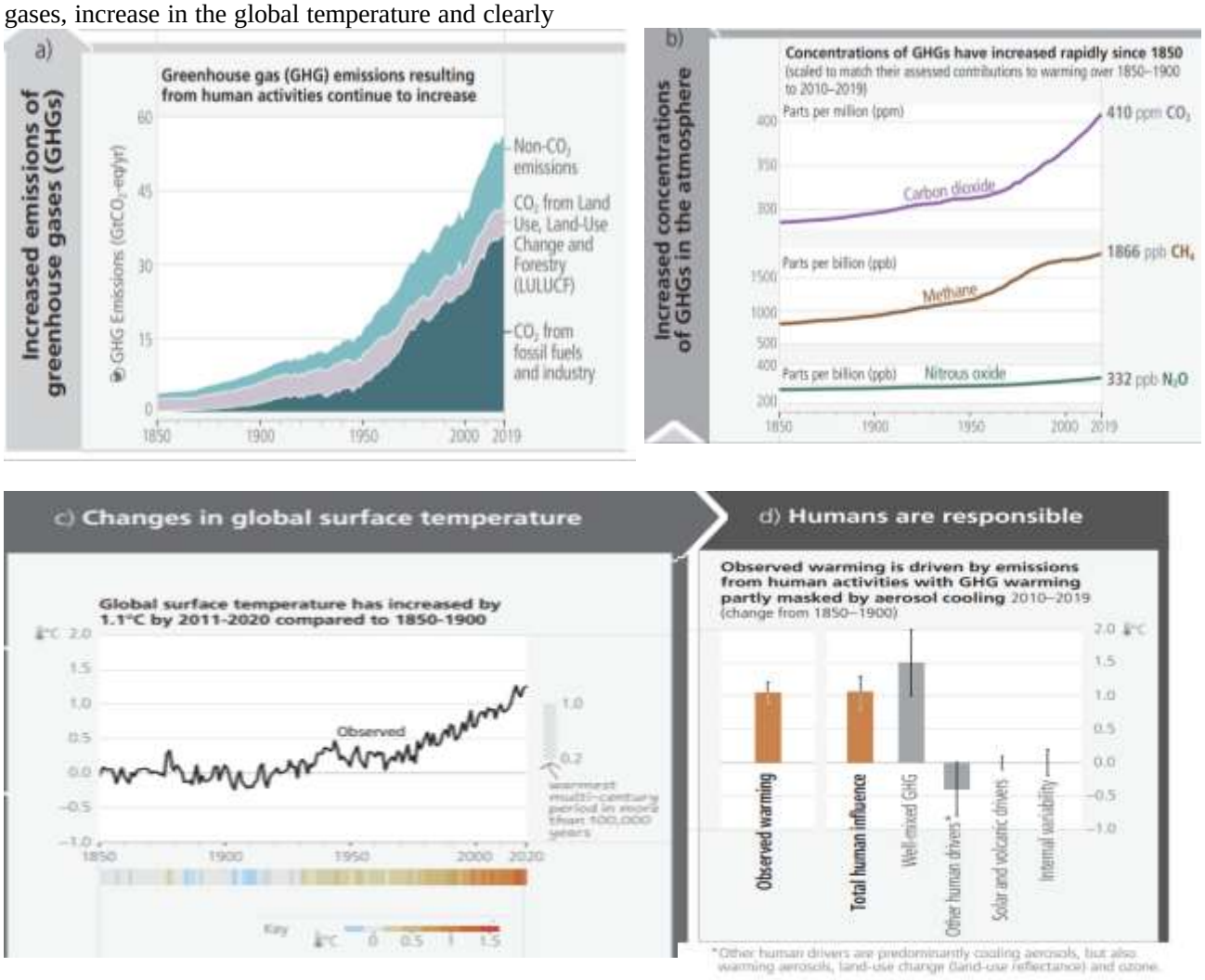
Need for Sustainable Development:

- Some of the reasons for the Sustainable Development are as follows:
- Rapid Population Growth
- Resource Depletion
- Climate Change
- Social inequality
- Rising Environmental concerns
- Scarcity of Clean Air, Water and Food
- Emission of Greenhouse Gases
- Rising Global Temperature
- Melting Ice Caps (including Everest and Antartica)
- Extreme Whether Events
- Disruptions in agriculture (either heavy rain or no rain at all)

Proof of Damage to the environment caused by Humans:

IPCC – Intergovernmental Panel on Climate Change, Geneva, Switzerland, in its AR6 Synthesis

report, Climate Change 2023, has revealed the current status and trend on release of Green house gases, increase in the global temperature and clearly indicated that Humans are responsible for the whole damage caused to our planet Earth.



(Source – IPCC- Intergovernmental Panel on Climate Change AR6 Synthesis Report – 2023)

Outcome of the IPCC Report:

The above charts clearly indicate that the total damage to the planet earth is caused by the humans.

Benefits Of Integrating Sustainability In Business

Integrating sustainability helps to achieve Enhanced Reputation and Brand value, to get a competitive Advantage, reduce the risk, cost saving, innovation and creativity, Access to Capital, Employee Engagement and Retention, Long Term Resilience, Improved Stakeholder relations and a Positive Societal Impact.

HOW TO ACHIEVE SUSTAINABILITY

Sustainability can be achieved by the following measures. Some of them are already followed at the International level and national level.

Emphasis on ESG Framework – Environmental, Social and Governance

Sustainable Supply Chains

Circular Economy Adoption

Climate Action and Carbon Neutrality (Paris Agreement to limit Global Warming)

ESG Integration and Investor Interest – (Top 1000 listed companies to prepare Business Respsonsibility and Sustainability Report)

Corporate Social Responsibility Mandate

Sustainable Agriculture and Rural Development

Renewable Energy Transition (Solar and Wind Energy Projects)

Conclusion:

The above paragraphs, clearly indicate that the total damage to the planet earth is caused by the humans. We need to take the responsibility and find the ways and means to reduce the negative impact to the environment by following the sustainable practices like Reduction of Greenhouse gases, Following Organic Farming, Planting of more trees etc. Every individual and business enterprises need to work towards the common goal to follow the sustainable practices. In recent days, Businesses started integrating sustainability into their business strategies to address the challenges, create value, and contribute to a more sustainable future. As

individuals and businesses, we need to focus not only for today but also for the future.

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Impact of GST on the first moving Consumer Goods Sector In India

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Abstract

With the advent of Goods and Service tax (GST) in India proposed from July 1st 2017, the biggest and most impactful change in Indian indirect taxation happened. The GST will replace the existing indirect taxes on consumption and will be applied on both goods and services.
For goods, it will be levied destination based, whereas for services, it will be levied consumption based.

Although it, may prove to be advantageous in the long run, it is possible that it may affect the business and stability. The aim of the project is to understand what Fast moving consumer goods (FMCG) Retailers and Wholesalers think about GST and its effect on the business. Secondary as well as primary research was conducted to find out what retailers think about GST and aspects related to that. Growing awareness, easier access, and changing lifestyles have been the key growth drivers for the sector 56 Retailers and Wholesalers were selected at random from across Delhi and were interviewed using a questionnaire having different type of multiple-choice questions. All responses were collected and analyzed. A study on the hypothesis was conducted so that a clearer picture could be obtained.

This Paper deals with Introduction, Benefits of GST on the Indian Economy, Impact of GST on the Indian economy, Major sectors in FMCG, Need for study, Impact of GST on FMCG, Objectives of the study, Importance of the study etc.

Introduction

The Goods and Service Tax (GST) is considered to be one of the great reformations implemented in India. It is a comprehensive, multi-stage, destination-based tax that will be levied on every value addition. Introduction of GST is an important restructuring in indirect taxation in India. It is an indirect tax, throughout India, to replace several other taxes levied by the central and state Governments. It will consolidate all state economies under one roof. The basic idea is to create a single, cooperative and undivided Indian market to make the country stronger and powerful.

In the light of above development, it is very important to analyze the provisions of the draft law in detail and assess its impact on various sectors. GST will have a far– reaching impact on business avenues and compelling organizations to realign their bottlenecks. India is one of the largest producers for a number Fast Moving Consumer Goods which offers a large and growing market. The impact of GST on the Indian fast-moving consumer goods is going to be manifold. Due to the implementation of GST there is a transparency and the tax liability will be moving to the consumers only for the quantity that they had consumed for. Under GST various indirect taxes would be subsumed and hence it is going to result in a simpler tax regime especially for Industries like FMCG.

Benefits of GST on the Indian economy

- Removal of bundled indirect taxes such as VAT, CST, Service tax, CAD, SAD, and Excise.
- Less tax compliance and a simplified tax policy compared to current tax structure.
- Removal of cascading effect of taxes i.e. removes tax on tax.
- Reduction of manufacturing costs due to lower burden of taxes on the manufacturing sector. Hence prices of consumer goods will be likely to come down.
  Lower the burden on the common man i.e. public will have to shed less money to buy the same products that were costly earlier.
- Increased demand and consumption of goods.
- Increased demand will lead to increase supply. Hence, this will ultimately lead to rise in the production of goods.
- Control of black money circulation as the system normally followed by traders and

shopkeepers will be put to a mandatory check.

- Boost to the Indian economy in the long run.

Effects of GST on Indian economy

- Reduces tax burden on producers and fosters growth through more production. The earlier tax structure pumped with myriad tax clauses, prevented manufacturers from producing to their optimum capacity and retards growth. GST took care of this problem by providing tax credit to the manufacturers.
- Different tax barriers, such as check posts and toll plazas, lead to wastage of unpreserved items being transported. This penalty transforms into major costs due to higher needs of buffer stock and warehousing costs. A single taxation system will eliminate this roadblock.
- There is more transparency in the system as the customers will know exactly how much taxes they are being charged and on what base.
- GST added to the government revenues by extending the tax base.
- GST provides credit for the taxes paid by producers in the goods or services chain. This is expected to encourage producers to buy raw material from different registered dealers and is hoped to bring in more vendors and suppliers under the purview of taxation.
- GST removes the custom duties applicable on exports. The nation's competitiveness in foreign markets increased on account of lower costs of transaction

Major segments in the FMCG sector are

30% household sector (Fabric wash, household cleaners) 30% Personal care (Oral care, Haircare, Skincare, cosmetics, Hygiene and paper products) 50% Food and Beverages (Health beverages, Bakery, snacks, chocolates, ice cream, processed fruits and vegetable and dairy products etc.)

GST is going to have a significant impact on the FMCG sector. Simpler tax regime under GST is going to benefit the FMCG company. It is also going to impact on the pricing strategies, sales, cost, tax compliances of FMCG companies

Need for the study

Fast Moving Consumer Goods (FMCG) goods are popularly named as consumer-packaged goods. Items in this category include all consumables (other than groceries/pulses) people buy at regular intervals. FMCG is also one of the fastest growing sectors among all the sectors in the Indian economy. FMCG segment is the fourth largest in the Indian economy. For most segments within the FMCG spare, GST brings good tidings on the back of lower tax incidence when compared to the total tax paid pre – GST.

In this sector GST would have an impact on the pricing, working capital, contracts with vendors and customers etc. The sale of retailers, wholesalers and the monthly budget of common people regarding fast moving consumer goods (FMCG) should have an impact of GST. Moreover, the concept of GST awareness among common man is an important matter to be analyzed.

FMCG goods have faced an increased rate of tax after GST certain big players like Nestle ,HUL and P & G have been impacted by GST.

- Reduction in logistics costs: The FMCG sector will

also benefit from GST by saving a considerable amount of expenses on logistics. Distribution costs for the FMCG sector currently amount to 2-7 percent of the total cost, but are expected to drop to 1.5 percent after implementation of GST software. Due to the smoother supply chain management in regards to paying tax, claiming input credit, and removing CST under the GST regime, there will be a cost reduction in terms of transportation and storage of goods. The reduction in taxes and distribution costs should enable companies to lower prices on consumer goods.

Increase in effective tax rates: Aerated beverages have been placed in the highest tax slab of 28 percent and will now attract an additional tax of 12 percent. Beverage companies have said the effective tax rate of 40 percent on sweetened aerated water and flavored water under GST is against the stated policy of maintaining parity with the existing weighted average tax, which is significantly below 40 percent.

Objectives of the study

1. To understand the concept of GST.
2. To obtain a comprehensive overview of consumer's, wholesaler's and retailer's awareness and perceptions of GST.
3. To study about FMCG
4. To find out the impact of GST on sales of retailers and wholesalers.
5. To analyze the impact of changes in the tax rates of fast-moving consumer goods on consumers. Is it positive or negative.
6. To analyze the issues in filing GST

Importance of this study

In an ocean of volatile industries, the FMCG industry represents an island of stability during times of economic uncertainty. Among the various industries that characterize the modern global economy, the Fast-Moving Consumer Goods Industry is amongst the most resilient to economic shocks. Unlike other industries, the FMCG sector is not prone to mass layoffs or substantial dips in profit when the economy slows down. This is due to the nature of the goods themselves.

For a developing country like India a sector like FMCG which does not get affected by economic stability is to be focused on. So, it is important to analyze the impact of a big tax reform in the country with respect to the 4^{th} largest sector of the Indian economy.

Conclusion

GST will bring in transparent and corruption-free tax administration, removing the current shortcomings in indirect tax structure. GST is business-friendly as well as consumer-friendly. GST in India is poised to drastically improve the positions of each of these stakeholders. We need a change in the taxation system which is better than earlier taxation. This need for change leads us to 'need for GST'.

GST will allow India to better negotiate its terms in the international trade forums aimed at increasing the taxpayer base by bringing SMEs and the unorganized sector under its compliance. This will make the Indian market more stable than before and Indian companies can compete with foreign companies.

GST is a recent policy introduced. GST aims at simpler tax regime and transparency in all transaction. FMCG sector which is an important player in the market sector has been impacted by GST to some extent. This research concludes that GST has an impact on various aspects of FMCG companies. Since it has only been three years from when the GST law came into force, the extent or degree of such impact cannot be completely fathomed. It would require more time evaluate whether GST would prove to be beneficial to FMCG retailers and wholesalers.

After questioning 56 retailers and wholesalers about GST we can conclude that their businesses have been affected due to GST.

According to our analysis we have concluded that retailers and wholesalers who file GST on their own face problems while filing GST. It is a new way of filing tax so traditional business have issues while filing GST.

The increase in prices of raw material of FMCG has effect on the price of goods therefore the price of raw material has a direct relation on the sales and the hiked price ultimately is paid by the consumers We also found out that if the government provides relief on FMCG the purchasing power of the Consumer will be affected as the prices will fall down the purchasing power will go up.

The purchasing power also has relationship with the credit period. GST is followed by many top economies in the world and hopefully it will bear fruit to the Indian economy as well.

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Mobile based library services in Academic Libraries of Higher Education System in India

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Abstract:
With the advent of mobile technology, academic libraries in India have embraced mobile-based library services to cater to the evolving needs of students and faculty. This paper explores the integration of mobile technology in academic libraries in Indian higher education institutions. It aims to analyze the effectiveness, benefits, and challenges of mobile-based library services, such as mobile apps for accessing catalogs, e-resources, and online requests. The research examines the current trends in mobile library services, assesses user satisfaction, and evaluates the challenges faced by libraries in terms of infrastructure, accessibility, and user awareness. The study highlights how these services enhance the learning experience and contribute to the overall academic ecosystem.

Keywords: Mobile-based Library Services, Academic Libraries, Higher Education, Technology in Libraries, Library Access, E-Resources, Mobile Technology, Library Management, India, Digital Libraries.

Introduction

In recent years, the increasing use of mobile technology has significantly impacted various sectors, including education and library services. Mobile-based library services in academic institutions are designed to facilitate easy access to library resources, enhance user engagement, and improve the efficiency of library operations. In India, the higher education system is undergoing rapid changes with the integration of digital technologies, and academic libraries are no exception. These libraries are now using mobile apps and platforms to provide access to online catalogs, e-books, journals, and other educational resources. This study aims to explore the role of mobile-based library services in enhancing access, convenience, and user satisfaction in Indian academic libraries. The rapid evolution of mobile technology has revolutionized various sectors, and the field of library services is no exception. Academic libraries, which have traditionally been the cornerstone of higher education, are now undergoing significant transformations, thanks to the integration of mobile technology. In India, academic libraries are increasingly adopting mobile-based services to enhance user engagement, improve access to resources, and address the changing needs of students and faculty. Mobile-based library services allow users to access library resources, databases, and catalogs from their mobile devices, thus breaking the constraints of time and physical location.

The higher education system in India is vast and diverse, with a growing number of universities, colleges, and research institutions. With the increasing use of smartphones and tablets among students and faculty, mobile technology offers an excellent opportunity to improve access to educational resources. As the digital era progresses, the need for libraries to keep pace with technology becomes ever more critical. Academic libraries, particularly in India, are now leveraging mobile-based services to provide on-demand access to a wide range of resources, such as e-books, academic journals, databases, and course materials.

India's mobile phone penetration has expanded significantly in recent years, with a large percentage of the population using mobile devices for various purposes, including educational needs. Given this context, mobile-based library services present an ideal solution for academic institutions to enhance their library operations and serve a larger number of users, even those in remote or underserved areas. These services not only provide students and faculty with easy access to library catalogs and digital resources but also allow them to make requests, reserve books, and even interact with library staff through chat services.

The importance of mobile-based library services cannot be overstated, especially in the context of Indian higher education, where access to physical libraries may be limited due to geographical constraints, a lack of infrastructure, or even the fast-paced, on-the-go lifestyle of students. Furthermore, these services align with the growing trend of digital

education and distance learning, where learning materials and library resources are increasingly available in digital formats. By integrating mobile technologies, academic libraries in India can become more responsive to the changing needs of the academic community and provide an efficient, user-friendly service.

This study aims to analyze the role of mobile-based library services in enhancing the accessibility, efficiency, and engagement of users in academic libraries in India. It will focus on understanding how these services are implemented, the challenges faced by libraries in their adoption, and the satisfaction levels of the users who benefit from them. By evaluating the effectiveness of mobile-based library services, the research aims to provide insights into the future potential of mobile technology in shaping the evolution of academic libraries in India, making them more inclusive, efficient, and future-ready. The introduction sets the stage for a deeper exploration into how mobile-based library services have become an essential tool in the digital age, contributing to the enhancement of academic experiences in India's higher education system.

In summary, mobile-based library services in academic libraries represent a leap towards modernization and user-centric accessibility. They enable institutions to reach a broader audience, streamline library operations, and provide students with the flexibility to access library services at their convenience. This introduction serves as a foundation to examine the significance, challenges, and benefits of such services within the Indian context, as well as their potential to transform the academic library landscape.

Definitions

- **Mobile-based Library Services**: Library services provided through mobile applications or websites, allowing users to access library resources, databases, and catalogs remotely.
- **Academic Libraries**: Libraries located within educational institutions that support academic research and learning by providing access to books, journals, e-resources, and other information.
- **Higher Education**: The system of education that encompasses universities, colleges, and research institutions providing post-secondary education and academic programs.

Need

The need for mobile-based library services arises from the growing dependency on mobile devices among students and faculty in academic institutions. With mobile phones becoming an essential tool for education and information, libraries must adapt to the changing needs of users by offering services that are accessible from anywhere at any time. Mobile library services help bridge the gap in access to library resources, especially in regions where physical access to libraries is limited.

Aims

- To explore the effectiveness of mobile-based library services in academic libraries of higher education institutions in India.
- To identify the benefits, challenges, and user satisfaction associated with mobile library services.
- To assess the current status of mobile library services in Indian academic libraries.
- To propose recommendations for improving the implementation and usability of mobile library services.

Objectives

- To evaluate the extent to which mobile-based library services are implemented in academic libraries in India.
- To analyze the impact of mobile library services on user satisfaction and accessibility.
- To identify the challenges faced by libraries in implementing mobile services.
- To examine the current trends in the adoption of mobile-based library services in Indian higher education institutions.

Hypothesis

- **H1**: Mobile-based library services improve the accessibility and convenience of library resources for students and faculty in Indian academic libraries.
- **H2**: The adoption of mobile library services enhances user engagement and satisfaction with library resources.
- **H3**: The major challenges in implementing mobile-based library services in India are related to infrastructure and user awareness.

Research Methodology

This research adopts a mixed-methods approach, combining both qualitative and quantitative techniques:

1. **Survey**: A structured questionnaire will be administered to students, faculty, and library staff at various academic institutions to gather data on the usage, satisfaction, and perception of mobile-based library services.
2. **Interviews**: Semi-structured interviews will be conducted with librarians and IT professionals to explore the challenges and limitations of implementing mobile services in academic libraries.
3. **Case Studies**: Selected academic libraries with successful mobile service implementations will be analyzed to identify best practices and key factors for successful adoption.
4. **Data Analysis**: The collected data will be analyzed using statistical tools to identify patterns, correlations, and insights regarding the use of mobile library services.

Strong Points of Present Research Study

- **Accessibility**: Mobile library services increase the accessibility of library resources, enabling users to access materials anytime, anywhere.
- **Convenience**: Students and faculty can access catalogs, request books, and check availability of resources without needing to visit the physical library.
- **Cost-Efficiency**: By reducing the need for physical infrastructure and making library services more accessible online, mobile library services offer a cost-effective solution for academic institutions.
- **User Engagement**: Mobile apps can integrate features such as notifications, alerts, and interactive user interfaces, which help engage users and keep them informed about library services.

1. **Enhanced Accessibility and Convenience:** One of the most significant advantages of mobile-based library services is the enhanced accessibility it offers. Students, faculty, and researchers can access library resources, catalogs, and databases from anywhere, at any time. This is especially beneficial in a country like India, where students may be in rural or remote areas and do not have easy access to physical libraries. Mobile devices remove geographical and time-related barriers, ensuring that users can access information at their convenience, whether they are on campus or off-campus.
2. **Promotion of Digital Literacy:** The integration of mobile-based services in academic libraries aligns with the digital transformation initiatives in higher education in India. It promotes digital literacy among students and faculty, empowering them to navigate digital resources, e-books, online journals, and databases with ease. As digital literacy becomes an essential skill in today's world, students who regularly interact with mobile-based library services are better prepared for the modern, technology-driven work environment.
3. **Efficient Resource Management:** Mobile-based library services provide a more streamlined way to manage library resources. Library staff can quickly update records, track book loans, and process reservations using mobile platforms. This not only improves operational efficiency but also helps maintain up-to-date records and reduces human error. Additionally, mobile technology allows for automatic notifications to users about overdue books, upcoming due dates, or new additions to the library's collection, which helps keep users informed.
4. **Increased User Engagement:** Mobile-based services provide a direct and interactive way for libraries to engage with their users. Features such as chatbots, push notifications, and personalized recommendations allow libraries to communicate with users instantly. Libraries can also send personalized reminders, book suggestions, or announcements regarding events and services. This increases user engagement and satisfaction, as students and faculty feel that the library is proactive in meeting their needs and providing relevant information.
5. **Support for Academic Research:** Mobile-based library services support academic research by providing easy access to a wide range of academic resources, including research papers, journals, and publications. This is particularly beneficial for research students and faculty who require regular access to academic materials for their work. The ability to quickly search for and access academic materials directly from their mobile devices increases productivity and facilitates more efficient research processes.
6. **Cost-Effective Solution:** Mobile-based library services are cost-effective for both libraries and users. For libraries, mobile apps and services reduce the need for physical infrastructure and staff for certain tasks. It also reduces the costs associated with paper-based communication and manual tracking of resources. For users, mobile apps eliminate the need for commuting to physical libraries and the associated costs, offering them more affordable and convenient access to library services.
7. **Improved User Satisfaction:** Convenience is a major factor in determining user satisfaction. Mobile-based library services offer an easy-to-use platform that allows users to access library services with minimal effort. The ability to renew books, reserve titles, and even communicate with library staff directly through mobile platforms enhances the overall user experience. As a result, students and faculty members tend to exhibit higher satisfaction with library services that are available on their mobile devices.
8. **Supports Distance Education:** With the growing trend of distance education and online learning, mobile-based library services offer a solution to bridge the gap between students and academic resources. Students enrolled in online or distance learning programs can benefit greatly from mobile-based library services that give them access to essential study materials, research databases, and academic resources regardless of their location.
9. **Better Integration with Other Digital Platforms:** Mobile-based library services can seamlessly integrate with other digital platforms such as Learning Management Systems (LMS),

university portals, and e-learning tools. This integration enhances the user experience, as students and faculty can access all relevant academic tools and resources in one centralized location. Such integration fosters a more cohesive and unified approach to academic learning and resource management.

10. **Environmentally Sustainable:** Mobile-based library services reduce the reliance on paper, which is a significant step towards sustainability. By providing digital access to resources and eliminating paper-based processes (such as printing, photocopying, etc.), mobile library services contribute to reducing the library's carbon footprint. This supports the environmental sustainability goals of higher education institutions in India and globally.
11. **Real-Time Updates and Notifications:** Mobile-based platforms allow libraries to send real-time notifications to users, which can include reminders about due dates, new acquisitions, or upcoming events. This functionality ensures that users remain informed and are always up to date with library services and changes, fostering a more connected and responsive environment.
12. **Scalability and Flexibility:** Mobile applications and platforms offer a scalable solution for libraries of all sizes. Whether it is a small college library or a large university library, mobile-based services can be customized to meet specific needs. The flexibility of mobile technology allows libraries to continuously update and adapt services as they evolve, enabling them to accommodate increasing user demands and changing technological landscapes.

Mobile-based library services offer numerous benefits to academic libraries in India. From enhanced accessibility and user engagement to supporting research and academic excellence, these services align with the evolving educational landscape of the country. As mobile technology continues to advance, the potential for libraries to expand their offerings and improve services becomes increasingly promising, making it an essential tool for academic institutions to stay relevant in the digital age.

Weak Points of Present Research Study

- **Technological Limitations**: Not all academic libraries have the infrastructure to support mobile-based services, particularly in rural or underserved regions of India.
- **User Awareness**: There is a lack of awareness among some students and faculty about the availability of mobile-based library services, affecting adoption rates.
- **Complexity**: Some users find it challenging to navigate mobile apps and may require training or support.
- **Security Concerns**: Data security and privacy issues related to the use of mobile apps for accessing sensitive academic resources are a concern.
- **Technological Barriers:** One of the primary challenges in implementing mobile-based library services is the digital divide, especially in rural areas of India. Many students and faculty members may not have access to advanced smartphones or stable internet connections. Inadequate access to mobile technology can limit the reach and effectiveness of mobile-based services. This gap exacerbates the challenges of equitable access to educational resources, hindering the full potential of mobile-based library services in academic settings.
- **Resistance to Change:** While mobile-based library services have numerous benefits, there is often resistance to adopting new technology, especially among older faculty members, staff, or students who are more accustomed to traditional library services. Resistance to change can slow down the implementation of mobile-based services, making it difficult for libraries to transition smoothly to digital platforms. Moreover, some people may feel overwhelmed by the complexity of navigating mobile apps or fear they might lose access to the personal guidance of library staff.
- **Technical Issues and Glitches:** Mobile applications, like any other software, are prone to technical issues such as bugs, connectivity problems, or glitches. This can significantly impact the usability and reliability of mobile library services. Frequent technical problems may frustrate users, resulting in a loss of confidence in the service. Additionally, if mobile apps crash frequently or do not function smoothly, users may avoid using them altogether, defeating the purpose of offering mobile-based solutions.
- **Security and Privacy Concerns:** Data security and user privacy are significant concerns when using mobile apps to access library resources. Mobile apps require users to enter personal information, including login credentials, contact details, and sometimes payment information for subscription-based services. If these apps are not adequately secured, it could lead to data breaches, identity theft, or

unauthorized access to sensitive user information. Academic institutions need to invest in robust cybersecurity measures to safeguard user data and ensure that privacy is maintained.

- **Limited Awareness Among Users:** Although mobile-based services are growing in popularity, not all students or faculty members may be fully aware of the available mobile services offered by libraries. Lack of awareness about the functionalities of mobile library apps, such as e-book access, online reservations, or real-time notifications, limits their utilization. Libraries need to actively promote these services through orientation programs, digital literacy campaigns, and ongoing engagement to ensure that users are informed and encouraged to adopt the mobile platform.

- **Digital Literacy Challenges:** Mobile-based library services require a certain level of digital literacy to navigate the apps effectively. Students, faculty, and staff who are not tech-savvy may face difficulties in using the app, understanding its features, or troubleshooting common issues. Providing support and training to ensure all users can use the mobile platform effectively is essential, but this may require additional resources and effort from library staff. Without adequate support, mobile services may alienate users who feel uncomfortable with technology.
- **Limited Content and Compatibility Issues:** Mobile-based library services may not always provide full access to all the resources that are available in the physical library, such as large-format books, rare manuscripts, or print journals. Additionally, some academic databases or digital content may not be optimized for mobile devices, leading to poor user experience. Compatibility issues with various operating systems or mobile device models may also affect the accessibility of library content. This limits the scope and effectiveness of mobile library services, particularly for users who rely on specialized resources.
- **Cost of Implementation and Maintenance:** Implementing mobile-based library services requires significant financial investment in technology, infrastructure, and development of mobile applications. Libraries must purchase licenses for software, hire skilled developers, and provide continuous maintenance and updates to keep the services running smoothly. For some academic institutions, particularly smaller colleges or underfunded universities, the cost of setting up and maintaining mobile-based services may be prohibitive. The financial burden may affect other critical library operations, leading to budgetary constraints in other areas.
- **Dependency on Mobile Devices:** Mobile-based library services inherently rely on smartphones or tablets, which means that those without access to such devices are excluded from using these services. This dependency can create disparities among students, particularly those from lower-income backgrounds who cannot afford mobile devices. In such cases, the mobile-based library system may unintentionally widen the gap between privileged and underprivileged students, contrary to the inclusive goals of higher education.
- **Over-Reliance on Technology:** While mobile-based services are convenient and efficient, there is a risk that over-reliance on technology may diminish the personal connection between library staff and users. Traditional library services often involve face-to-face interaction with staff, offering personalized recommendations and guidance. Relying too heavily on mobile-based services may result in users missing out on these personal connections and the sense of community that physical libraries offer.
- **Lack of Standardization:** Mobile library services are still evolving, and there is no standard framework for the design, functionality, or features of these services. Libraries may develop their own apps with different interfaces, functionalities, and security measures, making it difficult for users to navigate across different institutions. A lack of standardization also hampers the ability to provide a consistent experience to users across different academic libraries, which could lead to confusion or dissatisfaction.
- **Maintaining User Engagement:** While mobile-based services offer convenience, keeping users engaged over time can be challenging. Libraries need to continuously offer valuable and relevant content to ensure that users remain interested and active. Without continuous updates, improvements, or promotional campaigns, users may lose interest in using mobile library services, particularly if they do not find the platform's offerings compelling enough to justify regular use.
- **Overload of Information:** Mobile-based library services often offer a wealth of information and resources at the user's fingertips, which can lead to information overload. With so many resources available on a single platform, users may feel overwhelmed or may struggle to find the specific materials they

need. Libraries must balance providing comprehensive resources with offering clear, intuitive navigation features to ensure that users can easily locate the information they seek.

while mobile-based library services offer numerous benefits, they also come with significant challenges. Addressing these weaknesses will require continued investment in infrastructure, user training, and robust support systems. By overcoming these challenges, academic libraries can fully harness the potential of mobile technologies to provide accessible, efficient, and user-friendly services to students and faculty across India.

Current Trends of Present Research Study

- **Integration with Digital Resources**: Many academic libraries are integrating mobile services with digital libraries, enabling users to access a wide variety of e-books, journals, and academic papers directly through their mobile devices.
- **Cloud-based Solutions**: Cloud storage is increasingly being used to host library services, making them accessible across multiple devices and platforms.
- **User-Centric Mobile Apps**: There is a shift towards developing mobile applications that focus on user experience, offering features like push notifications, personalized recommendations, and user-friendly interfaces.
- **E-Resource Access**: Mobile services are being used to enhance the accessibility of e-resources, including journals, databases, and digital archives.

History of Present Research Study

The integration of mobile technology in library services started gaining momentum in the early 2010s when mobile apps and smartphones became widely available. Initially, academic libraries provided basic mobile services such as access to catalogs and online public access catalogs (OPACs). Over time, libraries started offering more advanced features such as mobile book reservations, remote access to e-books and digital journals, and even virtual assistance services. The transition from desktop-based services to mobile platforms allowed academic libraries in India to serve a larger user base, including those in remote areas. The history of mobile-based library services in India traces back to the gradual evolution of digital technologies and the adoption of mobile devices by the general public. The journey of mobile-based library services in Indian academic libraries can be understood through several key milestones that mark the convergence of technological advancements, changing educational needs, and the growing importance of information accessibility.

Early Years of Library Automation and Digitization (Pre-2000s)

Before the turn of the 21st century, most academic libraries in India operated in a traditional manner, relying heavily on physical books, journals, and periodicals. Library automation was a relatively new concept, with early efforts in cataloging and digitization limited to large universities and a few pioneering institutions in major urban centers. These systems focused primarily on automating administrative tasks such as cataloging, circulation, and inventory management.

During this period, libraries began to develop digital catalogs, but these were mostly available on desktop computers within the library premises. The internet was not widely used for academic purposes, and information dissemination was largely confined to traditional physical formats, such as books, printed journals, and paper-based indexing systems.

The Rise of the Internet and the Early 2000s: The Shift Towards Digital Libraries

With the onset of the 2000s, India witnessed a significant technological transformation. The rise of the internet and the increasing availability of affordable computers and mobile phones began to influence the way information was accessed and shared. Academic libraries, especially in metropolitan cities, began to experiment with digital services, such as electronic databases and online catalogs, to enhance resource accessibility.

During this period, libraries started to integrate digital resources such as e-books, online journals, and databases into their services. While these services were initially accessed via desktop computers within the library, the foundation for future mobile-based library services was being laid through the adoption of web technologies, and some institutions even began developing web-based library management systems.

The Emergence of Mobile Technology and Mobile Applications (Late 2000s – Early 2010s)

The late 2000s marked a crucial turning point for mobile technology, with the proliferation of smartphones and tablets across India. The rise of affordable smartphones with internet access provided a unique opportunity to revolutionize library services. During this period, libraries began experimenting with mobile platforms, recognizing the potential of smartphones and tablets to provide users with easy access to library services from anywhere, at any time.

Key developments during this period included:

1. **Introduction of Mobile-Friendly Library Websites and Portals:** Libraries began redesigning their websites and online catalogs to make them mobile-friendly, offering users the ability to search for books, access digital resources, and renew books via mobile devices. This development laid the groundwork for

mobile-based library services that would soon be available through dedicated apps.

2. **Library Mobile Applications:** Several universities and academic institutions in India started developing mobile apps to facilitate access to library resources. These apps allowed users to search for books, reserve study rooms, check the status of borrowed items, and even access electronic resources such as e-books and journals from their smartphones. Initially, these apps were limited to specific institutions but demonstrated the feasibility of mobile-based services in academic libraries.
3. **Integration with Learning Management Systems (LMS):** Many academic institutions began integrating their library systems with their Learning Management Systems (LMS). This integration allowed students and faculty to access reading materials, course reserves, and other library resources directly through their LMS platforms, further enhancing the convenience of mobile access.

Expansion and Development of Mobile Library Services (2010s – Present)

By the mid-2010s, the landscape of mobile-based library services in India had begun to expand significantly. The increase in mobile internet penetration, particularly in rural and semi-urban areas, further accelerated the adoption of mobile-based services by academic libraries. Mobile apps and platforms became more sophisticated, offering users an array of services tailored to their needs.

Key developments during this period include:

1. **Wider Adoption of Mobile Library Services:** The increasing availability of mobile apps for library services led to their widespread adoption by academic libraries in India. Institutions like the University of Delhi, IITs, NITs, and various other state universities introduced mobile platforms to provide library services, which included book searches, reservations, renewals, access to e-journals, and more.
2. **Introduction of QR Codes and RFID Technology:** To enhance user engagement and streamline library operations, many libraries introduced QR codes and RFID-based systems that allowed users to interact with library resources through their mobile phones. QR codes were integrated into books, journals, and even library walls, enabling users to scan and access digital content instantly.
3. **Mobile-based Resource Sharing and Collaboration:** Libraries began using mobile platforms for collaborative initiatives, such as sharing research papers, e-books, and other digital resources among academic institutions. This was particularly beneficial for students and faculty members who required access to resources beyond the confines of their own libraries.
4. **Integration with National Digital Library of India (NDLI):** The National Digital Library of India (NDLI) was launched as an initiative to provide free access to digital resources across the country. Mobile-based library services began integrating with NDLI, enabling users to access a vast repository of digital content, including textbooks, research papers, and journals, through mobile applications.
5. **Increased Focus on User Experience and Personalization:** As mobile technology evolved, there was a greater emphasis on improving user experience. Libraries began incorporating features such as personalized recommendations, push notifications for overdue books or new arrivals, and more intuitive user interfaces to make it easier for students and faculty to navigate the app and access services.
6. **Integration of Artificial Intelligence and Chatbots:** In the recent past, academic libraries have started integrating Artificial Intelligence (AI) technologies into their mobile services. AI-powered chatbots have been developed to assist users in finding information, answering frequently asked questions, and providing recommendations based on user preferences and search history.

Future Trends and Moving Forward

The future of mobile-based library services in India looks promising, with an increasing number of academic libraries adopting advanced mobile technologies and offering innovative services. The following trends are expected to shape the future of mobile library services:

1. **Enhanced Personalization and Data Analytics:** With the growing use of AI and data analytics, mobile-based library services will likely offer even more personalized experiences, recommending resources based on individual reading habits and preferences.
2. **Augmented Reality (AR) and Virtual Reality (VR):** As mobile devices become more powerful, libraries may integrate AR and VR technologies to provide immersive experiences, such as virtual library tours, interactive learning modules, and 3D visualization of information.
3. **Greater Integration with Academic Ecosystems:** Mobile library apps are expected to integrate even more seamlessly with other academic systems such as Learning Management Systems (LMS), ResearchGate, and other educational tools, allowing users to access all of their academic resources through a single platform.
4. **Increased Focus on Digital Inclusion:** As mobile internet access continues to expand

across rural and underserved regions, mobile-based library services will play a key role in bridging the digital divide and providing equitable access to educational resources for all students, regardless of their geographical location. The history of mobile-based library services in India reflects a journey of technological evolution, from early digitalization efforts to the current state of mobile-enabled academic libraries. While the path has been marked by significant progress, ongoing efforts are needed to address the challenges of technology adoption, digital literacy, and equitable access to ensure that mobile-based services can reach their full potential in academic libraries across the country.

Discussion of Present Research Study

Mobile library services are transforming the landscape of academic libraries in India. By offering increased accessibility, convenience, and user engagement, mobile technology has significantly improved how students and faculty interact with library resources. However, several challenges remain, including technological infrastructure limitations, low user awareness, and data security concerns. The survey data indicates that while many users appreciate the convenience of mobile library services, some face challenges in using mobile apps due to technical issues or a lack of training.

Results of Present Research Study

- **User Satisfaction**: A large number of students and faculty expressed satisfaction with mobile library services, particularly in terms of accessibility and convenience.
- **Challenges**: Major challenges included slow internet speeds, lack of sufficient technical infrastructure, and limited awareness about mobile-based services.
- **Opportunities for Improvement**: Libraries with better infrastructure and mobile-friendly apps reported higher usage and engagement levels.

Conclusion

Mobile-based library services are a promising development for academic libraries in India, offering increased accessibility and convenience for users. Despite facing challenges such as technological limitations and low user awareness, mobile library services have the potential to enhance the learning experience and improve resource accessibility in academic institutions. With continued investment in technology and user education, these services can further enrich the academic ecosystem in India.

Suggestions and Recommendations

- **Improving Infrastructure**: Academic libraries should invest in mobile-friendly platforms and infrastructure to enhance the delivery of mobile-based services.
- **User Education**: Libraries should conduct training programs and awareness campaigns to increase the adoption of mobile library services.
- **App Enhancement**: The design and functionality of mobile apps should be continually improved to make them more user-friendly and accessible.
- **Collaboration with IT Experts**: Academic libraries should collaborate with IT experts to develop customized mobile library solutions that meet the needs of their users.

Future Scope

- **Integration of AI**: Future studies could explore the use of AI in mobile library services, such as personalized recommendations and AI-powered search functionalities.
- **Expansion of Mobile Services**: Research could be done to explore the expansion of mobile services to other educational institutions, including technical and vocational education centers.
- **Impact on Learning Outcomes**: Future research can examine the direct impact of mobile library services on students' academic performance and learning outcomes.

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Gamma Ray-Induced Mutational Studies in *Pisum sativum*

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Abstract

This study examines the influence of gamma radiation on growth and biochemical characteristics of Pisum sativum L. (variety A. KARTIK-F1). Seeds underwent gamma radiation exposure at doses of 5, 10, and 15 KR using Cobalt-60. Plant height, survival rate at maturity, and biochemical markers such as protein, carbohydrate, and chlorophyll levels were measured. Results showed a decline in seedling height as radiation dose increased. Control plants had the tallest seedlings (6.75 cm), while the shortest (4.93 cm) were observed at 15 KR. Plant survival peaked at 60% under 10 KR but dropped to 23.3% at 15 KR, compared to 30% in the control. Biochemical assessments demonstrated dose-dependent variations. Protein content was highest (460 µg/ml) at 5 KR and lowest (180 µg/ml) at 15 KR. Carbohydrate content was maximized (424 µg/ml) at 10 KR and minimized (180 µg/ml) at 15 KR. Chlorophyll-a, chlorophyll-b, and total chlorophyll levels were highest at 10 KR (1.48, 0.90, and 2.38 µg/gm, respectively) and lowest at 5 KR. The findings highlight that moderate gamma radiation (10 KR) improves plant biochemical traits and survival, while excessive doses (15 KR) hinder growth. This supports mutation breeding as a strategy to enhance crop performance and resilience.

Keywords: Gamma radiation, Germination, Chlorophyll content, *Pisum sativum*

Introduction :

Pea (Pisum sativum L.) is a member of the Fabaceae family and dignified as one of the oldest domesticated crops, integral to agricultural systems worldwide.

The pea plant is a cool-season annual vine with a smooth, bluish-green, waxy appearance. The vines can extend up to 9 feet, although modern cultivars, primarily used today, have shorter vines, around 2 feet in length (Elzebroek & Wind, 2008). The stem is hollow, necessitating external support for taller cultivars. Pea leaves are alternate and pinnately compound, composed of stipules, oval leaflets, and terminal tendrils, with modern cultivars often showcasing the 'afila' leaf type where leaflets transform into additional tendrils (McGee, 2012).Inflorescences occur in the leaf axils, forming racemes with up to four flowers.

The flower anatomy consists of fused sepals and distinct petals, including the standard, keel, and wings. The keel encloses ten stamens, nine of which form a tube around the pistil. The fruit is a pod containing up to 15 ovules, measuring between 1 to 4 inches in length, with ripe seeds varying in shape, texture, and color from green to almost black (Elzebroek & Wind, 2008).

The domestication of peas traces back to the Mediterranean and Middle Eastern regions, with archaeological evidence suggesting their consumption dates to the 10th millennium BC (Zohary & Hopf, 2000). Peas were fundamental to early agricultural societies, evolving alongside cereals during the agricultural revolution. Wild pea varieties, such as P. fulvum and P. abyssinicum, contribute to the genetic diversity of modern cultivars (Smýkal *et al*., 2011).

Pisum sativum L. thrives in temperate climates, high altitudes, and during cool seasons in warmer regions. Major producers include China, India, Canada, Russia, France, and the United States (FAO, 2012). In India, field pea cultivation is widespread across states such as Madhya Pradesh, Uttar Pradesh, Jharkhand, and Rajasthan, contributing significantly to national pulse production (Anonymous, 2016). Peas are commonly integrated into crop rotations, providing benefits such as nitrogen fixation, pest cycle disruption, and soil health improvement (Veseth, 1989; Biederbeck *et al*., 2005).Pea roots harbor Rhizobium leguminosarum bacteria, which facilitate nitrogen fixation, enhancing soil fertility.

Austrian winter peas, valued as cover crops, withstand cold temperatures and regrow post-grazing (Clark, 2007). In India, pea cultivation spans 0.75 million hectares, with a production yield of 880 kg/ha, underlining its prominence in rainfed agricultural systems (Prasad *et al*., 2018).

Mutation breeding has significantly advanced pea cultivation by introducing desirable traits through physical and chemical mutagens. Gamma irradiation is notably effective, inducing genetic variability and improving yield traits (Maluszynski *et al*., 1995).

This technique enhances traits such as disease resistance, yield, and stress tolerance (Kharkwal, 2012). Gamma irradiation, commonly used in plant breeding, alters the genetic structure, stimulating growth and enhancing crop performance (Moussa, 2006). Higher doses of gamma irradiation impact plant physiology, reducing germination rates and modifying chlorophyll content (Sarkar *et al*., 2018). Effect of mutagenesis on germination and pollen Sterility in pigeonpea studied by Sangle e*t al*., (2011) Despite potential growth inhibition at high doses, gamma irradiation remains a powerful tool for developing improved pea varieties with enhanced resilience and productivity (Ahuja *et al*., 2014).

Pisum sativum L. continues to play a crucial role in global agriculture, providing nutritional, ecological, and economic benefits. Advances in breeding techniques, including mutation breeding, have bolstered its adaptability and productivity. As pea cultivation expands, its significance in sustainable agriculture and global food security remains paramount.

Materials and Methods:

The present study was conducted on valuable seeds of *Pisum sativum* L., seed material was sourced from the Agricultural shop (Krushi Seva Kendra) in Aurangabad District, Aurangabad (M.S.), India.

The seeds of *Pisum sativum* L. were treated using Cobalt-60 at a rate of 1.2 Grays per minute. The experiment involved four different radiation doses, along with one control group. A total of 360 seeds were treated with gamma radiation, with 120 seeds allocated per dose (50, 100, 150 minutes of radiation exposure). At eradiation center of government institute of science. Additionally, 60 seeds were left untreated as the control group. After radiation exposure, each batch of radiated and control seeds was transferred into 100 ml conical flasks. The seeds were then post-soaked in water for 6 hours and sowed in the field using RBD methods.

- **Plant Height:** Plant height was measured using a measuring scale 15 days after sowing the seeds of *Pisum sativum* L.
- **Plant Survival Percentage:** Upon maturity, the plants. were counted, and the survival percentage was calculated.
- **Seed Germination:** Thirty seeds per dose (50, 100, 150 minutes) were transferred to Petri plates to calculate the germination percentage.

Biochemical Analysis:

- **Protein Estimation:** Protein estimation was carried out using Lowry's method (1951).
- **Carbohydrate Estimation:** Carbohydrate content was estimated using the Anthrone method.
- **Chlorophyll Estimation:** The total chlorophyll, chlorophyll-a, and chlorophyll-b pigments were estimated from the plant material.

Results and Conclusions:

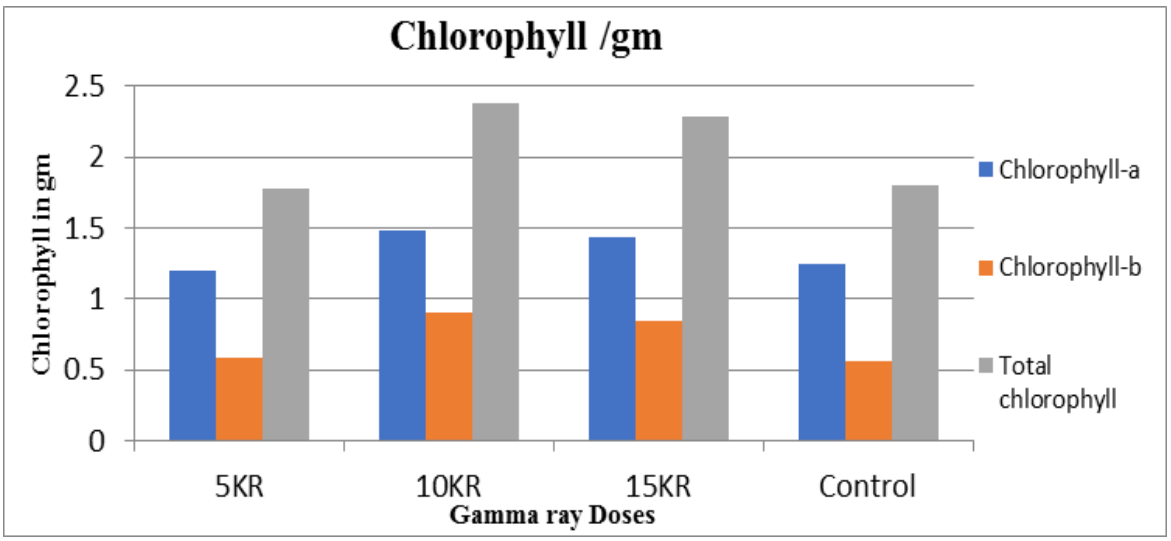
- **Seedling Height:** A decreasing trend in seedling height was observed with increasing gamma ray doses. Control seedlings measured 6.75 cm, while treated seedlings ranged from 6.75 cm to 4.93 cm. The highest height of 6.06 cm was recorded at 10 KR, while the lowest (4.93 cm) was at 15 KR.
- **Plant Survival at Maturity:** Plant survival increased with gamma ray doses up to 10 KR (60%) but decreased at 15 KR (23.3%). Control plants had a survival rate of 30%.
- **Protein Content:** Protein content varied across treatments. Control plants had 420 µg/ml, with the highest (460 µg/ml) at 5 KR and the lowest (180 µg/ml) at 15 KR. Mutation breeding improved protein quality at lower doses.
- **Carbohydrate Content:** Carbohydrate content showed variability. Control plants had 320 µg/ml, with the highest (424 µg/ml) at 10 KR and the lowest (180 µg/ml) at 15 KR.
- **Chlorophyll Content:** Chlorophyll content increased at 10 KR (1.48 for chlorophyll-a, 0.90 for chlorophyll-b, and 2.38 total) and was lowest at 5 KR (1.2, 0.58, 1.78 respectively).

Conclusion: Gamma irradiation affected plant growth, survival, and biochemical composition of Pisum sativum L. (variety A. KARTIK). Lower doses (5-10 KR) enhanced plant survival, protein, carbohydrate, and chlorophyll content, while higher doses (15 KR) negatively impacted growth and

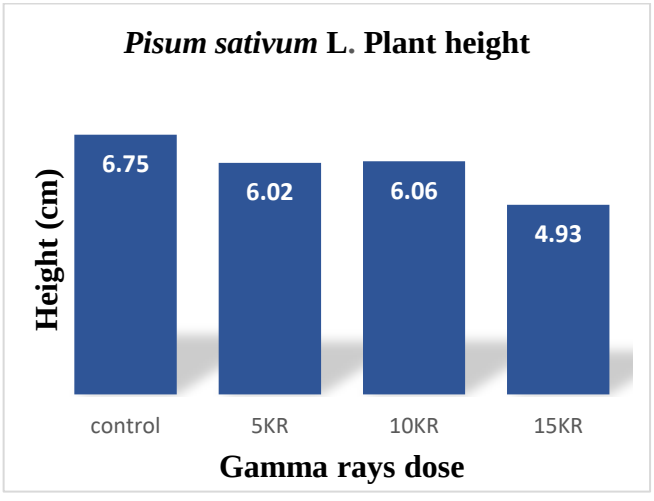
biochemical parameters. Mutation breeding through gamma irradiation is effective for improving desirable traits in Pisum sativum L.

Observations:

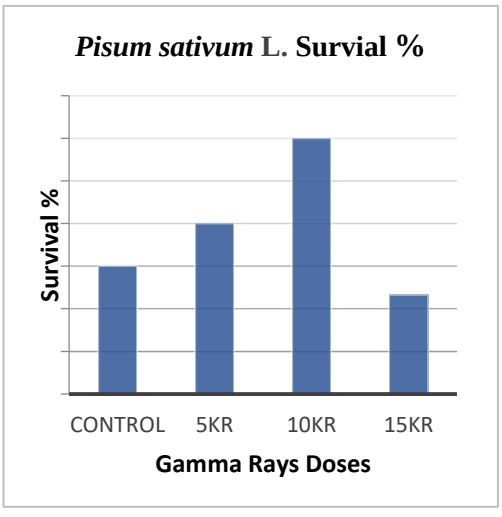
Sr. No.	Effect of Physical mutation (gamma radiation)	Doses			
		Control	5KR	10KR	15Kr
1	**Plant Height (cm)** after 15 days of sowing	6.75	6.02	6.06	4.93
2	Plant survival %	30	40	60	23.3
3	Protein concentration (ug/ml)	420	460	360	400
4	Carbohydrate concentration (ug/ml)	294	182	424	180
5	Chlorophyll concentration **Chlorophyll-a**	1.24	1.2	1.48	1.44
6	**Chlorophyll-b**	0.56	0.58	0.9	0.84
	Total chlorophyll	1.8	1.78	2.38	2.28



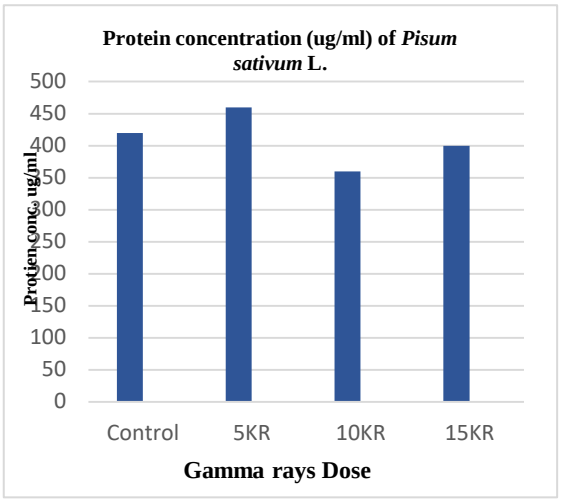
Effects physical mutation on Chlorophyll concentration/gm

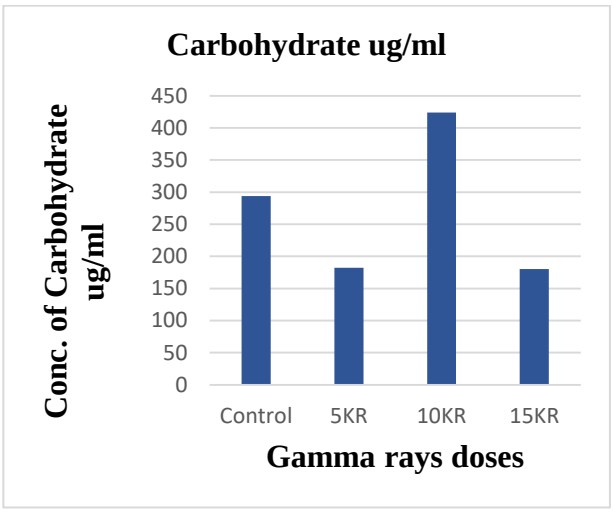


Effect of physical mutation on height



Effect of physical mutation on survival %





Effects of physical mutation on Protein and Effects of physical mutation on Carbohydrate concentration

Field of *Pisum sativum* L

Effects of physical mutation on chlorophyll deficiency

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Effect of gamma irradiation on leaf morphological sector in *Pisum sativum* L.

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Transforming Financial Reporting and Audits in India's Service Sector through Fintech Innovations

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Abstract

This paper probes into the implications of fintech for financial reporting and audit procedures in India's service sector. Through analysis of blockchain, AI, and other fintech tools. The research paper also provides insights into opportunities and challenges, charting a course towards innovation, integrity, and excellence in accounting. In the rapidly evolving landscape of India's service sector, fintech innovations have emerged as pivotal drivers of transformation, promising to revolutionize traditional accounting practices. This research paper examines the complicated relationship between fintech innovations and accounting practices, particularly within the dynamic context of India's service sector. The paper illuminates their profound implications for financial reporting standards compliance and audit procedures. This paper provides a comprehensive analysis of the opportunities and challenges presented by fintech for accounting professionals operating in India's vibrant service sector. The paper highly emphasises the implications of fintech innovations and accounting practices in financial reporting and audit procedures in Indian services.

Keywords: Accounting, Fintech, Innovation, Audit.

Introduction:

India's service sector drives economic growth and innovation, showcasing a vibrant ecosystem fueled by fintech advancements. From start-ups revolutionising digital payments to established firms embracing artificial intelligence for financial analytics, the sector buzzes with transformative energy. At its core, the cooperation between fintech innovations and accounting practices reshapes financial reporting and audit procedures. Blockchain technology has surged across India's financial landscape, revolutionizing transaction recording and validation. For instance, the National Stock Exchange (NSE) pioneers blockchain for trade settlement, streamlining processes and enhancing transparency. Similarly, artificial intelligence catalyses a revolution in financial analytics. Zoho Books, an AI-driven accounting platform, empowers businesses with automation and real-time insights, driving growth and innovation. Amidst these shifts, accounting professionals confront new technologies and regulatory landscapes.

Review of Literature:

The literature on fintech innovations and accounting practices provides a comprehensive overview of the transformative potential of technologies such as blockchain and artificial intelligence (AI) in reshaping financial management and reporting practices.

1. Blockchain Technology:

Tapscott (2016) and De Filippi and Wright (2018) highlight blockchain's role in enhancing transparency and auditability in financial transactions. Blockchain technology introduces immutable record-keeping capabilities, ensuring that once a transaction is recorded, it cannot be altered retroactively. This care for unprecedented levels of transparency and trust in financial transactions, benefiting stakeholders across various industries.

2. Artificial Intelligence (AI):

Agrawal, Gans, and Goldfarb (2018) and Huang and Rust (2018) underscore the significance of AI in automating tasks and providing insights for financial reporting. AI-powered analytics tools enable organizations to analyse vast volumes of transaction data with unparalleled precision. By leveraging machine learning algorithms, these tools identify intricate patterns, trends, and anomalies in real-time transaction data, empowering organizations to make data-driven decisions with greater accuracy and confidence.

3. Empirical Research on Adoption Trends and Barriers:

Zhang, Alles, and Vasarhelyi (2019) and Chen, Chiu, and Wang (2020) examine adoption trends and barriers to fintech integration. Their research sheds light on factors influencing the adoption of fintech innovations in accounting practices, including organizational culture,

regulatory environment, and technological infrastructure. Understanding these factors is crucial for accounting professionals seeking to navigate the complexities of fintech integration and maximize its potential benefits.

4. Case Studies on Real-World Applications:

Case studies by Smith (2021) and Patel and Shah (2021) illustrate real-world applications of fintech innovations in accounting practices. These case studies provide insights into how organizations are leveraging fintech tools to enhance efficiency and decision-making capabilities. For example, Smith (2021) examines the implementation of blockchain technology in a multinational corporation, showcasing its impact on transaction processing, auditability, and financial reporting accuracy.

Overall, the literature underscores the transformative potential of fintech innovations in reshaping financial management and reporting practices. From blockchain technology's ability to enhance transparency and auditability to AI's capacity to automate tasks and provide actionable insights, fintech is driving innovation and growth in the accounting field. Understanding the implications of fintech innovations is essential for accounting professionals seeking to adapt to the evolving landscape and leverage these technologies effectively to achieve their organizational objectives.

Objectives:

1. To analyse the transformative impact of fintech innovations, particularly blockchain technology and artificial intelligence, on financial reporting and audit procedures within India's service sector.
2. To assess the adoption trends, challenges, and opportunities of fintech innovations in accounting practices in India, drawing insights from case studies, empirical data, and existing literature.

Methodology:

The study is based on secondary sources of data and information. Different books, journals, newspapers, and relevant websites have been consulted to make the study an effective one. The study is strongly based on the review of the literature and secondary pieces of information.

A. Implications for Financial Reporting:

Fintech innovations resound profoundly throughout financial reporting practices within India's service sector. Blockchain technology, for instance, furnishes immutable record-keeping capabilities, fostering unprecedented levels of transparency and auditability. Simultaneously, AI-powered analytics tools empower organizations to craft more accurate financial reports and forecasts, facilitating data-driven decision-making processes with unprecedented precision and foresight.

Blockchain Technology:

Immutable Record-Keeping: According to a report by NASSCOM, India's IT industry association, the adoption of blockchain technology in India has seen significant growth, with a projected CAGR of 58.7% between 2021 and 2026. This indicates a rising trend towards immutable record-keeping in financial transactions, fostering unprecedented levels of transparency and auditability. Integration into a financial institution's transaction recording system ensures that each transaction is securely recorded in blocks, forming an unalterable chain of records, and instilling confidence among stakeholders.

AI-Powered Analytics:

Enhanced Accuracy and Reliability: A study conducted by the Confederation of Indian Industry (CII) found that organizations in India leveraging AI-powered analytics tools witnessed a 30% improvement in financial reporting accuracy. This underscores the transformative impact of AI on improving precision and reliability in financial reporting. A leading Indian e-commerce platform leverages AI-powered analytics software to analyse transaction data, identifying trends and anomalies, thus improving financial reporting precision.

Streamlined Reporting Processes:

Automation of Data Reconciliation: According to a survey by the Institute of Chartered Accountants of India (ICAI), 75% of Indian companies that implemented blockchain technology reported a significant reduction in the time and resources required for manual data reconciliation processes. This highlights the efficiency gains achieved through the automation of data reconciliation. Integration of blockchain technology into financial reporting processes automates data reconciliation, ensuring accuracy and efficiency in reporting tasks.

B. Implications for Audit Procedures:

Blockchain-enabled Audit Trails:

Real-time Access to Transaction Records: Data from the Reserve Bank of India (RBI) indicates that the implementation of blockchain-enabled audit trails in Indian banks has led to a 40% reduction in audit cycle time. This showcases the efficiency gains achieved through real-time access to transaction records, facilitating seamless verification and enhancing transparency throughout the audit process. A leading Indian bank implements blockchain technology for audit procedures, allowing auditors to securely access transaction records for efficient verification.

AI-Driven Audit Tools:

Swift and Accurate Data Analysis: According to a report by PwC India, the use of AI-driven audit tools has enabled auditors in India to analyse financial data 50% faster while maintaining a 95% accuracy rate. This highlights the significant

improvements in audit efficiency and effectiveness achieved through AI-powered data analysis. A multinational IT services company in India employs AI-powered audit software to swiftly detect irregularities in financial transactions, enabling auditors to focus their efforts on areas of higher risk.

Enhanced Audit Efficiency and Effectiveness:

Proactive Risk Assessment: Research by the Institute of Internal Auditors India (IIA India) indicates that the implementation of fintech innovations in audit procedures has led to a 35% reduction in audit-related fraud incidents reported by Indian companies. This underscores the role of fintech in enabling proactive risk assessment and enhancing audit effectiveness. Swift detection of financial irregularities using AI-powered audit software enhances audit quality and provides stakeholders with greater assurance regarding the accuracy of financial reporting.

Conclusion:

The integration of fintech innovations with accounting practices has ushered in a new era of efficiency and transparency within India's service sector. Technologies like blockchain and artificial intelligence have revolutionized financial reporting and audit procedures, offering unprecedented opportunities for streamlining processes and enhancing decision-making capabilities. However, accounting professionals must remain vigilant amidst evolving regulatory landscapes and data security concerns.

Moving forward, embracing a mindset of continuous learning and adaptation is imperative. By leveraging fintech innovations to their fullest potential while ensuring compliance with regulatory standards, accounting professionals can navigate the complexities of modern finance with confidence and precision. Ultimately, the integration of fintech innovations represents a paradigm shift in financial management and reporting, driving growth and innovation in India's service sector in the digital age.

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Impact of AI on informal retail sector in India

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Abstract:
This study looks at how artificial intelligence (AI) changes the informal retail sector in India, explaining its effects on business methods, consumer habits, and economic inclusion. By using qualitative methods and case studies from the sector, it seeks to show how AI technologies improve operational efficiency, enhance customer engagement, and innovate traditional retail practices. Major findings reveal two sides to AI's impact—helping small operations while also creating difficulties for unskilled workers in the informal economy. Keywords: AI, informal retail, India, operational efficiency, consumer engagement, economic inclusivity.

I. Introduction

The effect of artificial intelligence (AI) on different sectors has started a big change, especially in the informal retail sector in India, which is a large part of the economy. This sector does not have formal structures and often operates outside of regulatory rules, but it is now seeing significant changes as AI technologies become part of daily operations. The introduction of AI-driven tools, such as those for managing stock and interacting with customers, offers a chance to improve efficiency and productivity in the busy but often chaotic informal retail environment. This study aims to clarify the effects of adopting AI in this setting, looking at both the economic results and the social aspects that such advancements bring. Using a mixed-methods approach that includes interviews and surveys, this research seeks to give a full view of the role of AI and its future impact on the informal retail scene in India.

A. Overview of the informal retail sector in India

The informal retail sector in India is very important to the economy, containing about 90% of retail shops and giving jobs to many people. This sector includes a range of businesses, from small vendors on the street to shopkeepers without formal business registration. It is marked by a lack of formal rules and limited access to loans. These features have resulted in several economic issues, such as being open to outside shocks and changes in the market. The large informal sector shows wider problems, mainly regarding how easy it is to get credit, which can hinder growth and ability to adapt (see (Gabriel et al.)). Additionally, bringing in artificial intelligence (AI) to this area has the potential to make operations more efficient but also poses a risk of pushing smaller businesses aside that might struggle to use new technologies. Therefore, it is crucial to understand the complexities of the informal retail sector when looking at the overall effects of AI use in this area.

1. Research Methodology

Aims & Objectives: This study sets out to explore how AI can improve practices in India's informal retail sector, thus enhancing operational capabilities while considering possible socio-economic effects on workforce changes.

Research Methodology: A qualitative method was used, incorporating case studies from informal retail settings and expert interviews, which provided thorough insights into AI's disruptive effects.

B. Significance of AI in transforming retail practices

The use of AI technologies in retail methods marks an important change, especially in India's large informal sector. By using AI-based analytics and automation, small retailers can boost operational efficiency, simplify supply chains, and improve customer service to match changing consumer preferences. The strategic use of AI not only leads to more personalised shopping experiences but also builds stronger operations, even during market changes. This change does require a reassessment of the current labour situation, highlighting the importance of training initiatives that help bring informal workers into a more automated retail environment. Therefore, while AI can enhance retail operations, it must be executed with an awareness of its socio-economic effects, especially regarding job patterns and access to new technologies in informal retail scenarios.

II. The Role of AI in Enhancing Operational Efficiency

The idea of putting artificial intelligence (AI) into the informal retail sector in India brings not just a problem but also an opportunity to make operations run better. AI can help with decisions based on data, making it easier to manage inventory, improve supply chain logistics, and cut costs. AI's skill in looking at how customers behave lets retailers adjust what they sell, boosting sales and making customers happier. Recent studies show that, although AI use differs among sectors, its ability to change informal retail is especially important since this sector is a big part of India's economy, with about 90% of workers in informal jobs (Mukherjee AN, 2022). However, to truly gain these advantages, challenges like lack of digital skills and poor infrastructure need to be tackled. This complex situation highlights the need for teamwork between industry players and policymakers to make sure AI is brought in a way that is sustainable and inclusive.

A. Automation of inventory management and supply chain processes

The potential of automation to change inventory management and supply chain processes is very significant, especially in the informal retail sector in India. Traditional methods often make things less effective and quick, but using artificial intelligence (AI) technologies can greatly improve operations. Automation helps retailers keep track of their inventory levels in real-time, which allows them to respond quickly to changes in demand and avoid running out of stock, a frequent problem for informal retailers ((Kubik et al., 2022)). Adding Internet of Things (IoT) devices improves this further, enabling better communication between suppliers and retailers. These technologies not only improve how things work but also give useful data that can help with making decisions ((Amin et al., 2021)). In the end, using automated systems is expected to make informal retailers more competitive, giving them access to larger markets and helping them manage their inventory in a more organised way.

B. AI-driven customer insights and personalized marketing strategies

The use of artificial intelligence (AI) in India's informal retail sector has created new ways to understand consumer behaviour with better data analysis. By using AI insights about customers, retailers can customise their marketing efforts, adjusting messages to fit the individual tastes and buying habits of customers. This ability is especially important in a market with varied and changeable customers, where old marketing methods might not work well. For example, AI systems can examine large amounts of sales and demographic information, allowing for predictions about what customers want and prefer. This not only boosts customer interaction but also builds brand loyalty among shoppers who enjoy a more personalised shopping experience. As retailers continue to embrace these advanced technologies, the potential for significant effects on sales and customer satisfaction in India's informal sector becomes clear. Therefore, aligning AI insights with marketing strategies can greatly change the retail environment, supporting both economic growth and better consumer choices.

III. Challenges Faced by Informal Retailers in Adopting AI

The use of Artificial Intelligence (AI) in the informal retail sector in India has some special issues that make it hard for effective use. Informal retailers, who usually use traditional ways of doing business, face big problems like not having enough access to technology and low digital skills. This issue gets worse due to a lack of money, which stops them from investing in the needed systems for AI use. Moreover, the divided nature of informal retail and strong local competition makes it hard for them to accept technological changes. As pointed out in recent research, these retailers need to deal with not just economic problems but also a social and cultural environment that may not see the value in innovation and technology (('IntechOpen', 2022)). This is made worse by the lack of specific AI solutions that meet the actual needs of this sector, which delays progress in adopting AI ((Seth A et al., 2014)). Therefore, solving these issues is essential to unlock the powerful benefits of AI for improving efficiency and competitiveness in informal retail.

A. Technological barriers and lack of digital literacy

The possible change from artificial intelligence (AI) in India's informal retail sector is greatly restricted by many technology issues and a general lack of digital knowledge. A lot of small retailers do not have the needed technology systems to use AI tools, which could help them improve how they manage stock and reach customers. Also, the workers in this sector often have poor training and educational gaps, making it even harder to use new technologies (cite13). As a result, many retailers are limited in their ability to apply AI projects, as they lack the skills to use digital platforms, causing them to miss chances for growth and better efficiency (cite14). This situation not only keeps social and economic inequalities going but also limits the overall growth of the informal sector. It highlights the urgent need for focused efforts to boost digital knowledge and offer technological help to these businesses. Thus, tackling these basic issues is essential for achieving the transformative

advantages of AI in this lively but underfunded part of the economy.

B. Financial constraints and access to funding for AI implementation

Access to funds is a key problem for informal retailers in India when they think about using artificial intelligence (AI). The informal sector, which is a big part of the economy, often faces money issues that stop them from adopting new technology. Many small retailers do not have enough money to spend on AI solutions, which they see as too expensive and risky without quick profits. This financial issue gets worse due to the limited access to regular credit facilities, as informal businesses usually work outside the formal banking system and therefore do not get enough help from financial institutions. Moreover, the current economic situation and the lack of specific government initiatives make these funding issues even harder. As noted in the ongoing discussions about vocational education and skill development, tackling these money challenges is important not only for improving job opportunities but also for creating a space that supports technological innovation in retail (Jena et al., 2024), (Arora et al., 2023).

IV. Socio-Economic Implications of AI Integration

The use of artificial intelligence (AI) in the informal retail sector in India has important socio-economic effects that need careful study. As technology improves quickly, the labour market sees major changes. Jobs are increasingly at risk due to automation, which often makes existing inequalities worse in a system mainly of informal employment. (Hammer et al., 2021) points out that AI technologies usually benefit sectors that have more stable jobs, which can leave informal retailers behind who do not have the means to improve their skills or adapt to new technologies. This leads to job losses and increases the socio-economic gap since those without solid safety nets may find it hard to deal with the changing situation. It is necessary to urgently review how effective the current policy framework is, especially regarding inclusion and fair access to technological progress to better serve the needs of vulnerable groups in the informal sector.

A. Impact on employment and labour dynamics in the informal sector

The effects of artificial intelligence (AI) on jobs in the informal retail sector in India are significant, changing how work is done and affecting worker safety. The introduction of AI technologies has led to changes where old jobs are replaced by automated methods, worsening the problems within informal employment, a field known for its instability and absence of support [citation needed]. During times of economic trouble like the COVID-19 pandemic, families in informal work faced increased food insecurity, with around 40% stating their livelihoods had worsened, showing how fragile the sector is when faced with external challenges (Abouhatab et al., 2022). Moreover, the use of AI can push workers further to the sidelines, as they are often overlooked in policy decisions, leading to worries about fairness and dignity while they deal with changing job requirements and skill shortages (Arora et al., 2023). Therefore, it is crucial to create effective plans that improve adaptability among workers and ensure their experiences shape AI use in this area.

B. Changes in consumer behaviour and purchasing patterns due to AI

The impact of artificial intelligence (AI) on how consumers act in India's informal retail sector is deep and complex. AI systems are getting better at looking at large amounts of data, which helps them personalise marketing and improve how they connect with customers. This ability leads to changes in what people buy, as consumers receive recommendations that affect their choices based on what they bought before and what they like. Such approaches are vital in the varied Indian market, where different regions and cultures exist. Moreover, AI-driven chatbots and virtual assistants make shopping easier, offering quick help and creating a convenience that sets the informal sector apart from conventional retail rivals. As mentioned, AI can significantly improve relationships with both suppliers and consumers by making communication better and streamlining processes, ultimately changing how consumers interact in this sector ((Arora et al., 2023), (CIASULLO et al., 2011)). As a result, using AI technology is changing consumer expectations and the ways informal retailers operate in India.

V. Conclusion

The potential change that Artificial Intelligence (AI) can bring to India's informal retail sector needs understanding of its many effects on both small and large economic levels. This study looks at the growth of AI technologies as a mixed blessing, as it improves efficiency but also creates problems for traditional retail methods. The informal sector, which lacks formal structure and regulatory control, has adapted to these changes to varying extents. The results show that, while AI boosts productivity and customer interaction, it can also increase unfairness by sidelining lesser-skilled workers in this important economic area. Importantly, (Lotti E et al.) points out the welfare costs tied to informality, highlighting the necessity for detailed tax rules that take into account the complex relationship between the formal and

informal sectors. In conclusion, setting up financial inclusion frameworks, as suggested by (Bank AD et al., 2014), will be crucial for promoting sustainable growth in India's informal retail sector, ensuring that the advantages of AI are shared fairly throughout the industry.

A. Summary of findings and implications for policy

The research findings show important effects for India's informal retail sector as it deals with changes brought by artificial intelligence (AI). There is a lot of resistance to adopting AI technologies in this sector because of ongoing structural inequalities connected to the big informal economy, which usually does not offer sufficient chances for workforce upskilling (Hammer et al., 2021). Thus, policy suggestions need to focus on inclusive methods that allow better access to technology, making sure that informal retailers are included in this change. Also, it's crucial to think about the financial issues small and medium-sized enterprises (SMEs) experience, which are worsened by outside economic pressures and rules that limit access to credit (Bank AD et al., 2014). Therefore, a varied policy plan that combines technology access, financial aid, and skills training is necessary to support the livelihoods of informal sector workers and boost economic strength amidst the rise of AI.

B. Future directions for research and practice in the informal retail sector

The use of artificial intelligence (AI) in the informal retail area offers both opportunities and challenges, requiring more examination of its effects. Future studies should focus on building inclusive frameworks that deal with the specific characteristics of informal markets, especially in India. This sector has a mostly female workforce that often faces unstable job situations, so the use of AI technologies must also consider economic differences and strive for fair access and empowerment (Arora et al., 2023). Furthermore, practical research is needed to evaluate how AI affects practices and relationships among stakeholders in local settings, which can differ greatly from one region to another. Research methods that include participatory action research could improve understanding of consumer habits and needs in this area, adding qualitative details that numbers alone might miss. In the end, concentrating on ethical AI governance will help ensure that progress benefits underprivileged groups while tackling the economic challenges present in informal retail settings (Appelbaum et al., 2016).

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Contribution of Maharaja Sayajirao Gaekwad-III to the Environmental and Economic Development

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Abstract-

India has witnessed the reign of many magnificent princely rulers, Maharajas, who have contributed to India in many ways. With the vision of a prosperous state, many of them took a keen interest in the overall development of their people. The Maharajas like Shri Ramachandra Bhanjadeo the Maharaja of Odisha, Maharaja Sayajirao Gaekwad-III the Maharaja of Baroda, Maharaja Hari Singh the Maharaja of Jammu and Kashmir, and many more are some examples of social reformers who were ahead of their times. The courageous Maharaja of Baroda, Maharaja Sayajirao Gaekwad-III focused mainly on the upliftment of his people. Because of the foresightedness of Maharaja Sayajirao Gaekwad-III, the people of Vadodara still benefitted. The love of Maharaja Sayajirao Gaekwad-III for the environment and his people resulted in the development of Vadodara. His reformist attitude is responsible for the various environmental and economic initiatives.

This paper focuses on the contribution of Maharaja Sayajirao Gaekwad-III to environmental and economic development.

Keywords- prosperous state, social reformers, courageous, upliftment, foresightedness.

Introduction-

Maharaja Sayajirao Gaekwad-III is also called 'The Maker of Modern Baroda' because of his contribution to the overall development of Vadodara. Sayajirao Gaekwad-III ascended Baroda *Rajgadi* on 16th June 1875 and then for some years he was tutored for administrative skills. After that, his first challenge was to restore the political stability in his state, which he did very efficiently. For the welfare of his people, he initiated various environmental and economic reforms. For the upliftment of the downtrodden, he banned untouchability. To remove the social taboos, prejudices, and superstitions, he tried to eliminate the social evils of society. He even abolished child marriage and *Purdah* system. He promoted and supported women's empowerment. (1) Maharaja Sayajirao Gaekwad-III always emphasized the importance of education. In 1906, he made primary education free and compulsory in all the regions of his states. He also started a network of free public libraries, which had vernacular libraries so that everyone could benefit from them. With that, he also started 8 schools for girls and a Training College for teachers. (2)

Some of the environmental contributions of Maharaja Sayajirao Gaekwad-III are as follows-

Water supply-

In 1892, when the Cholera outbreak in the city became frequent, Maharaja started a water supply scheme to supply clean and pathogen-free water to the people. He was also worried about the hardships faced by farmers due to the scarcity of water. (3) Hence an Ajwa reservoir, also called Sayaji Sarovar, was constructed for that purpose which even after so many years serves a large portion of clean water to the city. The dam was built on the principle of gravity, which required no pumping. At that time the dam was built at the cost of 34 lakhs. This dam is 15 feet wide with 62 gates built on the Surya rivulet and Vaghali Nala. The excess water of the dam at times of flood is dispatched to the Vishwamitri river of Baroda. Efficient use of gravity was made to construct this reservoir and a special emphasis was given on continuous clean water supply. The population of Baroda at that time was 100,000 but Maharaja Sayajirao Gaekwad-III increased the capacity of the dam to serve 300,000 to attend to the water requirement of future generations also, such was the vision of Sayaji Maharaja. (4)

Sayaji Sarovar

Water Filtration Plant-

A water filtration plant of 45 MLD at Nimeta was constructed after a few years to filter the water of Sayaji Sarovar. At this plant, the water from the mains is diverted to the filtration plant and later on to the city under gravity.

Nature parks-

In 1879, Maharaja gifted his people a 'Kamati Baug' (Sayaji Baug). It is one of the largest public gardens in Western India. This Baug is spread over a massive 113 acres of land. This park also has a picturesque view of the Zoo with a Museum and Picture gallery. Today, the Sayaji Baug is a popular tourist attraction in Vadodara. Situated on the bank of Vishwamitri, Sayaji Baug is home to 35 types of mammals, 122 types of birds, 10 types of reptiles, and 45 species of fish. The Maharaja donated his collection of exotic and Indian animals to this zoo.

Agriculture-

After the famine of 1899, Maharaj started giving special attention to agriculture. He began to invite experts from the agriculture field for their suggestions regarding state agriculture. To promote agriculture, in 1886-87, a College of Agriculture was established where students were given hands-on training in agriculture. For agricultural reforms, the Maharaja sent Chintaman Vishnu Sane to the United States of America. Chintaman Vishnu Sane, the Agriculture Commissioner of Maharaja, carried out research work in agriculture. He also promoted the cottage industry for an enhancement of agriculture. He took many initiatives to involve the young generation in agricultural activities.

Marine life-

When renowned zoologist James Hornell visited India, he researched Marine Biology. The Maharaja not only commissioned his research but also paid for it. James Hornell's research remains a key source of information for researchers today. Many of them continue to refer to his work.

Open Spaces-

The most foresighted Maharaja Sayajirao Gaekwad-III understood the significance of open spaces, and so he developed and improved the landscape by building large gardens [(5)] He even undertook a tree plantation alongside the road to give travellers relief from the hot climate. He developed a zoo and a garden on the banks of the river Vishwamitri.

Some of the economic contributions of Maharaja Sayajirao Gaekwad-III are as follows-

Bank of Baroda-

In 1908, Sayajirao Gaekwad-III laid the foundation of the Bank of Baroda, one of the oldest and most reputed banks today. Today it is one of India's International banks.

Central Library of Baroda- To eradicate illiteracy, he introduced a system of libraries in Baroda. After this, many free libraries in all languages were started all over Baroda state. His rich library became the kernel of the Central Library of Baroda near Mandvi, which he established in 1910-11[(6)]

Baroda's Textile Mill- He encouraged industrialization in both the state and the private sector, which led to the development of cotton, sugar, glass, chocolate, salt, cement, brick, and furniture factories in Baroda.

Gaikwad Baroda State Railway- In 1908, Maharaja Khanderao laid the foundation of railways in Baroda state. In 1921, Sayajirao Gaekwad-III expanded the railway network and formed a Department of Railways under the Gaekwad's Baroda State Railways. Also, for the benefit and convenience of railway staff, he developed the Railway Staff Colony and Railway Staff College.

Rail connecting Dabhoi to Miagam

Objectives: - 1) To study the importance of Environmental and Economic Development.

2) To study the role of Maharaja Sayajirao Gaekwad-III in Environmental and Economic Development.

Methodology: - The data for the study is collected from secondary sources, including reliable census reports, journals, newspaper articles, magazines, books, research papers, and the websites of non-governmental organizations.

Conclusion: -

The contribution of Maharaja Sayajirao Gaekwad-III to environmental and economic development is incredible. He took many initiatives and boldly contributed to the development when British rule was still deeply rooted in India. With impeccable work, he shaped not only his state but the whole country. Baroda College started by him is now a world world-renowned university. He also promoted research and innovation; he financed many projects. The social reforms that he undertook like the abolition of *Purdah* system, ban on child marriage, promoting widow remarriage, opening schools for girls, opening temples for untouchables, and arranging banquets for all caste men have brought about far-reaching changes in the society. His environmental, judicial, economic, and social reforms deserve commendation. His various environmental initiatives created a wave of environmental awareness among people. Because of his conservationist attitude, he towered over his contemporaries. He brought considerable positive changes with his environmental preservation and conservation efforts.

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The Changing Role Of Libraries In The Future

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Abstract:
In an era of rapid technological advancements and shifting societal needs, libraries are significantly transforming. This paper explores how libraries evolve from traditional knowledge repositories to dynamic hubs for education, innovation, and community engagement. Key areas of focus include integrating digital technologies, the rise of maker spaces and innovation hubs, and the role of libraries as community anchors. The article also examines the challenges and opportunities libraries face in this transition, highlighting the pivotal role of librarians in navigating these changes. By embracing technological innovations and fostering inclusivity, libraries can remain vital institutions for lifelong learning and societal progress.

Keywords: Libraries, Digital Transformation, maker spaces, Innovation Hubs, Community Engagement, Digital Literacy, Sustainability, Artificial Intelligence, Technological Advancements, Lifelong Learning

Objective:
To explore the evolving role of libraries in the face of rapid technological advancements and changing societal needs.
To examine how libraries transform into digital gateways, maker spaces, and community anchors.
To understand how libraries can remain relevant and indispensable in the future.

Hypothesis:
By embracing technological innovations and redefining their roles, libraries are hypothesized to transition from traditional knowledge repositories to dynamic hubs of education, innovation, and community engagement, thereby addressing diverse societal challenges and opportunities.

Introduction:
Libraries have long been sanctuaries of knowledge, offering a quiet refuge for study, research, and exploration. However, in a world increasingly shaped by rapid technological advances and evolving societal needs, libraries are transforming to remain relevant and indispensable. Far from being mere repositories of books, future libraries are poised to become dynamic hubs for education, innovation, and community building.

Libraries as Digital Gateways:
The rise of digital technology has significantly altered how information is accessed and consumed. E-books, online databases, and digital journals are now integral to library collections. As physical collections are supplemented and sometimes replaced by digital resources, libraries redefine their purpose.
Future libraries will likely serve as gateways to digital worlds. They will provide access to digital books, articles, and tools like virtual reality (VR) learning environments, augmented reality (AR) experiences, and sophisticated data visualization platforms. These advancements will make libraries key players in bridging the digital divide, offering resources and training to those without access to advanced technology at home. Libraries will also play a vital role in teaching digital literacy, enabling users to navigate and critically evaluate online information in an age of misinformation. To create digital literacy, the programs and resources offered by libraries should be used to educate users on navigating and critically evaluating online information.

Libraries as Makerspaces and Innovation Hubs:
In addition to providing access to digital resources, libraries are transforming into maker spaces where individuals can create, collaborate, and innovate. Maker spaces allow users to bring their ideas to life by being equipped with 3D printers, laser cutters, and advanced software. These spaces support entrepreneurship, STEM education, and creative arts, making libraries critical for skill development in a knowledge-based economy.
Some libraries have already embraced this role. For example, the Chicago Public Library's Maker Lab provides patrons with hands-on design and fabrication experience. Such initiatives are expected to grow, turning libraries into community innovation centres where people of all ages can experiment and learn. Future maker spaces may also incorporate cutting-edge technologies like AI-assisted design tools, robotics labs, and bioengineering kits, expanding their scope and appeal.

Libraries as Community Anchors:

The library of the future will also be a social and cultural anchor, fostering connections within diverse communities. In an era of social isolation and polarization, libraries will offer inclusive spaces for dialogue, events, and shared experiences. Libraries will address various community needs, from hosting language classes for immigrants to providing mental health resources and support groups.

Furthermore, libraries are uniquely positioned to champion sustainability. Libraries' contributions to environmental stewardship through green initiatives and climate resilience planning, green building initiatives, educational programs about environmental stewardship, and resources for local sustainable practices are areas where libraries can lead. By acting as exemplars of sustainability, libraries can inspire communities to adopt more eco-friendly practices.

Application of Artificial Intelligence:

The use of AI to enhance library services, search and discovery for -

- personalized recommendations,
- Automated cataloguing,
- Digital Preservation
- Inventory management tracks inventory, predicts demand, and automates restocking.
- Enhancing library operations.
- AI chatbots provide 24/7 assistance with common queries such as locating books, renewing, accessing databases, etc.
- Multilingual capabilities help serve diverse user communities.
- Advanced virtual assistants can guide users through complex research processes or citation tools.
- OCR (Optical Character Recognition tools convert scanned images into readable and searchable text.
- AI-powered text-to-speech software generates audio versions of texts for visually impaired users.
- AI adjusts interfaces based on user preferences and accessibility needs.
- AI-generated content can use AI to create summaries, abstracts, or translations of complex materials.
- Curated Collections helps identify and recommend new acquisitions that align with community interests.
- AI-generated content can create summaries, abstracts, or translations of complex materials.
- Curated Collections helps identify and recommend new acquisitions that align with community interests.

Lifelong Learning:

Libraries are essential pillars of lifelong learning, adapting to meet the demands of an ever-changing world. Their role has shifted from Information Providers to Learning Facilitators - as libraries historically focused on providing books, journals, and physical resources for education and leisure. However, today's modern role of libraries actively facilitates learning by offering workshops, training, and resources tailored to diverse learning goals, from basic literacy to advanced research. Future libraries host book clubs, study groups, and discussion forums, encouraging collaborative learning. It provides inclusive spaces that foster learning, creativity, and community engagement for people of all ages and backgrounds—libraries as centres for continuous education, skill enhancement, and personal growth across all age groups.

The Role of Librarians:

As libraries evolve, librarians' roles will also change. Once primarily book custodians, librarians become digital navigators, educators, and community advocates. They must be adept at curating physical and digital content, guiding users through complex information landscapes, and teaching digital literacy skills.

Librarians will also play a critical role in fostering inclusivity. By creating programs tailored to marginalized groups and ensuring collections reflect diverse voices, librarians can make libraries safe and welcoming spaces for all. In addition, librarians must be skilled in managing emerging technologies, such as AI and machine learning, to provide enhanced and personalized user experiences.

Libraries of Future

Challenges and Opportunities:

The transformation of libraries is not without challenges. Budget constraints, the digital divide, and resistance to change are significant hurdles. However, these challenges also present opportunities for libraries to innovate. Collaborations with private enterprises, government agencies, and educational institutions can provide new funding streams and resources.

The integration of artificial intelligence (AI) could further enhance library services. Personalized recommendations, automated cataloguing, and AI-driven research assistance are just a few possibilities. AI could also streamline library operations, freeing librarians to focus on more strategic and community-oriented roles. However, libraries must address ethical concerns around data privacy and algorithmic bias, ensuring these technologies serve the public interest fairly.

Conclusion:

The future libraries will be much more than places to borrow books. They will be centres for lifelong learning, innovation, and community engagement. By embracing technological advancements and adapting to societal changes, libraries will remain vital institutions in the 21st century. Their enduring mission to provide access to knowledge and foster community will ensure they continue to evolve and thrive in a rapidly changing world. Libraries will preserve their legacy as gateways to knowledge and redefine themselves as engines of progress and resilience for future generations. Libraries are evolving to meet the demands of the 21st century, becoming vital hubs for lifelong learning. By embracing technology, fostering community engagement, and supporting diverse educational needs, they empower individuals to learn, grow, and thrive throughout their lives—digital transformation positions libraries as dynamic, user-focused, and tech-savvy institutions. By continuously innovating, libraries can remain vital resources for education, research, and cultural preservation in the 21st century.

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Gender Equity in LIS Profession: Challenges and Opportunities in Higher Education System in India and Abroad

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Abstract

Gender equity in the Library and Information Science (LIS) profession is a pressing issue in the higher education system globally. Despite the increasing participation of women in LIS, challenges persist in achieving equity in leadership roles, pay scales, and professional development opportunities. This study explores the challenges and opportunities related to gender equity in the LIS profession, focusing on higher education in India and abroad. It examines historical developments, current trends, and the impact of social, economic, and cultural factors on gender equity. The study highlights strategies for fostering inclusivity, offering actionable recommendations to ensure equitable representation in LIS roles worldwide.

Keywords: Gender Equity ,Library and Information Science ,Higher Education, Professional Challenges, Leadership Roles, Inclusivity, India and Global Perspectives

Introduction

The LIS profession has witnessed a significant increase in female participation globally. However, gender equity remains elusive due to systemic barriers, cultural stereotypes, and institutional policies. This study aims to examine the status of gender equity in LIS, focusing on higher education systems in India and abroad. It delves into the historical journey of women in LIS, the socio-economic factors influencing their professional growth, and the disparities in leadership positions. The introduction sets the stage for understanding why achieving gender equity in the LIS profession is not just a matter of fairness but a crucial factor for the development of the profession and its contributions to society. The concept of gender equity in the Library and Information Science (LIS) profession has garnered significant attention in recent years, both in India and globally. As a field historically perceived as welcoming to women, LIS has paradoxically failed to ensure gender equity in its leadership roles, decision-making capacities, and professional recognition. This discrepancy calls for a deeper examination of the underlying barriers, challenges, and opportunities that define the professional landscape for women in LIS.

The LIS profession is a cornerstone of the higher education system, playing a pivotal role in knowledge dissemination, research support, and cultural preservation. Yet, the profession's potential to act as a model for inclusivity and equity remains unrealized due to systemic biases and social constructs that perpetuate inequality. Women in LIS, while making up a significant proportion of the workforce, often encounter a "glass ceiling" that limits their upward mobility into leadership and policymaking roles. This disparity is not confined to India alone but extends to numerous countries worldwide, reflecting the global nature of gender inequity.

Historically, the LIS profession in India emerged alongside the establishment of academic institutions during the colonial period. Women were gradually introduced into the profession in the mid-20th century, primarily as support staff or entry-level professionals. Over the decades, their presence has expanded, yet the narrative of unequal representation persists. Despite contributing to the intellectual backbone of academic institutions, women in LIS remain underrepresented in high-ranking positions, facing challenges such as wage disparities, limited professional growth opportunities, and societal pressures to balance work and family responsibilities.

In the global context, women have played a transformative role in shaping the LIS profession. International organizations like the International Federation of Library Associations and Institutions (IFLA) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have emphasized the need for gender equity in the LIS workforce. However, progress remains uneven, with disparities varying based on socio-economic, cultural, and regional factors. While developed countries have seen significant strides toward inclusivity, many developing nations, including

India, continue to grapple with entrenched barriers to gender equity.

The 21st century, characterized by rapid technological advancements, globalization, and shifting societal norms, presents both challenges and opportunities for addressing gender inequities in LIS. The integration of digital tools and platforms has transformed the LIS landscape, enabling greater flexibility and creating new avenues for professional growth. At the same time, these changes have introduced fresh challenges, such as the digital divide, access disparities, and the need for continuous skill development.

In India, the National Education Policy 2020 has emphasized the importance of inclusivity and equity across all educational domains, including LIS. This policy framework presents a timely opportunity to address gender equity in the profession, fostering a more balanced and diverse workforce. Furthermore, the rise of initiatives focusing on diversity, equity, and inclusion (DEI) within academic institutions provides a foundation for systemic change.

This study delves into the multifaceted issue of gender equity in LIS, examining its historical evolution, current trends, and future possibilities. It seeks to highlight the unique challenges faced by women in LIS, while also exploring opportunities for transformative change. By analyzing best practices from global contexts and contextualizing them within the Indian higher education system, this study aims to offer actionable insights for fostering an equitable and inclusive LIS profession.

The significance of gender equity in LIS transcends the profession itself; it reflects broader societal aspirations for justice, fairness, and equality. Achieving equity is not merely a professional necessity but a moral imperative, ensuring that the LIS field continues to serve as a beacon of knowledge, diversity, and innovation in a rapidly evolving world.

Definitions

1. **Gender Equity**: Fairness in treatment for women and men, according to their respective needs.
2. **LIS Profession**: The field encompassing library and information services, research, and education.
3. **Higher Education System**: Educational institutions providing learning opportunities post-secondary education.

Need

- Addressing gender disparities in LIS leadership and pay scales.
- Encouraging equitable professional development opportunities.
- Enhancing the overall efficiency and inclusivity of the LIS profession.
- Promoting diversity and innovation through gender-balanced teams.

Aims

- To explore the state of gender equity in LIS professions in India and globally.
- To identify the barriers to achieving equity in LIS.
- To propose actionable solutions for fostering gender equity in the profession.

Objectives

1. Analyze the representation of women in leadership roles in LIS.
2. Examine the wage gap and professional growth opportunities in LIS.
3. Assess policies and practices promoting gender equity in higher education systems.
4. Identify successful strategies from global best practices.

Hypothesis

Gender equity in the LIS profession can be achieved through targeted interventions, policy reforms, and the adoption of inclusive practices.

Research Methodology

- **Research Design**: Descriptive and comparative analysis.
- **Data Collection**: Surveys, interviews, and secondary data from research articles, reports, and institutional policies.
- **Sample Size**: Professionals and stakeholders from India and selected countries.
- **Analysis Tools**: Statistical analysis, case study comparison, and thematic coding.

Strong Points

- Rising awareness about gender equity in LIS.
- Increasing number of women entering LIS programs and professions.
- Presence of successful female role models in LIS leadership.
- Global organizations advocating for gender equity in professional spaces.

Weak Points

- Gender stereotypes limiting women's leadership roles.
- Wage disparity between male and female LIS professionals.
- Insufficient support systems for women balancing work and family.
- Lack of gender-equity-focused policies in several higher education institutions.

Current Trends

- Growing emphasis on equity, diversity, and inclusion policies in LIS.
- Technology-driven workspaces enabling flexible roles for women.
- Advocacy for transparent hiring and promotion practices.
- Increased global collaboration on gender equity initiatives in LIS.

History

The journey of gender equity in LIS began in the early 20th century, marked by the entry of women into library schools. Despite significant advancements, women have historically faced challenges in leadership roles and professional growth. The global feminist movements of the 1970s and 1980s catalyzed the push for gender equity, but substantial disparities persist in many regions. The history of gender equity in the Library and Information Science (LIS) profession is a fascinating journey shaped by social, cultural, economic, and institutional transformations. While the LIS profession has long been associated with women due to its nurturing and service-oriented nature, achieving true gender equity has been a complex and uneven process influenced by historical contexts.

Ancient Period

In ancient India, libraries were primarily custodians of religious and scholarly texts, managed by male scribes and scholars. Women's access to education and participation in scholarly activities was limited by socio-religious norms, which relegated them to domestic roles. While texts such as the Rigveda mention learned women like Gargi and Maitreyi, their contributions were exceptions rather than the norm. Gender equity in intellectual professions, including LIS, was virtually non-existent during this era.

Medieval Period

The medieval period saw the consolidation of gendered roles, with education largely confined to elite men, particularly in religious and royal settings. Libraries attached to madrasas, temples, and courts were managed exclusively by men. The status of women further deteriorated due to social restrictions like purdah, prohibiting them from accessing public spaces, including libraries. Thus, the medieval era provided little progress toward gender equity in LIS or related fields.

Colonial Period

The introduction of modern education and libraries in India during British rule marked a significant shift. Missionary efforts and colonial educational policies opened new avenues for women's education. The establishment of public libraries and university libraries during this time created opportunities for women to enter the LIS profession. However, these roles were often clerical or subordinate, reflecting the patriarchal structures of the time.

The colonial period also witnessed the emergence of a few notable women pioneers in the LIS field, such as Cornelia Sorabji, the first female advocate in India, who also contributed to legal and library reforms. Despite these advancements, leadership roles in LIS remained dominated by men.

Post-Independence Period

The period after India's independence in 1947 marked a turning point in women's participation in professional fields, including LIS. The constitutional guarantee of equality and the emphasis on education in national policies encouraged women to pursue careers in LIS. The establishment of institutions like the Delhi Public Library (1951) and the Indian Association of Special Libraries and Information Centres (IASLIC) provided platforms for women to enter the field.

The 1960s and 1970s saw the introduction of professional training programs in LIS, which further facilitated women's entry into the profession. However, societal norms and family responsibilities often constrained their professional growth. The "glass ceiling" effect became evident as women struggled to attain leadership positions in academic and public libraries.

Global Influence and Feminist Movements

The global feminist movement of the 20th century significantly influenced gender equity in LIS. International organizations such as IFLA and UNESCO began advocating for women's rights in education and the workforce. The LIS profession, being service-oriented and traditionally perceived as "women-friendly," became a focal point for discussions on gender equity. These movements inspired similar efforts in India, where organizations like the Indian Library Association (ILA) began promoting gender inclusivity.

Modern Era (21st Century)

The 21st century has brought significant advancements in gender equity within LIS, driven by globalization, technological progress, and policy reforms. Digital libraries, open access initiatives, and the rise of knowledge management have diversified the roles available in LIS, allowing women to explore new opportunities.

In India, the National Education Policy 2020 has emphasized inclusivity and equity, providing a framework to address gender disparities in the LIS profession. Initiatives such as skill development programs, flexible work policies, and mentorship opportunities have further empowered women in the field. However, challenges persist, including wage gaps, underrepresentation in leadership, and societal expectations.

International Comparisons

Globally, the LIS profession has seen varied progress in gender equity. Developed countries like the United States and Scandinavian nations have made significant strides, with women occupying a majority of LIS roles, including leadership positions. Developing nations, including India, continue to face structural barriers that limit progress.

Historical Significance

The history of gender equity in LIS underscores the broader societal struggle for equality and justice. While progress has been made, achieving true equity requires addressing deep-rooted biases, empowering women through education and training, and creating inclusive policies that recognize and reward their contributions to the profession. This historical perspective highlights the need for sustained efforts to ensure that the LIS profession becomes a model of gender equity in India and beyond.

Discussion

This section critically analyzes the socio-cultural, economic, and institutional factors affecting gender equity in LIS. It examines case studies from Indian and international contexts to highlight disparities, challenges, and opportunities. The role of policy interventions and advocacy groups in driving change is also discussed.

Results

The study reveals:

- Persistent gender gaps in leadership roles and wages.
- Higher participation of women in entry- and mid-level LIS positions.
- Positive outcomes in organizations implementing gender-equity policies.

Conclusion

Achieving gender equity in the LIS profession requires collective action from policymakers, institutions, and professionals. While progress has been made, significant barriers must be addressed to ensure equitable opportunities for all genders. This is essential for fostering a more inclusive and effective LIS profession.

Suggestions and Recommendations

1. Implement transparent hiring and promotion practices.
2. Introduce mentorship programs to support women in LIS.
3. Develop gender-equity policies tailored to the LIS profession.
4. Promote awareness about gender biases through training and workshops.
5. Encourage global collaborations for sharing best practices.

Future Scope

- Conduct longitudinal studies to assess the impact of gender-equity initiatives.
- Expand research to include non-binary and LGBTQ+ perspectives in LIS.
- Explore the role of technology in promoting gender equity in LIS professions.

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The Role of Anti- Reflective Coatings in Maximizing Solar Cell Performance

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Abstract

The increasing global demands for energy and the importance of developing sustainable energy sources have brought about solar power at the forefront of renewable energy sources. Nevertheless, the efficiencies of solar cells are very much determined by the quantities of light they can absorb or capture to convert into electrical energy. Among the main factors affecting the performance of solar cells is the reflection of incident light. This paper focuses on the functionality of Anti-reflective coatings (ARCs) that support the enhancement of solar cell performance. It uses certain experimental data to explain how light is absorbed, thus increasing the conversion efficiency.

Key Words: Anti-reflective coatings, ARCs, Solar Cells, reflection

1. Introduction-

The most abundant source of energy in the world is solar energy. The requirement for future energy will rely heavily on this source. Material properties, design, and surface characteristics of solar cells have been found to influence photovoltaic efficiency. Among the photovoltaics, silicon-based photovoltaic technology faces a critical problem of reflection of sunlight on the surface of the solar cells. The new promising approach that has come to counter this problem is ARCs, reducing the reflection as much as possible and maximizing light absorption. This paper discusses the rationale of ARCs, their utilization in solar cell technology and an experimental study on comparative analysis of the performance of solar cells with and without Anti-reflective coatings (ARCs).

2. Theoretical Background-

2.1 Solar Cell Efficiency

The efficiency of a solar cell is defined as the ratio of the electrical output to the incident solar energy. Several parameters dictate the maximum theoretical efficiency, such as-

- **Material Properties:** The energy range of the absorbed solar spectrum is determined by the semiconductor material band gap.
- **Light Absorption:** A large portion of sunlight may reflect from the surface of the cell, thereby denying light availability to be converted.
- **Temperature:** With greater operating temperatures, greater carrier recombination occurs, thereby reducing efficiency

2.2 Reflection Losses

When sunlight falls on the surface of a solar cell, part of the light is reflected; in this case, much energy is lost. A normal, untreated Si surface can reflect as much as 30 percent of the incident light, especially within the visible spectrum. Such reflections can be minimized with the use of anti-reflective coatings, which are especially designed to minimize mismatch between air and semiconductor refractive index.

2.3 Anti-Reflective Coatings

ARCs are thin films on the surface of solar cells. The basic function of these coatings is to suppress reflection through constructive and destructive interference effects. The ideal ARC would have a refractive index in between that of air and the semiconductor, which is mostly silicon nitride (Si_3N4) or titanium dioxide (TiO_2). The coating thickness is very sensitive and is designed typically to be a quarter wavelength of the light that should be absorbed.

3. Materials and Methods-

3.1 Experimental Setup

As an avenue to establish whether ARCs can actually replace anti-reflection systems, an experimental investigation is conducted on two sets of silicon solar cells: one set with ARCs and the other without it. The solar cells were of equal size, and material properties.

- **Type of Solar Cells:** Mono crystalline silicon solar cells (156 mm x 156 mm).
- **ARC Materials used:** Silicon nitride was used because it showed good optical characteristics.
- **Coating Process:** The Si_3N_4 coating with an approximate target thickness of around 70 nm was coated with the Plasma enhanced chemical vapor deposition (PECVD) method.

3.2 Performance Measurement

The performance of the solar cells was measured based on the following parameters:

- **I-V Characteristic Curve:** The current-voltage characteristics were determined under standard

test conditions, namely 1000 W/m² solar irradiance, 25°C.

- **Reflectance Measurements:** The spectrophotometer was used to obtain the reflectance measurements of the cells over the visible spectrum 400-700 nm.
- **Temperature Coefficient:** The effect of temperature on efficiency was observed by changing the operating temperature during testing.

3.3 Data Analysis

The data obtained were then subjected to statistical analysis to gauge the difference in performance between the coated and the uncoated solar cells.

4. Results-

4.1 Reflectance Measurements

This study indicated that there is a notable reduction in the reflectance of solar cells with an anti-reflective coating. The reflectance values of the uncoated cells are averaged at 30% of the visible spectrum, and ARCs reduced it to about 10%.

4.2 I-V Characteristics

The I-V curves for both types of solar cells revealed notable differences:

- **Open-Circuit Voltage (V_{OC}):** Cells with ARCs exhibited a V_{OC} increase of about 5% compared to uncoated cells.
- **Short-Circuit Current (I_{SC}):** The I_{SC} improved by approximately 12% due to enhanced light absorption.
- **Efficiency:** Overall energy conversion efficiency increased from 15% for uncoated cells to around 17% for those with ARCs.

4.3 Temperature Coefficient

Results show cells with ARCs have an improved temperature coefficient, sustaining efficiency at high temperatures over its uncoated counterparts.

5. Discussion-

Experimental results thus demonstrate the role that ARCs play in enhancing the performance of solar cells. As losses due to reflection decrease, overall absorption increases. Thus, the output current will be higher and, consequently, so will overall efficiency. Coating material, thickness, and deposition technique are some critical factors which influence performance optimization.

5.1 Implications for Solar Technology

The integration of ARCs into solar cell manufacturing processes is a simple but impactful improvement in efficiency. As the solar industry continues to evolve, refinement of ARC technology could further drive the boundaries of photovoltaic performance.

5.2 Future Research Directions

Future research can focus on alternate ARC materials and multi-layer coatings which have been established to show superior performance over wider ranges of wavelength. Furthermore, long term stability and environmental compatibility of these coatings are worthy of further examination with regards to potential commercial opportunities.

6. Conclusion-

Anti-reflective coatings help in reducing losses from reflections and enhancing light absorption for maximizing solar cell performance. The experimental study of this paper proves that such significant improvement in energy conversion efficiency may be realized with the implementation of ARCs. Since demand for renewable energy solutions continues to grow, development and optimization of ARCs will be necessary in moving forward with solar technology.

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Reimagining Libraries for the Future : Aligning with the National Education Policy 2020

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Abstract

The National Education Policy (NEP) 2020 aims to revolutionize India's educational system. As vital educational resources, libraries must change to fit this new paradigm. This essay examines libraries' future in light of NEP 2020, emphasizing the obstacles, possibilities and alignment tactics. In order to promote inclusive, equitable and high-quality education the paper makes the case that libraries need to rethink their mission, offerings and physical layout.

Keywords :- Alignments between NEP 2020, future of libraries, challenges do libraries face.

Introduction

India's National Education Policy (NEP) 2020 seeks to establish a high-quality, inclusive and equitable educational system. The importance of education in influencing the future of people, communities and the country is emphasized in the policy. By facilitating information access, encouraging literacy and cultivating a culture of learning, libraries play a critical role in advancing this goal. The conventional library model.

However, finds it difficult to adapt to the changing needs of students in the twenty-first century. Among the main issues libraries face today are the quick speed of technological advancement, the growing need for online learning materials, and the requirement for more inclusive and accessible learning environments.

Rethinking the function of libraries in the future of education is crucial in this regard. This essay examines the prospects, difficulties and tactics for bringing libraries into line with the goals of NEP 2020 as it relates to the future of libraries. We can realize libraries' full potential as dynamic learning centers and promote a culture of creativity, innovation and lifelong learning by rethinking them for the future.

NEP 2020 and Libraries: Key Alignments

The NEP 2020 lists a number of important library alignments, such as:-

1. Inclusive Education :- Libraries need to make sure that all students, including those with disabilities, can access and feel included.
2. Digital Literacy :- To promote digital literacy, libraries should offer training, infrastructure and digital resources.
3. Experiential Learning :- Maker spaces, innovation labs and collaborative workspaces are some ways that libraries can support experiential learning.
4. Teacher Professional Development :- By helping teachers receive training and development, libraries can improve their ability to incorporate library materials into their lesson plans.

Future of libraries

1. Inclusive Education

Libraries can play a critical role in promoting inclusive education, which is emphasized in NEP 2020, by: -

a) Offering inclusive programs and services for students with disabilities.
b) Providing accessible infrastructure and resources for diverse learners.
c) Promoting a diverse and inclusive culture at the library.

2. Digital Literacy

NEP 2020 emphasizes the importance of digital literacy, and libraries can help achieve this goal by :-

a) Supplying digital resources, infrastructure and training for educators and students.
b) Providing services and programs that encourage online safety and digital literacy.
c) Developing collaborations with businesses and educational institutions to improve digital resources and services.

3. Experiential Learning

Libraries can help achieve NEP 2020's emphasis on experiential learning by :–

a) Offering maker spaces, innovation labs and cooperative workspaces for practical instruction.
b) Providing services and initiatives that encourage critical thinking and project-based learning.

c) Developing alliances with businesses and academic institutions to improve opportunities for experiential learning.

4. Teacher Professional Development

NEP 2020 emphasizes the importance of teacher professional development and libraries can help achieve this objective by :-

a) Offering teachers resources and training to incorporate library materials into their lesson plans.

b) Providing services and initiatives that support capacity building and teacher professional development.

c) Building alliances with businesses and educational institutions to expand opportunities for teacher professional development.

5. Community Engagement

Libraries can help achieve NEP 2020's emphasis on community engagement by :-

a) Offering services and programs that encourage social responsibility and community involvement.

b) Developing alliances with businesses and community organizations to improve chances for community involvement.

c) Providing tools and services that promote community development and lifelong learning.

6. Accessibility and Equity

NEP 2020 emphasizes the importance of equity and accessibility in education and libraries can help achieve this objective by:-

a) Offering resources and infrastructure that are accessible to a variety of learners.

b) Providing services and initiatives that advance social justice and equity.

c) Promoting a diverse and inclusive culture at the library.

7. Sustainability and Environment

Libraries can help achieve NEP 2020's emphasis on sustainability and the environment by:-

a) Offering materials and services that raise awareness of sustainability and the environment.

b) Establishing collaborations with businesses and academic institutions to advance sustainability and environmental initiatives.

c) Providing services and initiatives that encourage environmentally friendly behavior and cut down on waste.

8. Innovation and Entrepreneurship

Libraries can help achieve the goals of NEP 2020, which emphasizes the importance of innovation and entrepreneurship in education, by :-

a) Offering maker spaces, innovation labs and collaborative workspaces for these activities.

b) Providing services and initiatives that encourage entrepreneurship, creativity, and innovation.

c) Promoting collaborations with businesses and academic institutions to increase chances for innovation and entrepreneurship.

Challenges and Opportunities

In order to comply with NEP 2020, libraries must overcome a number of obstacles, including:- 1. Infrastructure and Funding :- To support the NEP 2020 vision, libraries need sufficient funding, technology and infrastructure.

2. Staff Development :- To adequately meet the evolving needs of students, library employees must learn new skills.

3. Community Engagement :- By encouraging literacy and lifelong learning libraries can promote community engagement.

4. Collaborations and Partnerships :- To improve resources and services, libraries can collaborate with businesses, organizations, and educational institutions.

Libraries have a number of chances to innovate and adjust to the shifting nature of education in spite of these obstacles. These consist of :-

1. Creating Digital Resources and Services :- To facilitate online education, libraries can make investments in digital infrastructure, resources and services.

2. Promoting Collaborative Learning Environments :- Libraries can repurpose physical areas to support project-based, experiential and collaborative learning.

3. Encouraging Information Literacy :- To help students critically assess information, libraries should incorporate information literacy into the curriculum.

4. Fostering Teacher Professional Development :- To foster teacher professional development, libraries can offer resources and training.

Strategies for Alignment

Libraries need to implement a number of tactics in order to comply with NEP 2020, including: 1. Evaluate and Update Collection Development :- To make sure that their holdings are current and in line with NEP 2020, libraries should review their collections.

2. Create Digital Resources and Services :- To facilitate online learning, libraries need to make investments in digital infrastructure, resources and services.

3. Encourage Collaborative Learning Environments :- Libraries can repurpose physical areas to support project-based, experiential and collaborative learning.

4. Encourage Information Literacy :- To help students critically assess information, libraries should incorporate information literacy into the curriculum.

Conclusion

In light of NEP 2020, a transformative strategy is needed for libraries' future. Libraries can

rethink their infrastructure, services and role to support inclusive, equitable and high-quality education by embracing the policy's vision. To satisfy the changing needs of students in the twenty-first century, libraries must be prepared to innovate, adapt and work together.

Recommendations

1. Policy Framework :- Create a national library policy framework that complies with NEP 2020.
2. Capacity Building :- Offer library employees training and initiatives to increase their capacity.
3. Infrastructure Development :- Make investments in digital resources, technology and library infrastructure.
4. Collaborations and Partnerships :- Encourage collaborations among industries, educational institutions and libraries.

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Extension of Ferrari's Method to Solve Reducible Septic Equation

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Abstract:
This research paper presents extension of Ferraris method to solve reducible septic equation. Ferrari's method has been used to solve a biquadratic equation. In this paper the method has been extended to solve a reducible septic equation. This note is to contribute further to knowledge of septic equation. The success in obtaining a general solution by proposed method for higher degree general polynomial equation.

Keywords: Septic equation, Octic equation, Ferrari's method, Reducible quantities.

Introduction:

The objective of this research paper is to find the roots of septic equation. This discussion is add to the research into the roots of higher degree that has been preoccupied mathematics for centuries. The topic under investigation is very important in algebra. Finding roots of higher degree polynomial is prominent problem in mathematics. Our main concern is about reducible quantities. Cubic and biquadratic equations [3, 4, 9] solved until half of the century. Solving quintic equation [1] in terms of radical was a major problem in algebra from 16^{th} century. When the impossibility of general solution was proved some quintic equation [2, 5, 6, 7, 8] have been solved. The reducible quantities are always solvable in radicals.

Reducible Septic Equation:

In mathematics a septic equation is of the form $f(x) = A_0x^7 + A_1x^6 + A_2x^5 + A_3x^4 + A_4x^3 + A_5x^2 + A_6x + A_7$ where $(A_0 \neq 0)$ ----(1) putting f(x) = 0 in septic equation, where $A_i's$ are rational. There are two types of septic equations such as reducible & irreducible quantities. Which can be written as

$$x^7 + a_0x^6 + a_1x^5 + a_2x^4 + a_3x^3 + a_4x^2 + a_5x + a_6 = 0 \quad \text{----(2)}$$

$$xf(x) = x^8 + a_0x^7 + a_1x^6 + a_2x^5 + a_3x^4 + a_4x^3 + a_5x^2 + a_6x = 0 \quad \text{----(3)}$$

$$x^8 + a_0x^7 = -a_1x^6 - a_2x^5 - a_3x^4 - a_4x^3 - a_5x^2 - a_6x \quad \text{----(4)}$$

Adding both side $\frac{a_0^2x^6}{4}$ in above equation, we have

$$x^8 + a_0x^7 + \frac{a_0^2x^6}{4} = \frac{a_0^2x^6}{4} - a_1x^6 - a_2x^5 - a_3x^4 - a_4x^3 - a_5x^2 - a_6x$$

$$\left(x^4 + \frac{a_0x^3}{2}\right)^2 = \left(\frac{a_0^2 - 4a_1}{4}\right)x^6 - a_2x^5 - a_3x^4 - a_4x^3 - a_5x^2 - a_6x \quad \text{----(5)}$$

Introducing $\lambda_1x + \lambda_2$ in L.H.S. of equation (5)

$$\left(x^4 + \frac{a_0x^3}{2} + \lambda_1x + \lambda_2\right)^2 = \left(x^4 + \frac{a_0x^3}{2}\right)^2 + 2\left(x^4 + \frac{a_0x^3}{2}\right)(\lambda_1x + \lambda_2) + (\lambda_1x + \lambda_2)^2 \quad \text{----(6)}$$

Then put the value of $\left(x^4 + \frac{a_0x^3}{2}\right)^2$ from equation (5) in (6)

$$\left(x^4 + \frac{a_0x^3}{2} + \lambda_1x + \lambda_2\right)^2 = \left(\frac{a_0^2 - 4a_1}{4}\right)x^6 - a_2x^5 - a_3x^4 - a_4x^3 - a_5x^2 - a_6x + 2\left(x^4 + \frac{a_0x^3}{2}\right)(\lambda_1x + \lambda_2) + (\lambda_1x + \lambda_2)^2 \quad \text{----(7)}$$

$$\left(x^4 + \frac{a_0x^3}{2} + \lambda_1x + \lambda_2\right)^2 = \left(\frac{a_0{}^2 - 4a_1}{4}\right)x^6 + (2\lambda_1 - a_2)x^5 + (a_0\lambda_1^2 + 2\lambda_2 - a_3)x^4 + (a_0\lambda_2 - a_4)x^3 + (\lambda_1^2 - a_5)x^2 + (2\lambda_1\lambda_2 - a_6)x + \lambda_2{}^2 \quad \text{----(8)}$$

So, right hand side of equation (8) is of the form

$ax^6 + bx^5 + cx^4 + dx^3 + ex^2 + fx + g$ ----(9)

On comparing equation (8) with (9) one can find the values of a, b, c, d, e, f, g by using condition $af^2 = c^2g$ ----(10) also we can find λ_1 & λ_2 so, putting these values in R.H.S. of equation (8) which become a perfect square of the type $(Ax^3 + Bx^2 + Cx + D)^2$. We write $\left(x^4 + \frac{a_0x^3}{2} + \lambda_1 x + \lambda_2\right)^2 = \pm(Ax^3 + Bx^2 + Cx + D)^2$ ----(11)

After simplification, we get biquadratic equation, leave the root $x = 0$ and we can find the roots of the biquadratic equation using Ferrari's method. Then the remaining seven roots are the roots of septic equation (1).

Example:

$x^7 - 10x^6 - 34x^5 + 440x^4 + 209x^3 - 4630x^2 + 2344x + 6720 = 0$ ----(12)

By using above method, after simplification we get,

$(x^4 + \frac{1}{2}x^3 + \lambda_1 x + \lambda_2)^2 = \frac{137}{4}x^6 + (2\lambda_1 - 44)x^5 + (\lambda_1 + 2\lambda_2 - 29)x^4 + (\lambda_2 + 463)x^3 + (\lambda_1^2 - 2344)x^2 + (2\lambda_1\lambda_2 - 6720)x + \lambda_2^2$ ----(13)

Comparing this equation with (9) we get values of a, b, c, d, e, f, g & we get λ_1 & λ_2. Put all the values in equation (13) we get biquadratic equation, solving this equation by Ferrari's method we get the roots of equation (12) as -1, 3, 4, 7, 2, -5, 8. Hence reducible septic equation can be easily solved by above method.

Conclusion:

A solution of the general septic equation has been reached by converting septic equation to get octic equation by introducing $\lambda_1 x + \lambda_2$ we get biquadratic equation. This extension of method gives a understanding of algebraic techniques and broadness the scope of problem solving in polynomial equations of varying complexities.

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NEP 2020 through Student Eyes: Bridging Education with Research and Internships

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Abstract:
The National Education Policy (NEP) 2020, introduced by the Government of India, is a transformative initiative designed to align the Indian education system with the demands of the 21st century and global educational standards. This study seeks to explore the perceptions and expectations of undergraduate students in the Mumbai Suburban region regarding NEP 2020. A survey conducted with 112 students from autonomous colleges revealed that the incorporation of internships is among the most appreciated aspects of NEP 2020. This research adopts a descriptive approach, presenting a concise and focused exploration of the role of research and internships as envisioned in the policy.

Keywords: NEP 2020, Research, Internship, Under Graduate, Students and Autonomous College

Introduction

In India, only 20 universities and 500 colleges with 2.1 lakh students engaged in higher education at the time of its independence.(UGC Annual report-English 2019-20)[i], Kumari S. (2024)[ii] "Independent India, as we know that post-1947 is almost seven decades and a half old, and still struggling to find a place in World-class education! We have realized quite late that a country's education must suit its own environment and requirements."(Devi and Cheluvaraju 2020)[iii]

The National Education Policy (NEP) 2020, introduced by the Government of India, is a transformative initiative aimed at reforming the Indian education system. Designed to meet the demands of the 21st century, it emphasizes holistic, flexible, and multidisciplinary learning while fostering the unique potential of each student. Replacing the National Policy on Education of 1986, NEP 2020 represents the first significant educational reform in over three decades.

The National Education Policy (NEP) 2020, implemented in 2022, aims to achieve the following objectives (NEP 2020)iv:

- Ensuring access, equity, quality, affordability, and accountability by making education accessible at all levels
- Fostering multidisciplinary and holistic education that integrates arts, humanities, and sciences to promote creativity and critical thinking
- Emphasizing skill development and employability through early vocational education to better prepare students for the workforce
- Offering flexibility in curriculum with multiple entry and exit points in higher education
- Promoting the use of regional languages, especially in primary education, to enhance learning
- Incorporating technology to improve the access and delivery of education

1.1 Academic Research

Section 17 of the NEP 2020, titled "*Catalyzing Quality Academic Research in all Fields through a New National Research Foundation*" emphasizes the pivotal role of research in driving economic growth, societal progress, and national development. Modern civilizations have advanced through contributions to science, art, and culture, with research serving as a fundamental catalyst. In today's world, efforts are concentrated on addressing global challenges such as climate change, population growth, artificial intelligence risks, and advancements in biotechnology. However, the NEP 2020 highlights that India's research investment was only 0.69% of its GDP, in contrast to nations like the USA (2.8%), Israel (4.3%), and South Korea (4.2%).

India faces urgent needs in addressing societal challenges like water scarcity, education, and healthcare. These issues demand interdisciplinary research that is grounded in India's unique socio-cultural and environmental context. To cultivate a culture of critical thinking and innovation, transforming the research landscape is essential. This includes promoting research within universities, integrating internships into undergraduate curricula, and enhancing faculty-driven research.

The establishment of the National Research Foundation (NRF) is a significant step toward achieving this transformation. Additionally, fostering stronger links between academia, government, and industry is crucial to ensure impactful research outcomes and effective policy integration.

1.2 Internship Framework Under Nep 2020 Guidelines[v]

The internship framework is designed to integrate hands-on, practical experiences with academic learning to enhance both employability and research aptitude among undergraduate students.

The key objectives of this framework are to develop workplace skills and research capabilities by bridging classroom learning with real-world applications. To support this, various online resources for teaching and learning materials are made available to students and institutions, promoting faster and more efficient learning.

Internships are categorized into two types:

1. **Internships for Enhancing Employability** – These focus on professional skills and workplace readiness.
2. **Internships for Developing Research Aptitude** – These emphasize research methodologies, data analysis, and innovative problem-solving.

The duration of internships ranges from 60 to 120 hours after the 4th semester, or as a semester-long research project for a 4-year undergraduate program. These internships will be linked to course credits.

To ensure the smooth execution of internships, the following responsibilities are assigned:

- **Nodal Officer**: Coordinates between students, organizations, and mentors.
- **Internship Supervisor**: Oversees and evaluates the intern's progress.
- **Mentor**: Provides both research and professional guidance.
- **Higher Education Institutions**: Establish internship cells, portals, and MOUs with organizations.

Internships can be hosted by industry, government bodies, NGOs, or research institutions and Interns will be assessed based on skill acquisition, innovation, and research outcomes through reports, presentations, and viva voce examinations.

Review of Literature

1 Kumar and Pathak (2020)[vi] The research paper discusses the current state and future direction of management education in India under NEP 2020. It highlights the historical context, the growth of management institutions, and challenges like poor quality and industry-education mismatch. The authors suggest aligning management education with national goals, focusing on quality, and adopting multidisciplinary approaches. They emphasize the need for faculty development, research, student support, and industry collaboration. NEP 2020 aims to transform higher education through holistic education, quality research, and effective governance.

2 Singh, R. K. (2024)[vii] This research highlights the importance of integrating ICT into Open and Distance Learning (ODL) to overcome geographical barriers and enhance educational outcomes. The study focuses on initiatives by the National Institute of Open Schooling (NIOS), the world's largest open schooling system, and how platforms like DIKSHA, PMeVidya, SWAYAM, and web radio have revolutionized open education in India. The use of QR codes in Self-Learning Materials (SLMs) and the DEEP Library further enriches the learning experience. The research concludes that ICT has been crucial in realizing the NEP 2020 vision by promoting inclusivity, flexibility, and quality in education.

3 Gupta (2023)[viii]. The paper discusses the integration of multidisciplinary research in higher education as envisioned by NEP 2020. It highlights its importance in enhancing learning and professional competencies among students. The paper addresses concerns regarding its implementation, interventions to improve research quality, and the competencies students need. It proposes a six-step model for managing multidisciplinary research at the institutional level and stresses the importance of fostering a research culture within institutions.

4 Devi and Cheluvaraju (2020)[ix] The study examines the awareness and impact of NEP 2020 on stakeholders in commerce and management education. It highlights the need for curriculum redesign to align with global job market demands and emphasizes outcome-based education. The study also discusses the challenges and benefits of implementing NEP 2020, focusing on developing analytical skills and industry-relevant competencies among students.

5 Tiwari, A. (2022)[x] has discussed the importance of research in teacher education and the development of a National Curriculum Framework (NEP 2020). It also emphasizes the need for multidisciplinary inputs and aims to enhance research quality through financial support.

6 Kaur H. (2024)[xi] has highlighted in the research that NEP 2020 emphasizes skill enhancement through vocational education to bridge the gap between traditional education and the modern workforce. According to this study the policy aims to integrate vocational education into mainstream education, making it a core component of the system which will provide students with practical, hands-on learning aligned with current workforce needs.

Objectives of the Study

- To study the perception of students with respect to NEP 2020
- To discuss the provision of section 17 of NEP 2020 that deals with research and innovation
- To get an insight on internship under NEP 2020 guidelines

Research Methodology

This descriptive study gathered undergraduate students' opinions on NEP 2020 from autonomous colleges in the Western Suburban region of Mumbai. Data was collected using a questionnaire distributed via Google Forms to 200 randomly selected students across three colleges. A total of 120 responses were received, and after removing duplicates and outliers, 112 valid responses were considered for analysis. Excel was used to analyze the data.

4.1 **Limitations of the Research**

- The study is limited to the Western Suburban region of Mumbai.
- Data was collected from three autonomous colleges.
- The target participants were undergraduate students.

Data Analysis

The sample consisted of 58% female and 42% male students, with 33% from the first year, 39% from the second year, and 28% from the third year. As shown in Table 1, 55 out of 65 female students were aware of the NEP guidelines, while 37 out of 47 male students were aware. The awareness of NEP among females (85%) was higher than that among males (79%). Overall, 13% of respondents were not aware of the NEP 2020 guidelines.

Table 1. Are you aware of NEP 2020 guidelines

Gender	Maybe	No	Yes	Grand Total
Female	3	7	55 (85%)	**65**
Male	2	8	37 (79%)	**47**
Grand Total	**5**	**15 (**13%)	**92**	**112**

Table 2 shows students' awareness of NEP 2020 based on their current class. The sample included 33% first-year, 39% second-year, and 28% third-year students. Awareness was lowest among third-year students at 81%, while it was 89% among second-year students and 90% among first-year students. Since NEP 2020 applied to first and second-year students, the lower awareness among third-year students can be attributed to the policy's limited relevance to them.

Table 2. Count in numbers of awareness of NEP 2020 guidelines?

Class	Maybe	No	Yes	Grand Total
FY	1	4(11%)	32	**37**
SY	3	5(11%)	36	**44**
TY	1	6(19%)	24	**31**
Grand Total	**5**	**15(13%)**	**92**	**112**

Table 3 presents the respondents' opinions on NEP 2020, showing that 59% consider it to be good, 12% find it complicated, 6% view it as not good, and 10% feel it is difficult to understand(can’t say).

Table 3. Count and percentage of opinion regarding NEP

Opinion	Count	Percentage
Not Good	7	6.25
Can't Say	11	9.82
Complicated	13	11.61
Good	66	58.93
NA (Not aware)	15	13.39
Grand Total	**112**	**100**

Table 4 presents the gender-wise opinions on NEP 2020. Among females, 65% considered the policy good, 6% felt it was not good, 11% could not comment, and 8% found it complicated. Among males, 51% viewed the policy as good, 6% felt it was not good, 9% couldn’t comment, and 17% considered it complicated.

Table 4. Gender wise opinion about NEP

Gender	Not good	Can't Say	Complicated	Good	Not aware	Grand Total
Female Count	4	7	5	42	7	**65**
Percentage	6.15	10.77	7.69	64.62	10.77	**100.00**
Male Count	3	4	8	24	8	**47**
Percentage	6.38	8.51	17.02	51.06	17.02	**100.00**
Grand Total						**112**

Table 5 presents class-wise opinions on NEP 2020. Among first-year students, 51% considered the policy good, 14% found it complicated, 16% felt it was not good, and 8% had no opinion. For second-year students, 63% viewed it as good, 2% as bad, 14% as complicated, and 9% couldn't comment. Among third-year students, 61% considered it good, 13% couldn't comment, and 6% found it complicated.

Table 5. Class wise opinion about NEP 2020

Class	Not good	Can't Say	Complicated	Good	Not aware	Grand Total
FY Count	6	3	5	19	4	**37**
Percentage	16.22	8.11	13.51	51.35	10.81	**100**
SY Count	1	4	6	28	5	**44**
Percentage	2.27	9.09	13.64	63.64	11.36	**100**
TY Count	0	4	2	19	6	**31**
Percentage	0	12.90	6.45	61.29	19.35	**100**
Total						**112**

According to Figure 1, the respondents identified internships as the best part of NEP 2020 (34%), followed by skill enhancement (22%).

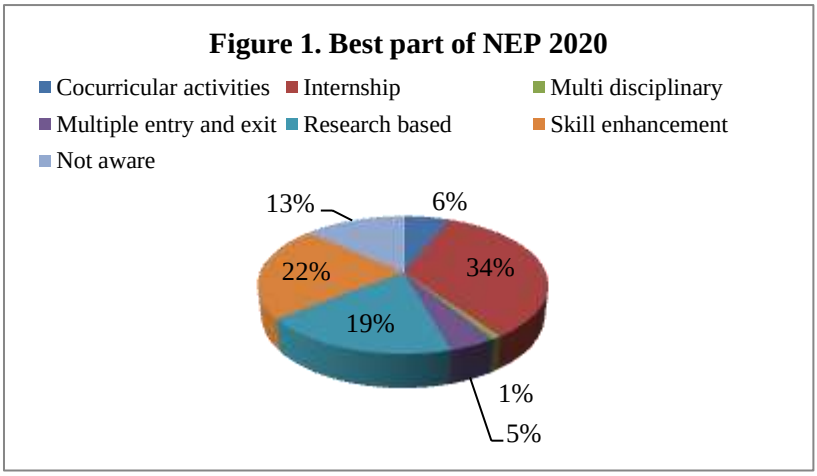
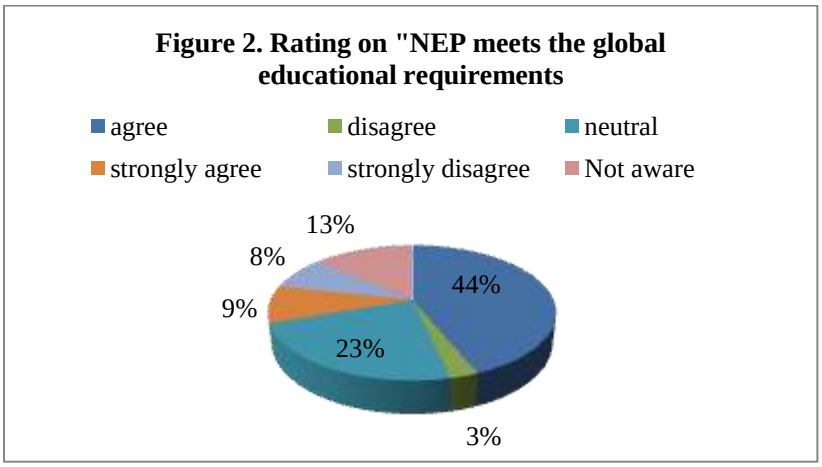


Figure 2 shows respondents' perceptions of NEP 2020's ability to meet global standards. It is observed that 44% agree the policy meets global requirements, while 23% remain neutral.



Findings

- Awareness of NEP 2020 was higher among females, with 85% being aware, indicating a greater level of engagement among female students compared to their male counterparts.
- First-year and second-year students showed greater awareness, at 90% and 89%, respectively, highlighting that students in earlier years are more informed about the policy's provisions and its implications.
- Among all classes, the majority of second-year students (64%) felt that NEP 2020 is good, suggesting that students in this cohort are more optimistic about the policy compared to other year groups.

- Gender-wise, 65% of female students considered NEP 2020 good, compared to 51% of male students, reflecting a stronger positive perception among female students.
- The majority of respondents viewed internships (34%) and skill enhancement (24%) as the best parts of NEP 2020, emphasizing the importance of practical learning and vocational development in the modern educational framework.
- 44% of respondents believe that NEP 2020 meets global educational standards, suggesting that many students feel the policy is aligned with international educational trends and prepares them for a global workforce.
- Despite the overall positive outlook, 13% of the respondents were not aware of the NEP guidelines, indicating a need for greater awareness campaigns to ensure all students are informed.
- The implementation of NEP 2020 has shown varied responses across different academic years, with third-year students showing lower levels of awareness and engagement compared to first and second-year students, possibly due to the policy's direct relevance to the earlier stages of education.

Suggestions and Conclusions

There is a need for Enhance Awareness Campaigns, given that 13% of respondents were unaware of NEP 2020, it is important to increase efforts in raising awareness across all student groups.

Gender-Specific Outreach Programs. since female students exhibited higher awareness and more positive perceptions of NEP 2020, institutions could design gender-inclusive programs that encourage male students to engage more with the policy. This could include discussions, focus groups, and mentorship programs.

Strengthen Internship and Skill Development Programs, as internships (34%) and skill enhancement (24%) were identified as the most appreciated aspects of NEP 2020, colleges and universities should prioritize expanding these opportunities. Establishing more industry partnerships and offering a variety of skill-building workshops or certifications can help students gain practical experience that aligns with workforce requirements.

Foster Global Standards Awareness, since 44% of respondents feel that NEP 2020 meets global educational standards, institutions can emphasize this by providing examples of how the policy is aligning Indian education with international trends. This can include showcasing collaborations with global institutions or highlighting the global job market demands that NEP 2020 aims to address.

By focusing on these suggestions, educational institutions can increase the effectiveness of NEP 2020 and better prepare students for the evolving demands of the global workforce.

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A Pilot Study- Assessment of Physical Health Indicators of Adolescent Girls (18-19 yrs) In Bharathidasan Government College for Women in Puducherry

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Abstract

Adolescent girls are important population because they are future generation makers. The good health of adolescent girl assures the good health of tomorrow citizens. However the young girl's faces unique physical health challenges due to improper diet, poor health education, lack of self awareness, fall on social media fantasies and body image concerns. So this study aimed to assess the physical health status of adolescent girls (18-19yrs) in Bharathidasan Government College for Women, Puducherry. A cross – sectional study was conducted among randomly selected 200 adolescent girls. The physical health status was assessed by using questionnaire, Anthropometric measurements and Haemoglobin test. Based on the responses of the samples the study revealed the half of the adolescent girls are malnourished, anaemic and having poor sleeping habits. According to the study 26.5 percents girls were underweight and 9 percent were overweight. About 28 percent girls are having irregular periods and 16 percent are suffering in menorrhagia (heavy menstrual bleeding). Only 4 percent girls were non anaemic and other falls on anaemic in other classification. 38 percent girls are sleeps less than 6 hours at night. The study conclude that health status of young girls is a pressing concern that need prompt attention to improve their healthy lifestyle by good nutrition and physical activity, providing health education and supporting healthy habits.

Keywords: adolescent girls, physical health, BMI, anemia, Puducherry.

Introduction:

Adolescence is a crucial stage of life noted by important physical, emotional and social changes. For young girls, this duration is particularly susceptible as they direct to pubertal development, social connections and coming into view of independence. During this vulnerable stage, girls are creating habits, attitudes and beliefs that can influence their health and well-being throughout their lifetime.

Young girls' physical health indicators are important measures of their overall health and wellness. The nutritional status includes health eating habits; adequate calorie intake and proper nutrition are needed for their growth and development. A healthy BMI range varies by age and gender, but commonly falls between 18.5 to 24.9. Regular pain-free menstruation is denotes a good sign of reproductive health. Being physically active promotes overall health and development. Sleep for 6 to 9 hours/night is good for physical and mental wellbeing. A standard dental checkup ensures healthy teeth and gums.

Early detection and support for mental health concerns such as stress, fear, eating disorders and sleeping disorders are important. It's significantly to note that these health indicators may different from one culture, socioeconomic and environmental factors to another. Pointing out these measures through detailed health education, opportunities to use health care services and support system can helps to increase the wholeness of adolescent girls' physical health.

Objectives:

- To monitor the growth and development of adolescent girls through BMI.
- To check the hemoglobin level of adolescent girls.
- To examine the menstrual health of adolescent girls.
- To evaluate the sleeping time of adolescent girls.

Methods and Materials:

To assess the physical health indicators, a total of 200 adolescent girls were randomly selected to be part in the study from Bharathidasan Government Women College, Puducherry. From the selected girls, the information was gathered with help of a questionnaire. In the questionnaire, the menstrual details and sleeping times were mentioned and responses were marked. Assessment of hemoglobin levels was assessed by hemoglobin meter. For weight assessment, the weighing apparatus starting from 0kg was used and for height measurement, the

standard height scale was used and the BMI was calculated by using weight and height measurement and noted.

1. Analysis and Interpretation of Data.

The collected data was compiled and analyzed. To have an overview of the study Percentages is used.

Result and Discussion:

1. Body Mass Index: From the following table it can be cleared that out of 200 adolescent girls who have been assessed for their BMI with the help of Height and weight, 26.5 percent were underweight, 65.5 percent were normal, 8 were overweight and none of them were obesity.

Table: 1.1 BMI of Adolescent girls

BMI Classification	Number	Percent
Underweight	53	26.5
Normal	131	65.5
Over weight	16	8
Obesity	0	0
Total	200	100

2. Hemoglobin Status of Adolescent Girls:

About 79.5 percent of girls were moderately anemic, 11.5 percent were mildly anemic and 5 percent were severely anemic and 4 percent were non-anemic, which can be seen from the hemoglobin levels of the girls

Table: 1.2 Hemoglobin Status of Adolescent Girls

Hemoglobin Status	Number	Percent
Mild Anemic	23	11.5
Moderate Anemic	159	79.5
Severe Anemic	10	5
Non-Anemic	8	4
Total	200	100

3. Regularity of Menstruation and Pattern of Menstrual Bleeding: The menstruation leads a vital role in adolescent physical and mental illness. About 82 percent girls were having their periods regularly and 28 percent were having irregular menstrual cycle. The menstrual bleeding pattern of adolescent girls were assessed and the responses shows about 28 percent had light bleeding, 56 percent had medium bleeding, and 16 percent had heavy bleeding, indicating the possibility of Menorrhagia.

Table: 1.3. Regularity of Menstruation

Regularity of Menstruation	Number	Percent
Regular	164	82
Irregular	36	28
Total	200	100

Table: 1.4 Pattern of Menstrual bleeding of adolescent girls

Pattern of Menstrual Bleeding	Number	Percent
Light	56	28
Medium	112	56
Heavy	32	16
Total	200	100

4: Sleeping Hours of Adolescent Girls:

According to WHO, the sleeping hours were classified. From the below table it shows about the 38 percent girls were sleeping less than 6 hours and only 8 percent were sleeps more than 9 hours per night. And half of the percent of girls were sleeps good at night.

Table: 1.5 Sleeping Hours of Adolescent Girls:

Sleeping Hours	Number	Percent
6 - 9 hours	108	54
less than 6 hours	76	38
more than 9 hours	16	8
Total	200	100

Conclusion:

From the study it was noted that half of the selected samples were good at in terms of BMI,

Menstrual health and sleeping hours and most of the girls were moderately anemic and only few girls are non anemic. Since half percentage girls were malnourished, so this condition can have far reaching consequences. Moreover, the physical unhealthy status can also impact the adolescent girl's educational prospect, therefore it is needed to address the root causes and find the effective intervention to overcome the physical health challenges faced by adolescent girls. By prioritizing the health and wellness of young girls, we can ensure their good future for themselves and also for their communities.

Related Articles

- S N Patil V Wansik R Wadke Health problems amongst adolescent girls in rural areas of ratnagiri District of Maharashtra IndiaJ Clin Diagn Res20093178090
- D Shanbhag R Shilpa N D' Souza P Josephine J Singh Perception regarding menstrual cycles among high school going adolescent girls in resource limited settings around Bangalore cityInt J Collaborative Res Intern Med Public Health2014415362
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Paradigm Shift in Library Management: Integrating Artificial Intelligence for the Future

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Abstract:
This paper explores the transformative effect of Artificial Intelligence (AI) on library control, emphasizing its capacity to redefine how libraries characteristic and serve users. The have a look at delves into diverse AI packages that beautify library services, consisting of chatbots for real-time person assistance, advice structures for personalized aid suggestions, automatic metadata era for green cataloging, and predictive analytics for optimizing aid making plans and person engagement. The paper additionally highlights the vital position of AI literacy amongst library experts, stressing the want for schooling and talent-constructing to make certain the powerful adoption and control of those superior technology. While AI gives considerable advantages, consisting of operational performance and progressed person experiences, the paper addresses demanding situations, which includes the excessive charges of implementation, restrained technical expertise, and moral worries like statistics privatives and algorithmic bias. Through a complete method combining literature review, case studies, and qualitative analysis, the studies identifies techniques for overcoming those demanding situations, consisting of fostering collaboration, growing moral guidelines, and making an investment in expert development. Ultimately, the have a look at envisions a destiny wherein AI-powered libraries act as dynamic, inclusive hubs for understanding and innovation, making sure equitable get entry to sources and sustainability in library control.

Keywords: Artificial Intelligence, Library Management, AI Integration, Library Automation, Personalized Library Services, AI Literacy

Introduction:
The advent of AI has revolutionized the way libraries operate, manage resources, and interact with users. Traditionally, libraries relied on manual systems such as card catalogs and the Dewey Decimal Classification System to organize and retrieve information (Buckland, 1992). However, with the rapid advancement of digital technology, libraries are increasingly adopting automated systems and digital archives to improve accessibility and efficiency (Baker & Wilkins, 2018). The advent of AI technology has further revolutionized library management, enabling the use of innovative tools such as chatbots for real-time user support, automated metadata generation for efficient cataloging, personalized recommendation systems, and predictive analytics for optimized resource management (Teece, 2020). Despite the benefits, there are also challenges in adopting AI in libraries, including financial constraints, technical limitations, and ethical concerns related to data privacy and algorithmic bias (Johnson & Larkin, 2019). Additionally, as AI continues to reshape library operations, mastery of AI has become an essential skill for library professionals who must adapt to these technologies to ensure effective integration into library systems (Thompson, 2021). This article explores the role of AI in transforming library operations, examines the AI tools currently in use, and addresses the challenges and opportunities associated with AI adoption. It also highlights the growing importance of AI knowledge for library professionals and offers recommendations for libraries to help them move toward a more AI-driven future.

SCOPE:
This study explores the transformative impact of **Artificial Intelligence (AI)** on library management, focusing on its applications, challenges, benefits, and future trends. Key areas include automating routine tasks, enhancing user engagement, and optimizing resource allocation. It addresses challenges such as financial constraints, AI literacy gaps, and ethical concerns like data privacy and bias.

The study emphasizes the importance of AI literacy for library professionals and projects future advancements, such as AI-driven virtual libraries, smart library designs, and fully automated systems. By examining these aspects, the research provides insights for librarians, researchers, and policy-makers to embrace AI ethically and effectively, ensuring libraries remain innovative and user-focused.

Objectives:

The research objectives describe the specific goals that the study aims to achieve. These objectives guide the research and help ensure that the study addresses key aspects of integrating AI into library management. The main objectives of the study are as follows:

- Analyze the role of AI in library management
- Examine the impact of AI-based tools on library operations
- Explore the challenges and barriers to integrating AI into libraries
- Study the importance of mastering AI for library professionals
- Assess the benefits and risks of adopting AI in libraries

Literature Review

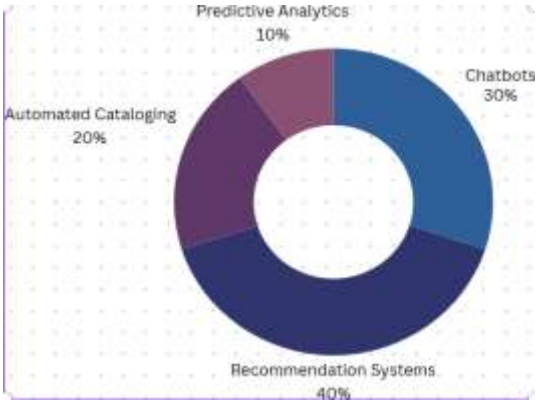
The Literature Review section of the research paper on "Paradigm Shift in Library Management: Integrating Artificial Intelligence for the Future" reviews previous studies and articles on integrating artificial intelligence (AI) into library systems. This section serves to provide a basis for understanding the current state of knowledge on AI in libraries and highlights the gaps that this research seeks to fill.

AI in Libraries: Key Application Areas

Several studies have explored the different ways in which AI is transforming library operations. AI technology is increasingly being used to automate and improve several important areas in libraries, including:

- Cataloging and metadata generation: AI can automate the process of cataloging library resources, tagging books, articles, and digital content with relevant metadata. This makes library cataloging systems more efficient, reduces human error, and improves resource management. Tools such as machine learning (ML) algorithms are now used to automatically classify content, significantly reducing the workload of library staff (Blazek et al., 2018).
- Personalized recommendations: Libraries have started using AI-based recommendation systems to personalize content delivery to users. By analyzing users' behavior, interests, and reading habits, AI can recommend books, articles, or other resources, thereby improving the user experience (Zhang & Chen, 2020).
- Chatbots for user services: AI-driven chatbots are used in libraries to provide 24/7 support to users, answer common questions, assist with navigation, and make recommendations for research papers. This improves user engagement and reduces the need for constant human interaction (Luo et al., 2020).
- Predictive analytics for collection development: AI-based predictive models help libraries predict future needs by analyzing borrowing trends and user requests. This helps libraries make more informed decisions about what materials to collect and maintain (Sussman and Schmidt, 2022).

The pie chart shows the distribution of AI tool usage across library functions. For example: Chatbots: 30% Recommender systems: 40% Automated cataloging: 20% Predictive analytics: 10%



Pie chart: 1-AI in Libraries: Key Application Areas

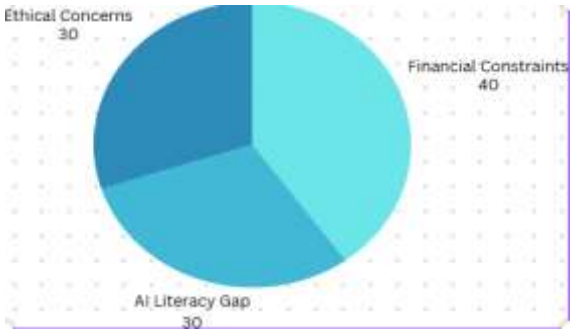
Challenges in AI Integration in Libraries

While AI offers significant potential to improve library operations, the literature also identifies a number of challenges that hinder its integration:

- Financial constraints 40%: Financial constraints are one of the biggest barriers to AI adoption in libraries. Smaller libraries with limited budgets may have difficulty allocating the necessary funds for AI implementation, including purchasing AI tools, upgrading infrastructure, and maintaining systems over time (Blazek et al., 2018)
- AI knowledge gap 30%: Lack of adequate training and knowledge of AI among library professionals is another major challenge. Many library staff may lack the technical knowledge required to effectively use AI systems, which impacts the successful implementation of these technologies in libraries (Luo et al., 2020).

- Ethical concerns 30%: Ethical concerns surrounding the use of AI in libraries, such as data privacy, algorithmic bias, and transparency, is another significant challenge. Libraries should be cautious when integrating AI tools to ensure they do not inadvertently violate user privacy or perpetuate bias (Sussman & Schmidt, 2022).

This pie chart provides a clear and concise picture of the major barriers to integrating AI into libraries. By illustrating the relative importance of each challenge, it helps readers understand the priorities and areas to focus on for successful AI adoption.



Pie chart: 2- Challenges in AI Integration in Libraries

Benefits of AI Integration in Libraries

To visually represent the benefits of AI integration in libraries, we can use a pie chart. This chart will highlight the relative importance of the three primary benefits based on the literature reviewed.

- Increased efficiency (40%)

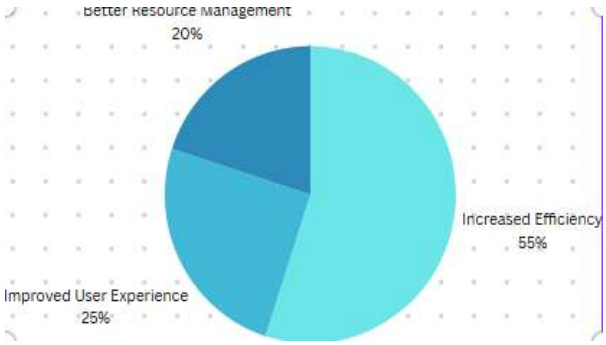
Explanation: The largest portion of the pie chart represents the increased efficiency that AI brings to library operations. Automating repetitive tasks, such as cataloging and sorting, allows library staff to focus on higher value-added tasks. This results in faster and more accurate library management. As suggested by Blazek et al. (2018), AI systems reduce human error, increase productivity, and save time, making them the most important benefits of AI adoption in libraries.

- Improved user experience (35%)

Explanation: The second largest segment focuses on enhanced user experience supported by AI tools such as personalized recommendations and chatbots. These technologies improve library services by making them more interactive and tailored to the individual needs of users. As Zhang and Chen (2020) note, AI-based systems improve accessibility and engagement by providing real-time support and personalized content, making this benefit an important area of AI integration.

- Better Resource Management (25%)

Explanation: The third segment represents better resource management, enhanced by AI through data-driven decision making. AI tools analyze resource usage patterns to predict future demand, helping libraries make informed decisions about resource allocation and maintenance. As Sussman and Schmidt (2022) point out, AI can improve resource management efficiency, ensuring that libraries allocate their budgets and space efficiently.



Pie chart:3-Benefits of AI Integration in Libraries

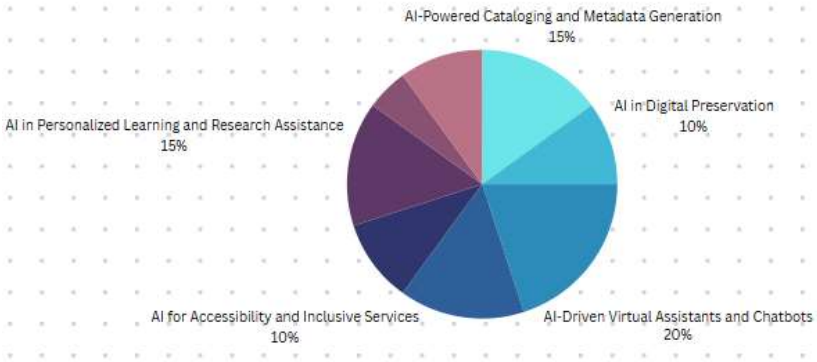
This pie chart visually presents the distribution of benefits that AI brings to libraries, with increased efficiency being the most significant advantage, followed by improved user experience and better resource management. These findings emphasize the positive impact AI can have on both the operational side of libraries and the user experience. Integrating AI can ultimately lead to a more streamlined, efficient, and user-friendly library environment.

Future Trends in AI in Libraries

1. AI-powered cataloging and metadata (15%): AI tools will automate the process of cataloging library resources and generating metadata. This

will not only save time but also improve the accuracy of library catalogs. AI will classify resources based on their content, facilitating better resource discovery. This trend is an important part of the future of library management systems (Luo et al., 2020).

2. AI in digital preservation (10%): AI will help preserve digital content by identifying at-risk materials and automating the process of converting from outdated to newer formats. As libraries store increasing amounts of digital content, AI will become essential to ensure long-term preservation (Rieger, 2019).
3. AI-powered virtual assistants and chatbots (20%): AI-powered virtual assistants and chatbots are expected to transform the user experience in libraries. These tools will assist with tasks such as answering questions, providing reading recommendations, and guiding users to resources. AI chatbots will make libraries more accessible and responsive, improving user engagement and interaction (Zhang & Chen, 2020).
4. AI in library analytics and data-driven decision making (15%): AI will help libraries make more informed decisions by analyzing usage data, predicting trends, and recommending resource allocation. This will improve the management of collections, library programs, and other operational aspects, making libraries more efficient (Blazek et al., 2018).
5. AI for accessibility and inclusive services (10%): AI technology will significantly improve accessibility for users with disabilities, providing a more personalized experience. AI tools such as speech-to-text, language translation, and visual descriptions will make libraries more inclusive, improving accessibility for all users (Sussman & Schmidt, 2022).
6. AI in personalized learning and research support (15%): Libraries will use AI to provide personalized learning and research support, providing relevant resources, research recommendations, and learning support based on individual user profiles. AI will help users navigate complex search tasks by suggesting the most relevant documents (Zhang & Chen, 2020).
7. AI-driven security systems (5%): AI will enhance security in libraries by using technologies such as facial recognition and advanced cyber security measures to protect physical and digital resources. AI-driven security systems will monitor access to library facilities and protect user data (Rieger, 2019).
8. AI for Collaboration and Networking in Research Communities (10%): AI will help researchers connect and collaborate more efficiently. AI tools will analyze academic trends, identify potential collaborators, and suggest interdisciplinary research topics. This will foster greater cooperation among libraries, research institutions, and researchers (Sussman & Schmidt, 2022).



Pie **chart: 4 -Future Trends in AI in Libraries**

Recommendations for Libraries:

1. Investment in AI Training: Libraries should invest in ongoing AI literacy training programs for their staff. These programs should cover both the technical aspects of AI and its ethical implications, ensuring that professionals are fully equipped to manage and apply AI technologies in library systems.
2. Ethical AI Implementation: Libraries must adopt ethical guidelines for the implementation of AI tools. This includes ensuring data privacy, algorithmic fairness, and transparency in all AI-driven processes. AI tools should be regularly assessed to ensure they align with the library's ethical standards and user needs.
3. Collaboration with AI Experts: To stay abreast of AI advancements, libraries should collaborate with AI experts and research institutions. This will facilitate the integration of cutting-edge technologies and best practices into library services while promoting continuous learning for library professionals.

4. Long-Term Financial Planning: Libraries must develop a financial strategy for the gradual integration of AI. This includes budgeting for AI infrastructure, training, and ongoing maintenance costs, particularly for smaller libraries with limited budgets.

Conclusion:

AI represents a promising and transformative force in library management, with the potential to improve operations and user experiences. However, successful integration requires AI proficiency among library professionals, as well as a commitment to ethical practices and strategic investments. By prioritizing AI mastery, ensuring ethical use of AI, and planning for long-term implementation, libraries can fully exploit the potential of AI to meet evolving user needs and remain at the forefront of technological innovation in the information age.

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Perspectives of Teachers towards Quick Response (QR) Code Based Mind Mapping Learning Program for Higher Primary Level Students

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Abstract:
This study explores the perspectives of teachers towards Quick Response (QR) code-based mind mapping learning programs for higher primary level students. Survey method was adopted and the data were analyzed by using inferential statistics. The findings reveal teachers' attitudes, perceived benefits, and challenges associated with integrating QR code-based mind mapping learning programs into their teaching practices. The results provide valuable insights for educators, policymakers, and researchers seeking to enhance teaching and learning experiences in higher primary level education.

Keywords: QR Code, Mind Maps, Higher Primary Level Students

Introduction:

Teaching is considered a noble profession because teachers do more than just transmit subject knowledge. They help children discover their inner strengths and potential, nurturing them into responsible individuals. Teachers are the pillars of our society, playing a vital role in bringing out the best in children. By molding and shaping young minds, they cultivate extraordinary personalities.

As we know that there are various subjects are taught in schools. Each subject has its own importance and hence the school appoints a well-qualified subject teacher for teaching. But just having knowledge of the subject is not enough .the teachers should be able to apply appropriate pedagogical knowledge and skill while teaching, according to the need of the students. The repetition of the same method of teaching ultimately creates boredom among the student and gradually the student starts to lose interest in the subject. This mostly happens when the students learns the history subject. You must have often heard students saying that they find maths difficult, but history is the most boring subject. This is because of lack of creative teaching method. The graphical presentation of Mind Map integrated with QR codes of history subject can be proved an engaging and fun learning method. Unlike traditional teaching methods, mind maps present content visually, rather than in lines and rows. Visualization involves a sequence of graphic elements, including: Colors, Symbols, Pictures, Spatial arrangements of branches. Mind Map motivates the students to express themselves by their own. Mind maps provide an opportunity for students to enhance their thinking skills by creating their own maps.

Mind Map:

The concept of Mind Mapping was popularized by Tony Buzan, a British author on psychology. According to Buzan, traditional note-taking methods force readers to scan content linearly, from left to right and top to bottom. However, our brains process information non-linearly, making Mind Mapping a more effective approach.The science behind Mind Mapping is rooted in the concept of the left and right hemispheres of the brain. The brain's twin halves are connected by the corpus callosum, a complex network of nerve fibers. Each hemisphere dominates different mental activities, with the left hemisphere controlling speech, writing, language, and logic, and the right hemisphere controlling spatial relationships, creativity, imagination, and context.When both hemispheres work together, individuals can achieve optimal cognitive function. By stimulating both sides simultaneously, people can enhance their thinking, memory, and recall abilities. Mind Mapping, which is based on imagination and association, engages both hemispheres, fostering whole-brain learning.In educational settings, Mind Maps play a pivotal role in promoting effective thinking and learning among students. By leveraging the power of whole-brain learning, Mind Maps empower students to become proficient thinkers and learners, unlocking their full potential.

QR Code:

A QR Code is a two-dimensional barcode consisting of small black squares on a white background, storing encoded information. This information can be easily accessed using a smartphone equipped with a QR Code reader app. Recently, the Maharashtra State Board has integrated QR Codes into their textbooks, linking

them to the Diksha portal. By scanning these QR Codes, students can access videos on specific topics, created by teachers from across India. One significant advantage of QR Codes is that they eliminate errors caused by manual typing of website addresses. Since QR Codes are scanned rather than typed, there's no risk of spelling mistakes, saving valuable time and ensuring seamless access to online resources.

Review of Related Literatures:

Key points emerging from the literature review and theoretical overview have been noted down by researcher. **Rajapriya .M. & Kumar .N (2017)**conducted study on" Effectiveness of Mind Mapping in Higher Education" The study concluded that Mind Maps are effective for studying written material and can promote deeper processing, leading to improved memory formation. **Rafidah Abd Karim(2018)** conducted researched and presented paper on "Technology-Assisted Mind Mapping Technique in Writing Classrooms: An Innovative Approach" The findings of the study suggest that mind mapping is a highly beneficial tool for both educators and students, particularly in the context of writing. **Kanelechi C.K (2018)** published research paper on "Mapping As An Independent Learning Strategy For Students' Academic Performance" This study concluded that the mind mapping approach improved students learning outcome and the teaching method is not gender-biased. **Samar Al Shdaifat (2019)** excuted research on "The Impact of an E-mind Mapping Strategy on Improving Basic Stage Students' English Vocabulary" The findings of the study reported statistically significant results in the mean scores of the E-mind mapping group compared to the control group. **Dwi Atmono(2020)** conducted study and published paper on "The Impact of Electronic Mind Map as Part of Learning" The findings of the research indicate that the use of electronic mind maps positively impacts student achievement, aligns with instructional media use, enhances understanding, and is consistent with constructivist learning theories.

Research Questions:

The following research questions provide the framework for this investigation.

Research Questions

1. What are teachers' attitudes towards the integration of QR code-based mind mapping learning programs in their teaching practices?

2. How do teachers perceive the effectiveness of QR code-based mind mapping learning programs in enhancing student learning outcomes?

3. What challenges, if any, do teachers anticipate in implementing QR code-based mind mapping learning programs for higher primary level students?

Objectives of the Research Study:

The study was conducted to achieve the following objectives.

i. To know the Attitude of Male teachers towards Quick Response Code Based Mind Mapping Learning Program for the students of Higher Primary Level in History subject.

ii. To know the Attitude of Female teachers towards Quick Response Code Based Mind Mapping Learning Program for the students of Higher Primary Level in History subject.

iii. To compare the Attitude of male and female teachers with reference to Quick Response Code Based Mind Mapping Learning Program for the students of Higher Primary level in History subject

Hypothesis:

The Null Hypotheses of the present study were as follow:

$H0_1$: There is no significant mean difference between the attitude of male and female teachers towards the effectiveness of Quick Response Code based Mind mapping Learning Program of History subject on the academic performance of students at Higher Primary level

Scope and limitation of the Study:

The present research study was confined to higher Primary school level students and teachers affiliated with Maharashtra State Board only. The present research study was geographically limited to Amravati District only. The present research was restricted to English Medium Schools only**.**

Methodology of the Study:

"A survey method was used for this study. In this study, 250 male teachers and 250 female teachers were selected purposefully from Higher Primary schools affiliated with the English medium Maharashtra State Board in Amravati district. This study employed techniques such as participant observation, conversational analysis, descriptive analysis, and interpretative analysis. A separate attitude scale was constructed to measure the perspectives of teachers towards the QR Code-Based Mind Mapping Learning Program."

Analysis and Interpretation of Data:

For the analysis of data, the investigator has used the test of significance of the differences between mean and percentage analysis.

Table No.01: Perspective of teachers towards QR Code Based Mind Map

Factors of QR Code Based Mind Mapping Learning Program	Sample	N	Mean	Standard Deviation	t value	Significant
Awareness about QR Codes	Male teachers	250	**16.036**	**7.2719**	**1.74**	NS
	Female teachers	250	**14.936**	**6.7920**		
Awareness about Mind Maps	Male teachers	250	**11.71**	5.836	**1.42**	NS
	Female teachers	250	**12.49**	6.392		
Importance and use of Mind Maps in teaching-learning process	Male teachers	250	**42.65**	11.18	**2.1**	S*
	Female teachers	250	**44.79**	11.72		

Note : S* = Significant at 0.05 level ; S** = Significant at 0.01 level ; NS = Not Significant

The table 01 reveals that there is no significant mean difference between the attitude of male teachers and female teachers towards the factor "Awareness of QR Code" and "Awareness about Mind Maps" at both 0.01 level and 0.05 level. Hence the null hypothesis is rejected for two dimension of QR Code Based Mind Mapping Learning Program viz. **"Awareness of QR Code" and "Awareness about Mind Maps"**. Whereas there is a significant mean difference between the attitude of male and female teacher towards the factor **"Importance and use of Mind Map in teaching-learning process** at 0.05 level only .Hence the null hypothesis is accepted for one dimension of QR Code Based Mind Mapping Learning Program.

Findings:

On the basis of analysis and interpretation of the field data; the investigators has drawn the following findings:

1. There is no significant mean difference between the attitude of male and female teachers towards the dimension of QR Code Base MMLP like Awareness about QR Code and Awareness about Mind Maps. Whereas there is significant difference between the attitude of male and female teachers towards one of the dimension of QR Code Based MMLP like Importance and use of Mind Map in teaching-learning process.

2. The findings reveal that, 68.0% of female teachers were completely unaware of the Diksha App, compared to 55.6% of male teachers.

3. The findings reveal that, only 20.8% of male teachers and 13.6% of female teachers are aware about mind map apps. This suggests a need for targeted teachers training programs to integrate mind mapping apps into their teaching practices.

5. The findings reveal that, 90.8% of female teachers and 85.2% of male teachers believe that mind maps enhance brainstorming by stimulating bilateral brain activity in students.

6. The findings reveal that, 63.6 % of male teachers and 54.4% of female teachers endorsed that mind map saves a lot of time and helps the teachers to summarize the vast content in short concrete form.

7. The findings reveal that, 72.4% of female teachers and 71.6 % of male teachers agreed that Mind map reduce the habit of rote memorization and boost the confidence among the students to perform well in exams.

8. The findings indicate that, 69.6 % of female teachers agreed that Mind map develops the critical thinking and note taking ability among the students., compare to 56.9 % of male teachers. Conversely, 30.4% of female teachers and 25.6 % of male teachers reported disagreement

Conclusion:

The study reveals that monotonous teaching methods leads to students disinterest and poor performance in history while videos embedded in QR Codes engage students, but they don't aid in writing answers due to memorization requirement. Overloaded information videos are not always aligned with learning goals. On the basis of above findings and opinions of teachers, Mind Mapping is consider as an innovative technique for teaching history. It effectively covers vast syllabi, fosters student engagement, visual learning, and critical thinking. Mind Mapping enhances answer-writing skills, note-taking, and creates an interactive learning environment, making it the preferred method for teaching history. The Education Ministry should introduce this innovative "QR Code-Based Mind Mapping" teaching technique to history subject teachers and should encourage to implement it. The Education Ministry should incorporate QR Code-Based Mind Mapping in Maharashtra State Board Textbook.

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Legal Approaches to Managing Water Resources in the Era of Global Warming in India

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Abstract:
The growing impacts of global warming have led to increasing water scarcity and the degradation of water resources globally, with India being one of the most vulnerable nations. This study explores the legal approaches employed to manage water resources in India in light of global warming. The study examines existing environmental laws and policies, their effectiveness in addressing the challenges posed by climate change on water resources, and highlights the need for stronger legal measures. By analyzing both domestic and international legal frameworks, this study aims to provide insights into how legal tools can be leveraged to ensure sustainable water management in India amidst the rising temperatures and erratic rainfall patterns. The findings suggest that while there are several legal provisions, there is a need for a more cohesive and adaptive legal framework to protect India's water resources in the face of global warming.

Keywords: Global Warming, Water Resources, Legal Approaches, Climate Change, Water Scarcity, India, Environmental Law, Sustainable Water Management, Legal Frameworks, Water Governance.

Introduction:

Water is a critical resource for human survival, economic development, and ecosystem health. However, in the era of global warming, the availability of water resources is rapidly diminishing due to changing rainfall patterns, increasing evaporation rates, and rising temperatures. India, with its vast population and dependence on agriculture, is highly vulnerable to water stress. Legal frameworks have been created over time to govern the use and protection of water resources, yet these laws face challenges when dealing with the accelerating effects of climate change. This study delves into the legal approaches to managing water resources in India amidst the rising global temperatures, evaluating existing policies, legal reforms, and the effectiveness of regulatory institutions. Water is one of the most essential resources for the survival of all life forms on Earth. It is crucial for a range of human activities, including drinking, agriculture, sanitation, industry, and maintaining ecosystems. However, in recent decades, the availability and quality of water have been severely impacted by various global challenges, the most prominent being global warming. Global warming refers to the long-term rise in Earth's average surface temperature due to the accumulation of greenhouse gases in the atmosphere, resulting from human activities such as burning fossil fuels, deforestation, and industrial processes. The consequences of global warming are widespread, and its effects on water resources are particularly significant, with countries like India experiencing more intense droughts, erratic rainfall, and shrinking water supplies.

India, a developing country with a vast population and rapidly expanding economy, heavily relies on its water resources to meet the demands of its people and industries. However, climate change has exacerbated existing water-related issues, such as water scarcity, pollution, and the mismanagement of water resources. India's water systems are already under strain due to factors such as over-extraction, poor water management practices, and rapid urbanization, which have only worsened due to the impacts of global warming.

The role of legal frameworks in managing water resources has become more important than ever in this context. Over the years, India has implemented several laws to protect and manage its water resources, such as the Water (Prevention and Control of Pollution) Act of 1974, the National Water Policy of 1987, and various state-level water regulations. However, these laws often fail to address the broader challenges posed by climate change. While they have been effective in regulating certain aspects of water usage, they do not fully account for the increased unpredictability of water supply and demand caused by global warming.

India's existing legal and regulatory systems for managing water resources need to be restructured and adapted to ensure that they can

mitigate the impacts of climate change on water availability, quality, and accessibility. This requires both strengthening the legal frameworks and ensuring their effective implementation through better governance, technology, and public participation. The need for a legal approach that integrates water conservation with climate resilience is critical in ensuring the sustainable management of water resources, particularly in the face of global warming.

This research aims to explore the legal approaches and frameworks that are currently in place for managing water resources in India and assess their effectiveness in addressing the challenges posed by global warming. The study will also examine potential reforms that could be implemented to ensure that water resources are protected for future generations. By understanding the legal landscape surrounding water resources and the challenges of global warming, the study aims to provide valuable insights into how India can develop a more adaptive, inclusive, and sustainable legal approach to water governance.

The legal management of water resources in India must take into account not only national and regional considerations but also global environmental agreements and frameworks aimed at addressing climate change. This includes aligning Indian water law with international standards, such as those outlined in the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, and other global initiatives designed to tackle climate change. India's ability to effectively manage its water resources in the era of global warming will depend on how well its legal and institutional frameworks evolve to face the growing challenges posed by a changing climate.

This study will evaluate the strengths and weaknesses of India's current legal frameworks related to water resource management, consider the role of legal institutions in mitigating climate impacts, and propose legal reforms to ensure water security for the future. Understanding the intersection of law, water resources, and climate change will be key in developing a sustainable approach to managing water resources in India amidst the growing challenges of global warming.

Definitions:

- **Global Warming**: The long-term rise in Earth's average surface temperature due to human activities, primarily fossil fuel burning, leading to increased greenhouse gases in the atmosphere.
- **Water Resources**: The total stock of water available in natural bodies like rivers, lakes, and groundwater, used for drinking, agriculture, industry, and ecosystem health.
- **Legal Approaches**: Legal measures, regulations, and frameworks enacted by the government to regulate, allocate, and conserve water resources.

Need:

The need for this study arises from the increasing pressure on India's water resources due to the dual impact of rapid population growth and the consequences of global warming. Existing water laws need to be evaluated and adapted to the evolving climate scenario to ensure the sustainability of water for future generations. This research is essential for understanding how law can act as a tool to mitigate the effects of climate change and promote water conservation.

Aims:

- To analyze the current legal approaches to water resource management in India.
- To assess the impact of global warming on India's water resources and its legal implications.
- To propose legal reforms to ensure sustainable water management in the context of climate change.

Objectives:

1. To review the existing water laws and policies in India.
2. To evaluate the effectiveness of these laws in the face of global warming.
3. To identify gaps and challenges in the current legal framework for water resource management.
4. To propose legal solutions to address water scarcity and degradation.
5. To analyze international legal practices in water resource management under climate change.

Hypothesis:

The hypothesis of the study is that India's existing legal framework for managing water resources is inadequate to address the challenges posed by global warming and requires comprehensive reforms to ensure water sustainability in the future.

Research Methodology:

This study adopts a qualitative research methodology, relying on both primary and secondary data sources:

- **Primary Data**: Interviews and surveys with policymakers, environmental lawyers, water resource managers, and NGOs working on water conservation.
- **Secondary Data**: A detailed review of existing legal literature, government reports, case studies, and scholarly articles related to water management laws in India.

Strong Points:

1. Provides a comprehensive review of India's legal framework concerning water resources.
2. Highlights the implications of global warming on water law, which is an emerging field of study.

3. Combines both domestic and international legal perspectives on water management.
4. Identifies policy gaps and suggests legal reforms, making it relevant for lawmakers and legal practitioners.

Weak Points:

1. The complexity of legal frameworks might make it challenging to fully assess the effectiveness of each law.
2. Limited empirical data due to the difficulty in obtaining primary data from legal experts.
3. The study may not cover all regional variations in water law across India, focusing mainly on national-level frameworks.

Current Trends:

- Increasing adoption of integrated water resource management (IWRM) frameworks.
- Growing awareness about the need for climate-resilient water policies.
- The rise of judicial interventions in water disputes, especially regarding interstate water sharing.
- Integration of technology and data-driven solutions for water management.

History:

India's legal approach to water management dates back to colonial times, with the Indian Easements Act of 1882 being one of the earliest laws governing water usage. After independence, several legislative frameworks, such as the Water (Prevention and Control of Pollution) Act of 1974 and the National Water Policy (1987), were enacted to manage the growing concerns over water availability. However, these laws often lack enforcement mechanisms and comprehensive frameworks that address the impacts of climate change on water resources. The history of water resource management in India is deeply intertwined with its cultural, economic, and political development. Water has always been a vital resource in Indian civilization, integral to agriculture, industry, and daily life. The management of water resources, therefore, has been a significant concern from ancient times through the colonial period and continues to be so in modern India, especially in the context of climate change and global warming. The legal and institutional frameworks for water resource management have evolved over centuries, shaped by various dynastic, colonial, and post-independence factors.

Ancient and Medieval Period

In ancient India, water resource management was highly advanced, with a strong emphasis on sustainability and equitable distribution. The ancient Indus Valley Civilization (around 2500 BCE) is known for its sophisticated water management systems, including wells, drains, and bathing platforms. Similarly, the Maurya and Gupta periods (around 300 BCE to 500 CE) saw the development of extensive irrigation systems for agricultural purposes, including the construction of canals, reservoirs, and step wells.

Water management in these periods was largely governed by customary laws and local practices. Religious texts and codes, such as the Manusmriti and Arthashastra, also contain references to water rights and water conservation. The traditional system of water management was closely linked to the community and local governance structures, with the role of water bodies being crucial for sustaining agricultural productivity, especially in arid and semi-arid regions.

British Colonial Period (1757-1947)

The British colonial period marked a significant shift in the legal and institutional framework for water resource management in India. Under British rule, the primary focus was on economic exploitation and infrastructure development to serve the colonial interests. Water management was largely aligned with agricultural needs, particularly in the context of revenue generation. The British implemented large-scale irrigation systems to enhance agricultural productivity and revenue from land, leading to the construction of major dams, canals, and reservoirs, such as the Sutlej Valley Project and the Upper Ganga Canal.

However, the legal framework for water management during the colonial period was largely exclusionary. The British introduced several laws that centralised water management and often disregarded traditional systems. The Indian Irrigation Act of 1876 and the Indian Penal Code (IPC) provided the legal foundation for controlling and regulating water resources. These laws focused primarily on the development of irrigation for agricultural purposes, with little regard for equitable distribution or sustainability.

The colonial government also implemented policies that alienated local communities from water management. The creation of state-controlled irrigation networks, combined with land tenure reforms, marginalized traditional community-based management systems, disrupting the decentralized approach to water governance that had existed for centuries.

Post-Independence Period (1947–Present)

The period after India's independence in 1947 saw the establishment of a more structured and legal framework for water resource management, with the government taking a more proactive role in addressing water-related issues. The Constitution of India, adopted in 1950, laid the foundation for water law in India, recognizing water as a vital resource for the sustenance of life and the economy. Article 246 of the Constitution grants the Union and State Legislatures the authority to make laws regarding water resources, with the subject being listed under

both the Union and State List in the Seventh Schedule.

In the early years after independence, the focus of water resource management was on agricultural development and industrialization. The Indian government embarked on major infrastructure projects, such as large dams, irrigation systems, and hydropower plants, as part of its economic planning. The establishment of institutions like the Central Water Commission (CWC) in 1952 and the National Water Development Agency (NWDA) in 1982 marked the beginning of a more coordinated approach to water management.

The post-independence legal framework for water management was built on several key statutes and policies. Some of the most significant pieces of legislation include:

- **The Indian Easements Act, 1882**: This Act recognized the right of individuals to use water from natural watercourses, such as rivers and streams, subject to certain limitations.
- **The Water (Prevention and Control of Pollution) Act, 1974**: This law aimed to address water pollution, a growing concern in the post-independence period, particularly due to industrialization and urbanization.
- **The National Water Policy, 1987**: This policy laid the foundation for comprehensive water resource management in India, emphasizing the need for efficient utilization and conservation of water resources.
- **The National Water Mission, 2011**: Under the National Action Plan on Climate Change (NAPCC), this mission was launched to address the impacts of climate change on water resources and to promote water conservation and efficient use.

In the late 20th and early 21st centuries, the increasing threat of climate change, including global warming, began to significantly affect water resources in India. Changes in rainfall patterns, the depletion of groundwater, the drying up of rivers, and the increased frequency of floods and droughts began to underscore the inadequacies of the existing legal framework in dealing with the challenges posed by climate change. The increasing demand for water, coupled with its shrinking supply, has highlighted the need for more effective legal solutions.

Key Legal Developments and Challenges Post-2000

In the 21st century, the legal framework for managing water resources in India began to evolve to address the emerging challenges posed by climate change, population growth, and environmental degradation. Some key developments include:

- **Water Conservation and Management Laws**: Several states in India, including Maharashtra, Gujarat, and Rajasthan, have enacted laws focused on water conservation, groundwater management, and water use efficiency. These laws emphasize the need for public participation, community-based management, and the protection of traditional water bodies.
- **The National Water Policy, 2012**: This policy highlighted the need for integrated water resource management, focusing on ensuring water security and the equitable distribution of water resources. It stressed the importance of adapting to climate change impacts through effective planning and governance.
- **Judicial Activism**: The Indian judiciary has played a crucial role in shaping water law in India. The Supreme Court and various High Courts have heard numerous cases on water pollution, water rights, and the allocation of water resources. Landmark judgments, such as the **T.N. Godavarman Thirumulpad case** on the conservation of rivers and forests, and the **M.C. Mehta case** on Ganga pollution, have established important legal precedents.

Present Day and Future Directions

Today, India faces a water crisis exacerbated by the impacts of global warming. The existing legal and regulatory framework is struggling to address the challenges posed by climate change, urbanization, and increasing demand. Water availability is becoming more unpredictable, with the country experiencing both droughts and floods more frequently. Therefore, the need for a more integrated, adaptive, and forward-looking legal framework is paramount. This includes strengthening environmental laws, ensuring efficient water governance, and incorporating climate resilience into water management strategies.

Moreover, India's approach to water governance will need to consider new models, such as the adoption of water markets, the use of technology for water monitoring, and the active involvement of local communities in water conservation and management efforts. India's future water law must incorporate these approaches while addressing the dual challenges of climate change and water scarcity to ensure the sustainability of its water resources.

Thus, the history of water resource management and legal responses in India has evolved from traditional and community-based systems to colonial-era centralized approaches, followed by post-independence legal reforms and, more recently, an increasing recognition of the need for climate resilience and sustainable water governance in the face of global warming.

Discussion:

This section would delve into the effectiveness of the existing legal frameworks like the National Water Policy, Water Resources Bill,

and state-level water regulations in addressing issues like water scarcity, over-extraction, and pollution. The discussion would also cover the challenges faced by legal institutions in adapting to climate change impacts, such as erratic rainfall patterns, melting glaciers, and increasing water demand.

Results:

The analysis reveals that while India has a robust legal framework for water management, it falls short in addressing the newer challenges posed by climate change. Several laws require reforms to accommodate modern water conservation practices and adapt to environmental changes caused by global warming. Additionally, there is a need for more public participation in water governance, greater accountability of water-related institutions, and the use of technology to track and manage water usage.

Conclusion:

The study concludes that legal reforms are necessary to address the challenges of water scarcity and degradation caused by global warming in India. A cohesive national legal strategy, integrated with regional governance mechanisms, is needed to protect water resources and ensure sustainable water management. Effective implementation of these laws, along with active community involvement and technological advancements, will help India mitigate the impacts of climate change on water resources.

Suggestions and Recommendations:

1. **Legal Reforms**: Amend existing water laws to incorporate climate change adaptation strategies.
2. **Strengthening Enforcement Mechanisms**: Improve the implementation of water laws with stronger penalties for violations.
3. **Water Pricing**: Implement a fair pricing system to encourage efficient water use.
4. **Public Awareness and Involvement**: Promote public awareness campaigns on water conservation and legal rights related to water access.
5. **Technology Integration**: Adopt digital solutions for better monitoring and management of water resources.

Future Scope:

Future research could explore the impact of emerging technologies like artificial intelligence and data analytics on water resource management. Additionally, there is potential for a comparative study of legal frameworks across countries to assess the effectiveness of international legal mechanisms in managing water resources in the face of global warming.

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Liquefaction of Natural Gas (LNG) Facilities in India

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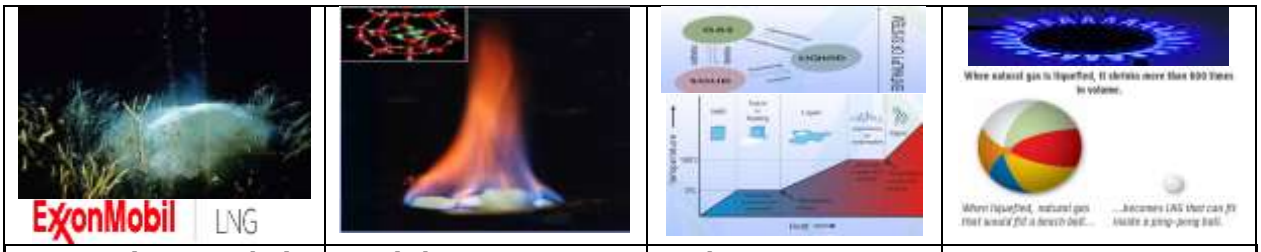
Abstract:
India's journey with LNG has been a transformative one. Currently, it stands as the fourth largest importer of LNG globally, highlighting its increasing reliance on this eco-friendly fuel. Natural gas has been formed by the degradation of organic matter accumulated over millions of years. Two main mechanisms (biogenic and thermogenic) are responsible for this degradation. Natural gas is a complex mixture of hydrocarbon and non-hydrocarbon constituents and exists as a gas under atmospheric conditions. The objective of gas processing is to separate: Natural gas, Condensate, Non-condensable, Acid gases, and Water. The raw gas is first treated to remove typical contaminants. Next, the treated gas is chilled, cooled, and condensed to 162°C in succession using propane, ethylene, and methane. The last stage is pumping LNG to storage tanks and awaiting shipment. Liquefied natural gas is used to transport natural gas over long distances, often by sea. In most cases, LNG terminals are purpose-built ports used exclusively to export or import LNG. Natural gas consists almost entirely of methane (CH_4), the simplest hydrocarbon compound. India is the **14th** largest gas consumer 58 bcm **(~158 mmscmd)**, and 4th largest LNG importer **31 bcm** (**~82 mmscmd**), Economy growing at a CAGR of about **6 - 7%** with similar growth in Energy Consumption. This paper evaluates the environmental and economic performance of liquefied natural gas (**LNG**) as a transition fuel to replace diesel in heavy goods vehicles (HGVs). A Well-to-Wheel (WTW) assessment based on real-world HGV drive cycles is performed to determine the life-cycle greenhouse gas (GHG) emissions associated with LNG relative to diesel. The analysis is complemented with a probabilistic approach to determine the total cost of ownership (**TCO**) across a range of scenarios. The government aims to significantly increase share of Natural Gas in the Indian Energy basket in the coming years. Despite an increase in domestic gas production dependency on imported gas to increased substantially. The pipeline network- developing into a national grids connecting new markets.

Keywords: LNG (Liquefied Natural Gas), Hydrate, Methane, Phase-Transition

Introduction: -

Natural gas exists in nature under pressure in rock reservoirs in the Earth's crust, either in conjunction with and dissolved in heavier hydrocarbons and water or by itself. It is produced from the reservoir similarly to or in conjunction with crude oil. Natural gas produced from geological formations comes in a wide array of compositions [1].

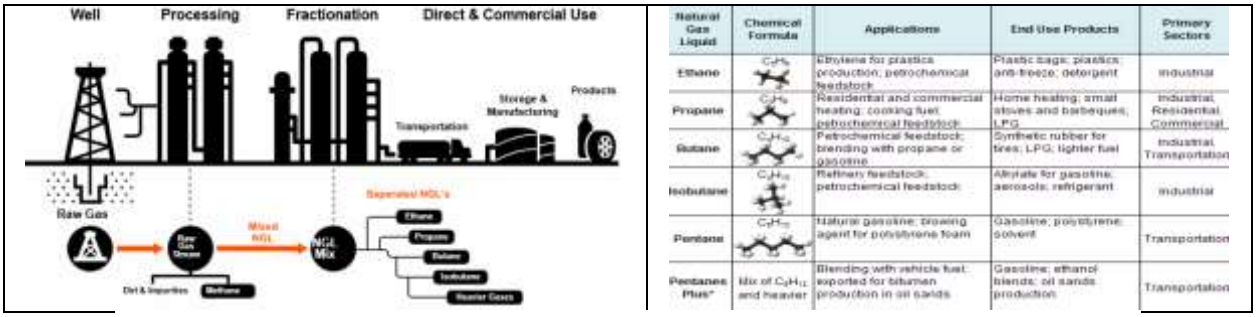


Gas Hydrate at seabed	Clathrate Structure.	Phase Transitions.	LNG is 85 to 95%.

Figure [1]:- Methane at Seabed to Phase Transitions to the LNG at Home.

The varieties of gas compositions can be broadly categorized into three distinct groups; non-associated gas it occurs in conventional gas fields, associated gas it occurs in oil fields, is as shown in Figure [1]. Raw natural gas after transmission through the field-gathering network must be processed before it can be moved into long-distance pipeline systems for use by consumers. India has steadily increased its imports of LNG over the decade demonstrating a growing reliance, on this cleaner energy option. Starting at 13.3 million tonnes in 2014–15 the imports have consistently risen, peaking at 25.1 million tonnes in 2020-21. While there was a dip to 23.4 million tonnes indicating a resurgence in growth? This uptrend in LNG imports underscores India's commitment to

transitioning towards energy sources as it actively pursues its sustainability objectives. North Field East is a planned liquefaction terminal, located in Al Khor, Qatar. It will have a capacity of 32.0 mtpa. The terminal is under construction and its expected start is in 2026. It will be operated by Qatar Energy and is likely to use the process – AP-X, Air Products, QatarEnergy (75.00%), TotalEnergies (6.25%), Shell (6.25%), Exxon Mobil Corp (6.25%), ConocoPhillips (3.13%), and Eni (3.12%) are the equity holders in the terminal. Total primary energy demand in South Asia is expected to grow by 77%, reaching 2,235 Mtoe by 2050, with India contributing 80% to this growth and acting as a powerhouse for the region. Natural gas, the cleanest burning hydrocarbon, is projected to raise its share in South Asia's energy mix to 13% by 2050 from 9% in 2022. India's LNG imports are expected to grow nearly fivefold to 105 Mt by 2050 from 22 Mt in 2023, despite a rise in domestic production. Affordability, along with energy sustainability and security, remains a key concern in the region. Petronet LNG announced the development of a floating LNG terminal in Odisha by 2025 at the cost of INR 1600cror. Furthermore, Petronet is likely to invest INR 600 crore in raising the capacity of the Dahej LNG import terminal to 22.5 million tonnes per annum from the current 17.5 million tonnes. Gas-fired power generation can play a critical role in decarbonizing and modernizing India's power sector.



Natural Gas Liquid	Chemical Formula	Applications	End Use Products	Primary Sectors
Ethane	C_2H_6	Ethylene for plastics production; petrochemical feedstock	Plastic bags; plastics; anti-freeze; detergent	Industrial
Propane	C_3H_8	Residential and commercial heating; cooking fuel; petrochemical feedstock	Home heating; small stoves and barbeques; LPG	Industrial, Residential, Commercial
Butane	C_4H_{10}	Petrochemical feedstock; blending with propane or gasoline	Synthetic rubber for tires; LPG; lighter fuel	Industrial, Transportation
Isobutane	C_4H_{10}	Refinery feedstock; petrochemical feedstock	Alkylate for gasoline; aerosols; refrigerant	Industrial
Pentane	C_5H_{12}	Natural gasoline; blowing agent for polystyrene foam	Gasoline; polystyrene; solvent	Transportation
Pentanes Plus*	Mix of C_5H_{12} and heavier	Blending with vehicle fuel; exported for bitumen production in oil sands	Gasoline; ethanol blends; oil sands production	Transportation

Figure [2]:- Natural Gas Liquids (NGLs) are used as inputs for PETROCHEMICAL plants.

Natural gas liquids (NGLs) are hydrocarbons in the same family of molecules as natural gas and crude oil, composed exclusively of carbon and hydrogen. Ethane, propane, butane, isobutane, and pentane are all NGLs as shown in Figure [2]. NGLs are used as inputs for petrochemical plants, burned for space heat and cooking, and blended into vehicle fuel. Ethane occupies the largest share of NGL field production. It is used almost exclusively to produce ethylene, which is then turned into plastics. Much of the propane, by contrast, is burned for heating, although a substantial amount is used as petrochemical feedstock. The process of separating various NGLs is called fractionation. Since each molecule (ethane, propane, etc.) has a different boiling point, the hydrocarbon stream goes through multiple fractionators, each with a different temperature. This process removes a different NGL at each step, starting with the lightest hydrocarbons and working up to the heaviest. Typically ethane is removed first, followed by propane, butane, and isobutane. After these NGLs are removed and the natural gas meets the pipeline quality standards for the pipeline it will be transported on, it is sent to natural gas utilities, power generators, and industrial customers. "International trade in liquefied natural gas (LNG) continues to be one of the most vibrant segments of the world's natural gas value chain, growing in 2017 by 35.2 MT growth of 12%".

Composition: -

Raw natural gas typically consists primarily of methane (CH_4), the shortest and lightest hydrocarbon molecule. It also contains varying amounts of: Heavier gaseous hydrocarbons: ethane (C_2H_6), propane (C_3H_8), normal butane (n-C_4H_{10}), isobutane (i-C_4H_{10}), pentanes, and even higher molecular weight hydrocarbons. Acid gases: carbon dioxide (CO_2), hydrogen sulfide (H_2S), and mercaptans such as methanethiol (CH_3SH) and ethanethiol (C_2H_5SH). Phase transition is the transformation of a thermodynamic system from one phase (commonly referred to as "state of matter") to another. Enthalpy change accounts for energy transferred to the environment at constant pressure through expansion or heating, as well as sector-wise Natural Gas Demand and processing of LNG up to 2030 as shown in Figure [3].

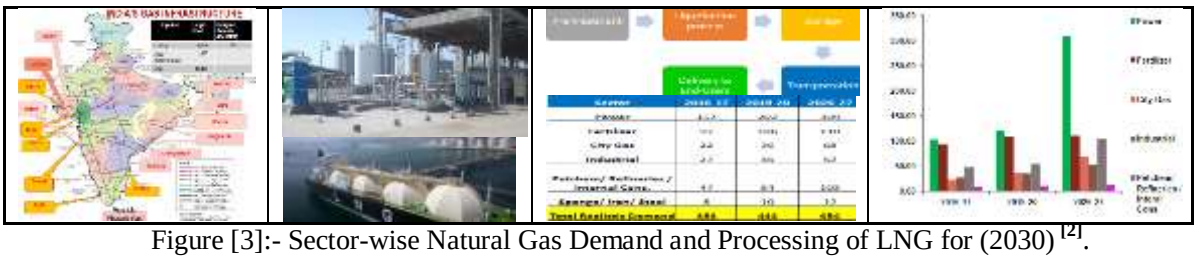


Figure [3]:- Sector-wise Natural Gas Demand and Processing of LNG for (2030) [2].

The enthalpy of fusion is a latent heat because during melting the introduction of heat cannot be observed as a temperature change, as the temperature remains constant during the process. Gas has three quantities: Volume, Temperature, & Pressure. These three gas rules govern the behaviour of gases: Boyle's Law, Charles' Law, and Gay-Lussac's Law. The industrial sector relies on natural gas as a feedstock or fuel for manufacturing many of the products we rely on today, including pulp and paper, metals (for computers, automobiles, and telecommunications), chemicals, fertilizers, fabrics, pharmaceuticals, and plastics. The transportation sector is beginning to see natural gas as a clean and readily available alternative to other fossil fuels.

Methodology of this Research Study: -

The concept of Liquefied Natural Gas (LNG) is a response to the inefficiency of natural gas pipelines and the technical and economic problems of running pipelines over long distances. If natural gas is cooled at minus 160.5°C, it becomes liquid and more compact, occupying just 1/600th of the gaseous volume. This is because most of the heavier hydrocarbons are removed during liquefaction. The cargo transported in bulk by sea is predominantly methane (over 80%), a colourless, odourless, transparent liquid non-toxic, non-corrosive, and less dense than water. As LNG is highly volatile, specialist operators are involved in its transportation [3].

Primary LNG Project / Chain Components are:

Upstream development of long-term natural gas supply for feed gas to an LNG plant, downstream development of liquefaction, storage and loading facilities, Marine transportation, Downstream development of receiving terminals for re-gasification and pipeline transportation to market [4]. Typical LNG is about 87-92% methane, with most of the remainder being liquid ethane. With additional processing, ethane and nitrogen components can be removed as well, yielding a product that is 99 + % pure methane. An important concern with use of liquid methane/ethane mixtures is possibility of changes in fuel composition during handling & processing. This is known as **weathering**," or "**enrichment**".

Four liquefaction processes can be distinguished: -

C3MR or ACPI (designed by Air Products & Chemicals), Cascade (designed by ConocoPhillips), Shell DMR & Linde are shown below in Figure [4]. In these processes raw gas is first treated to remove typical contaminants. he treated gas is chilled, cooled and condensed to 162°C in succession using propane, ethylene and methane. Last stage is pumping LNG to storage tanks and awaiting shipment [5].

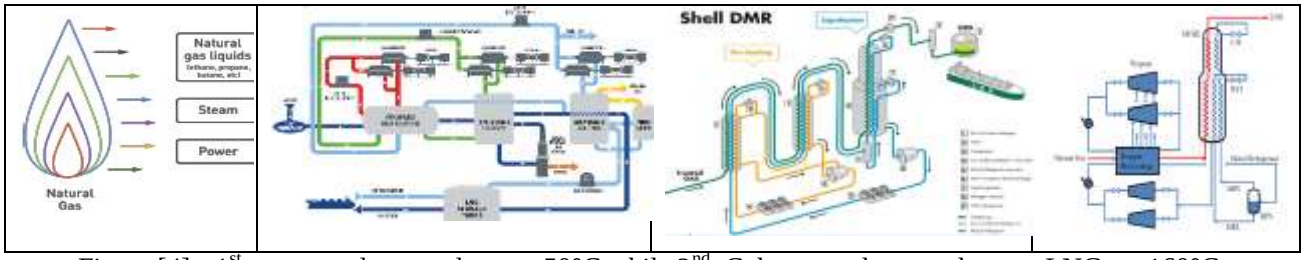


Figure [4]:- 1st. stage cools natural gas to 50°C while 2nd. Column cools natural gas to LNG at -160°C.

LNG must be kept cold to remain a liquid, independent of pressure. Despite efficient insulation, there will inevitably be some heat leakage into the LNG, resulting in the vaporization of the LNG. This boil-off gas acts to keep the LNG cold [5]. The boil-off gas is typically compressed and exported as natural gas, or it is re-liquefied and returned to storage. Although diesel has a higher energy density than LNG [6], the volume of greenhouse gas (GHG) and criteria air contaminant (CAC) emissions associated with both upstream & downstream sectors is for natural gas Table 1. The Average Gross Capacity with the different processing is shown in Figure [5].

Table [1]:- Emission from Natural Gas [7].

	Carbon Dioxide (kg/m^3)	**Methane (kg/m^3)**	**Nitrous Oxide (kg/m^3)**
Extraction	0.043	2.3×10^{-3}	4×10^{-6}
Processing	0.090	3×10^{-4}	3×10^{-6}
Combustion	1.918	3.7×10^{-5}	3.5×10^{-5}
TOTAL	**2.051**	**2.64×10^{-3}**	**4.2×10^{-5}**

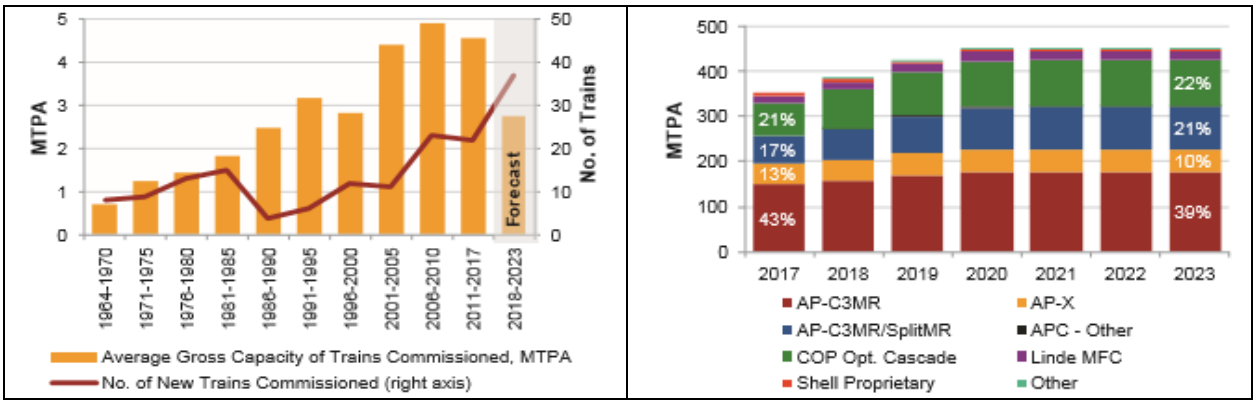


Figure [5]:- The Average Gross Capacity MTPA with the different processing over the years.

Liquefaction of natural gas into LNG allows the gas to be transported from producing regions to distant countries as shown in Figure [6]. In 1959, the world's first LNG carrier, the Methane Pioneer, set sail from Lake Charles, Louisiana with a cargo of LNG destined for Canvey Island, UK. This first ever U.S.-UK shipment of LNG demonstrated that large quantities of LNG could be transported safely across the ocean, opening the door for what would become the global LNG industry. A major use for domestic natural gas is power generation. Natural gas can also be used as fuel in transportation, industries, commercial buildings or residences. Natural gas can provide fuel substitution for higher cost and more environmentally damaging fuels as well as utilizing a country's domestic resources. Additionally, natural gas can be used as a feedstock for various other industrial plants, such as fertilizer plants, methanol plants, petrochemical plants and gas-to-liquids plants. The price of natural gas must be balanced between the cost of supply and what is affordable for consumers; otherwise, consumers will not switch to gas, assuming other alternatives are in place and/or available.

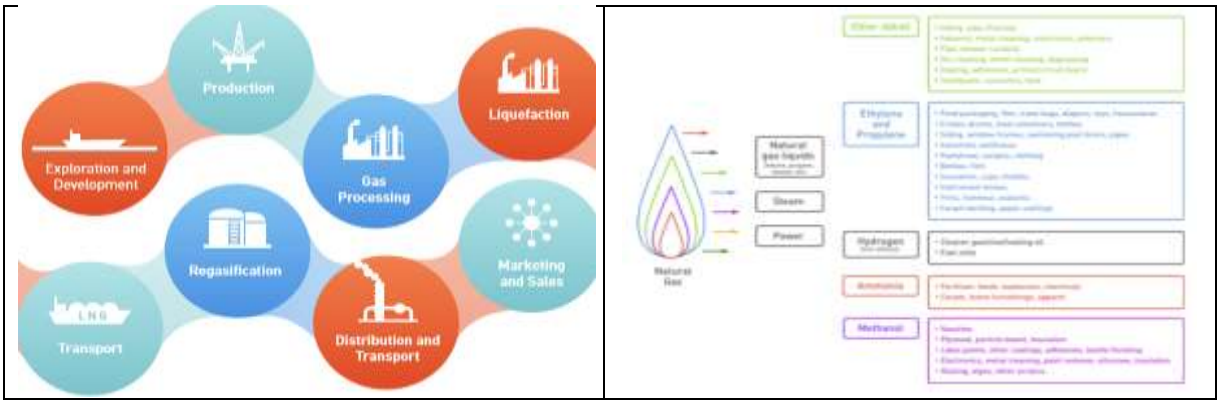


Figure [6]:- Global LNG Fundamentals over the Petrochemical manufacturing regions.

Local gas prices, particularly for imports, are influenced by global market prices and are also impacted by regulatory policy choices, which impose costs through taxes and mandated technology choices. There are challenges involved in connecting gas resource development with power demand, particularly with respect to the small size of domestic gas demand in many countries compared to the magnitude of natural gas resources required to justify a world-scale LNG project. Approximately 70% of world LNG trade is priced using a competing fuels index, generally based on crude oil and referred to as “oil price indexation” or “oil-linked pricing."

Figure [7]:- LNG POWERED Crude OIL Tanker Njord DF, LNG inside tank.

The formula used in most of the Asia LNG contracts that were developed in the late 1970s and early 1980s can be expressed by: $\mathbf{P = \alpha \times P + \beta}$

Where: P_{LNG} = price of LNG in U.S.$/mmBtu (U.S. $/GJ x 1.055) **α** = crude linkage slope P_{CRUDE} = price of crude oil in U.S.$/barrel **β** = constant in U.S. $mmBtu (U.S. $GJ x 1.055), historically, there was little negotiation between parties over the slope of the LNG contracts, with most disagreements centered on the value of the constant **β**. Following the oil price declines of the 1980s, most new LNG contracts incorporated a floor and ceiling price that determined the range over which the contract formula could be applied. At present the LNG price are based on a number of factors are fallows; (1). Delivered LNG price to the Customer. (2). Custom Duty is paid on the LNG. (3) Regassing price on the LNG. (4) The COST SYSTEM is used for the LNG. (5) The TARIFF for the pipeline used to transport the LNG. This pipeline tariff is based on the distance from the TERMINAL, with ZONE 1 being up to 300 km, zone 2 being between 300 – 1,200 km, and zone 3 being more than 1,200 km. The strategic location of Dahej and Hazira LNG terminals in India means that importers have limited options as shown in Figures [7 & 8].

Figure [8]:- LNG terminals in India means that importers have limited options.

A typical small-scale liquefaction unit can produce as little as 25,000 gallons/day, equivalent to gas production of around 2.5 MMcfd, which might equate to the production from a single onshore gas well of North East INDRADHANUSH LNG pipeline grid is shown in Figure [9].

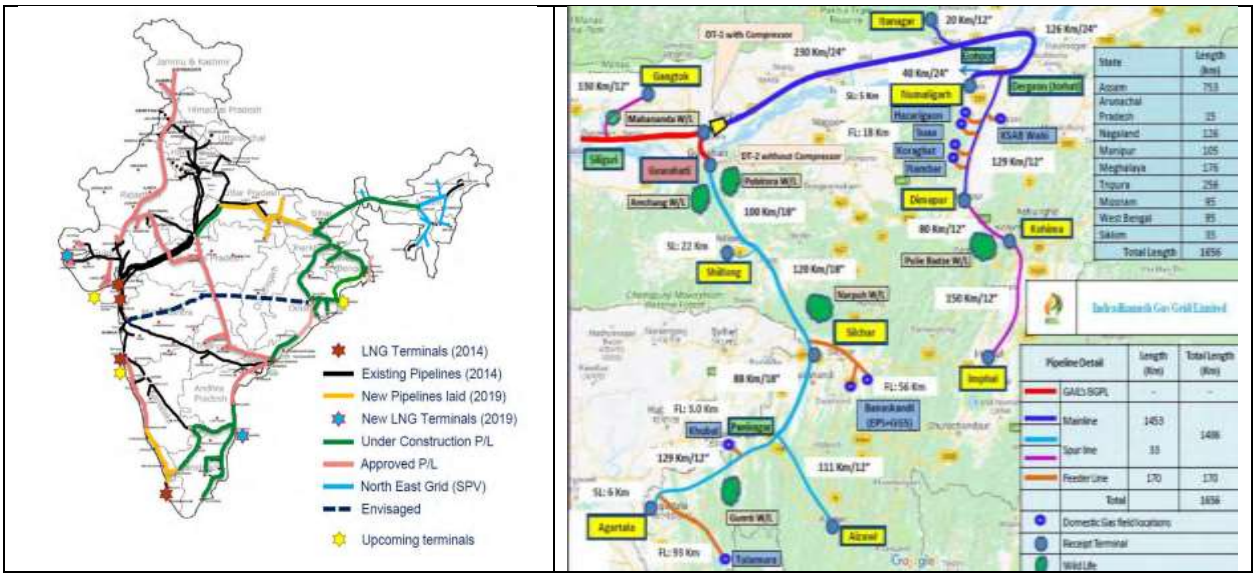


Figure [9]:- The onshore gas well of North East INDRADHANUSH LNG & pipeline grid [7].

Reduction of its GHG intensity of its GDP by 33 – 35% below the 2005 levels by 2030 is one of the four key commitments in the NDCs for climate change goals pledged by India in the Paris Agreement of the COP-21 (2015). India's contribution in the growth of CO2 emissions last year was only 15%, behind China (34%) and US (20%). In 2017, the Draft National Energy Policy prepared by the NITI Aayog (formerly Planning Commission, the key Policy think-tank body of the Governmental of India with Prime Minister as it's Chairperson) projected a share of about 8 to 9% for Gas in the primary energy mix in 2040.

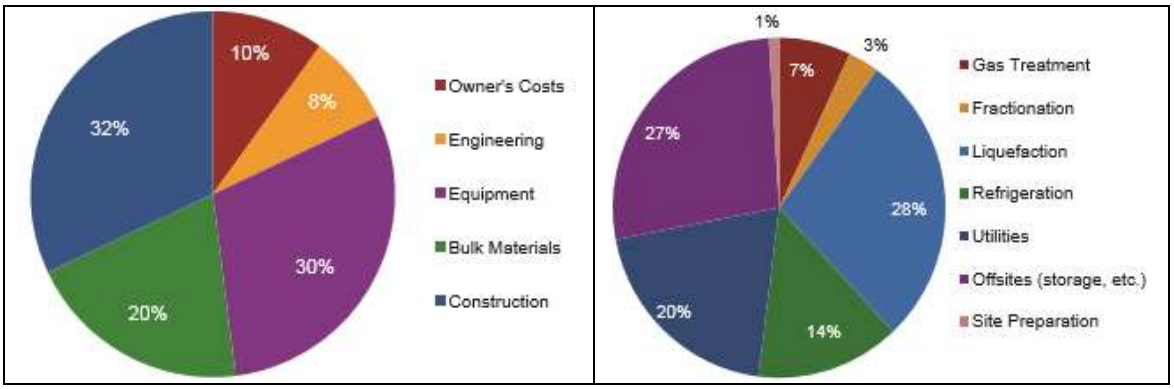


Figure [10]:- Cost Breakdown of Liquefaction Project for CONSTRUCTION & EXPENSE Category.

Considering that the fossil fuels shall still contribute about 78% in the primary mix in 2040, it means that in absolute terms, the contribution of gas could be quite significant, Average Cost Breakdown of Liquefaction Project by construction and expense category as shown in Figure [10]. Subsequently, the government has however set a higher target for gas. The Ministry of Petroleum & Natural Gas has projected a target of 15% for gas in coming years as appearing in its Annual Report 2018-19. Even the NITI Aayog targets in absolute terms could see an increase by 2.5 times in gas consumption by 2040.

In the more than 50 years of the LNG business, there have been many changes and evolutions [8]. As industry continues to grow and develop, changing market demands coupled with the acceleration of the energy transition will lead to significant opportunities for those terminals able to adapt to the new reality. Embracing the functionalities outlined in this report will be key for all elements of the LNG value chain if they are to secure their part in the growing role of LNG in the Energy Transition as shown in Table [2].

Source		2019	2020	2025	2030	2040
RLNG	In MTPA	23.5	25.9	66.5	74	89
	Utilization	87	85	80	75	75
	Gas in mmscmd	74	79	192	200	240
Domestic Gas		90	87	124.2	138.6	139.5
Total Gas		**164**	**166**	**316**	**338**	**380**

Fortunately, global natural gas reserves are vast, estimated at about 6,800 Tcf. This is nearly 60 times the volume of natural gas used worldwide in 2013. However, much of the reserves are considered stranded due to geographic locations and distance to consuming markets. Converting natural gas to LNG allows stranded gas to move to useful markets.

Emerging opportunities for LNG 1, as shown in Figure [11]. Distribution channels: There have been considerable developments in transportation of LNG by Rail Containers and LNG trucks. LNG barges for fuelling of coastal gas-based stations also have potential. 2. LNG for City Buses

And long-haul trucks:

The LNG storage pressure is very low and chances of leakage are less than CNG, thereby improving the safety concerns. The storage is also about 3 times of CNG and in one tankful, the buses can ply upto 600-700 kms. As per SEA-LNG, some 96 ports across the globe have already LNG bunkering infrastructure and 55 more ports are in the process of installing such facilities. 5. Virtual Gas supplies for regions devoid of sourcing gas by pipelines, are foreseeable opportunities, backed by Soft pricing of LNG. As per the projections in the Report, Installed Capacity in 2029-30 would be about 832 GWs, with about 300 GW of Solar.

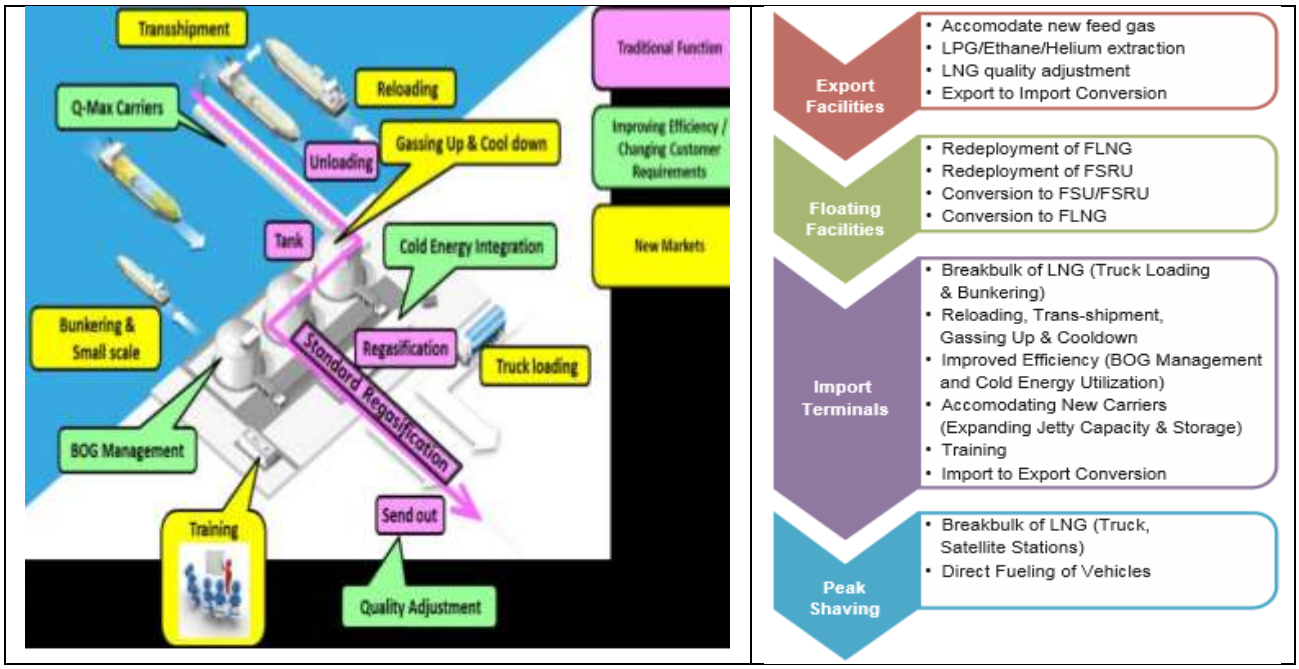


Figure [11]:- The Overview and Flexibility At Lng Terminal

In addition, as society moves to a carbon-neutral energy mix, new functionalities could be envisaged. One such new functionality is associated with the increase in biogas production. This presents an opportunity for facilities in biogas producing countries to become involved in the development of the bio-LNG market. This may involve the addition of bio-LNG treatment and small-scale liquefaction units. For instance, in France, which has set the target that by 2030 10% of all gas will come from renewable sources, facilities will be needed to store and transport this gas. As per the projections, about 2400 Bus of electrical energy would be required in 2029-30, and about 2% of energy generation is from the Gas-based power plants. This means that about 48 BUs would be generated by Gas-based plants and the required gas would be about 11 bcma or about 30 MMSCMD. This is a significant down-scaled consumption as compared to about 45 mmscmd in the NEP- 2018. The paper points out that the model indicates that a significant capacity of nearly 34 GWs (136 GWh) of Battery Storage system is to be added from 2025 till 2029-30.

Conclusions: -

The manufacturing of LNG from natural gas is based on three main processes: gas treating, dehydration, and liquefaction. Treating results in the removal of impurities from the raw gas and these comprise entrained particulate matter, mercury, and acid gases such as H_2S and CO_2. The chilling or liquefaction process is the conversion of the treated and dehydrated gas into liquid by refrigeration of the gas down to a temperature of about -162ºC (-240ºF). Natural gas may be sold indexed to the price of certain alternative fuels such as crude oil, coal and fuel oil. Small-scale liquefaction plants are suitable for peak-shaving on natural gas pipelines, transportation fuel, or for deliveries of natural gas to remote areas not connected to pipelines. They typically have a compact size, are fed from a natural gas pipeline, and are located close to the location where the LNG will be used. This proximity decreases transportation and LNG product costs for consumers. It also avoids the additional greenhouse gas emissions generated during long transportation. Today, approximately 30% of the world's energy needs are met with this gas. Most of it is supplied in gaseous form by pipeline. Ultimately, it is the Volumetric Energy Density that decides the convenience of use. Comparing the volumetric Energy Density of Diesel, which is 34 MJ/L, Natural gas, has 0.364 MJ/L, LNG 21 MJ/L, and CNG 9 MJ/L. LPG has a volumetric Energy Density of 25 MJ/L. Besides LNG vessels, LNG is also used in some aircraft. From an environmental point of view, the results show that engines powered by Liquefied Natural Gas, compared to traditional fuels, save between 28% in the case of freight ships and 31% for passenger ships in the emission of CO_2 into the atmosphere (52 tons per journey). On the other hand, the saving in NO_x emissions is reduced by 87%. In addition, SO_x emissions are completely eliminated and PM emissions are reduced to negligible values.

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Multilingual Text Recognition using Advanced Deep Learning Techniques

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Abstract:
Reading licence plates, recognising street signs, retrieving photographs, doing mobile visual searches, identifying image-based relocation, and aiding visually impaired individuals are just a few of the many uses of text recognition in natural scene images in computer vision systems. The proliferation of digital multiscript documents, photos, and videos has made the detection and identification of text in multilingual scenes an increasingly difficult undertaking. By creating methods for word detection from real-world scene pictures, this study hopes to solve the current problem of scene text extraction. There are a lot of obstacles for texts in natural photos, such as images with wavy messages, images with rotated texts and orientation, images with noise, images with a diversity of typefaces, and photographs with wild backgrounds. By using atrous separable convolution, the improved system, light-YOLOv3, outperforms the original YOLOv3 in terms of accuracy and agility. One model for language identification that uses neural networks is FastText, which can learn several language representations of text automatically. This paper introduces many methods using CNN to enhance text detection. Our study's results show that deep learning techniques and embedding visualisation are effective in multilingual text classification, and we achieved this by using light-YOLOv3, which replaced standard convolution with atrous separable convolution. This reduced the volume of computations and the number of parameters for multi-lingual scene text detection.

Keywords: Multilingual Text Recognition, Language, Scene, CNN, Text Based Language Identification

Introduction:

An essential issue in Natural Language Processing (NLP) is language identification (LID). As the internet continues to grow in popularity, more and more languages than English are becoming accessible online. The main identification of language is necessary for the automated processing of these texts for any purpose requiring natural language processing, including indexing and questioning. The problem is complex for computers because to the fact that various scripts employ different shaped patterns to generate distinct sets of characters, even if it seems easy and basic to humans. In a nation like India, where people speak more than one language, LID takes on added importance. One hundred and twenty-two of India's many languages have been officially recognised by the constitution as "major" languages [1, 2]. Common occurrences also include code mixing and frequent code switching. Exploring linguistic phenomena like code-switching and code mixing, as well as effectively processing each portion of multilingual texts, would greatly benefit from the ability to separate them according to language. As a result, language recognition from a short text is a significant challenge in the Indian setting. The Devanagari script is among the most widely used and accepted scripts worldwide. In addition to several additional languages and dialects, Sanskrit, Hindi, Marathi, Nepali, Konkani, and Punjabi are all written using the Devanagari script.

Dealing with many languages, scripts, and domains makes multilingual text categorization a tough endeavour. It has a wide range of potential uses, including content moderation, spam filtering, topic recognition, and sentiment analysis. On the other hand, it presents a number of linguistic and technological challenges, including data scarcity, language heterogeneity, and cross-lingual transmission. This post will teach you how to increase your multilingual text categorization performance by overcoming these obstacles.

Data augmentation:

When dealing with multilingual text categorization, one typical problem is that not all languages or domains have enough labelled data. Because of this, models' generalizability and accuracy may be compromised. Translation, back-translation, paraphrase, and synonym substitution are some data augmentation methods that may be used to fix this problem. You may lessen the likelihood of bias and overfitting by using these methods to produce samples that are more representative of the target language or domain.

Pre-trained models:

Using pre-trained models that have been trained on large-scale multilingual corpora, such mBERT, XLM or BERT, is another viable technique for multilingual text categorization. These models provide a comprehensive and cross-lingual representation of text inputs by capturing the syntactic and semantic aspects of several languages. Use these models as feature extractors for downstream classifiers or fine-tune them on particular tasks and domains. Improving cross-lingual transfer and adaptability is possible with the aid of pre-trained models, which allow you to make use of the existing knowledge and resources of several languages.

Language identification:

Writings of unknown or unclear languages, or writings including more than one language, may sometimes be encountered. This has the potential to increase the difficulty and unreliability of multilingual text categorization. Language identification methods like n-gram models, character-level models, and neural networks may help with this issue. Using these methods, you may determine which classifier or model is most suited to handle texts based on their language or languages. To improve accuracy and memory in multilingual text categorization while decreasing noise and confusion, language identification is a useful tool.

Text Recognition and Scene Analysis:

Many vision-based applications have made heavy use of scene text detection and identification, which has garnered a lot of attention in recent years. Text detection and recognition is a challenging and complex task in this field due to the many types of challenges that can be encountered, such as images with wavy text, images with text rotated or oriented differently, images with noisy backgrounds, and images with a variety of font sizes and styles. Text detection and recognition in scene images has been the subject of much research in recent years. However, there are a number of obstacles that make this process more complicated and difficult, such as images with wavy text, images with text rotation and orientation, images where the size and variety of fonts are changed, noisy images, and wild background images [8]. There are three main subfields within text detection and recognition: detection, recognition, and end-to-end [9, 14]. Finding potential spots in the picture where the text may be found is part of the process for text location detection. The text recognition approach involves translating the identified text into computer-readable and editable symbols. Among the components of the end-to-end text recognition approach is a system that can identify texts and their locations. Sliding windows and connected component analysis (CCA) are two approaches that have been utilised to locate and identify text in recent years: To identify and analyse potential text regions, the linked component approach makes use of colour, edge, stylus (density calculation and pixel gradient), and texture attributes. Text candidate extraction, edge clipping, or colour clustering are the first steps in detecting potential components. The next step is to refine the candidates by removing any non-textual elements using either automatic train classifications or human-created design criteria. Due to the modest number of components that may be handled, this approach is both practical and effective. The key benefits of this approach may include font variation, insensitivity to size changes, direction and rotation, and change of direction. On the other hand, they become very sensitive if there is an increase in text density, which alters the interconnected parts. One drawback of this approach is this. Another way to lower the recall rate is to change the candidate and remove the non-text candidate. This can cause you to lose certain characters and texts. Two feature extraction techniques Two methods that have used the connected component technique to identify and localise text are the Maximum Stable Extremal Region (MSER) and Stroke Width Transform (SWT) [10]. Text detection is also defined in the sliding window approach by moving a window to all places at many sizes. Due to the huge number of text candidates used and the increased number of false positives, this technique has a high recall since it is a thorough search. Scanning all windows also adds to the high computational cost.

Literature Review:

Patil, Chandrashekhar & Zope, Renuka & Jabde, Meenal. (2023)

In-Vehicle-Infotainment (IVI), Instrumental cluster, and Heads-Up Display (HUD) have seen remarkable progress and refinement in the car industry over the last several decades. A significant difficulty is the validation of warnings on HMI contents in the Driver information system, in-vehicle infotainment, and centre media display. In this case, human error is the reason manual testing fails. These alerts may be presented in more than one language and on some HMIs, the text may be displayed either horizontally or vertically. For these multilingual circumstances with horizontal and vertical scrolling text, automating the text verification is the biggest problem. Using a complicated backdrop for an alert or warning in a digital cluster might be challenging at times. In order to recognise and verify multilingual content regardless of font size and different backdrop gradients applied to HMI, this research provides a machine learning/deep learning-based method [3].

Chen, Zhuo & Yin, Fei & Zhang, Xu-Yao & Yang, Qing & Liu, Cheng-Lin. (2020)

Script identification and handwriting recognition are often executed in a cascaded fashion to perform multilingual handwritten text

recognition. Nevertheless, the accumulation of errors renders this strategy suboptimal. In this research, we provide a novel architecture called multilingual text recognition networks (MuLTReNets) that can identify scripts and recognise handwriting all at once. A feature extractor, script identifier, handwriting recognizer, and auto-weighter are the four main components that make up the system. In order to encode text pictures into characteristics that are shared by the script identifier and recognizer, the feature extractor leverages spatial and temporal information. Both the script identifier and the handwriting recognizer use auto-weighters to balance distinct scripts in variable-length sequences, while LSTM and CTC are used to decode sequences in the script identifier. Both the unified recognition with merged alphabet (MuLTReNetV1) and the cascaded script identification-single script recognition with joint training (MuLTReNetV2) multilingual recognition methods may benefit from the proposed framework's multi-task learning. Using English, French, Kannada, Urdu, and Bangla handwritten text databases, we assessed how well the suggested technique performed. Both script identification and handwriting recognition are areas where our technique excels, according to the experimental findings. Script identification accuracy approaches 99.9 percent. In contrast, the suggested approach achieves better results in handwriting recognition than both cascade and script-specific algorithms [4].

Huang, Jing & Liang, Kevin & Kovvuri, Rama & Hassner, Tal. (2023)

Because of the abundance of datasets including both English and numbers, the majority of current optical character recognition (OCR) algorithms concentrate on alphanumeric characters. When it comes to expanding the characters to other languages, new methodologies have shown that training separate scripts with separate recognition heads, rather than merging characters from all languages in one recognition head, significantly improves the end-to-end recognition accuracy. But we hypothesise that certain languages' shared features would make cooperative training possible, allowing us to share model parameters.

The process of classifying languages, however, takes some time. In order to achieve this goal, we provide a Gumbel-Softmax-based automated approach to multilingual text recognition that incorporates a task grouping loss and a weighted recognition loss for concurrent model and grouping module training. We found experimental support for the notion that a superior configuration of task grouping/separation exists somewhere in the midst of merging all tasks together and separating all tasks [5].

Saha, et al (2020)

Researchers have difficulty in scene text analysis due to factors such as complicated backgrounds, picture quality, text orientation, text size, etc. When the picture includes texts in more than one language, the situation becomes much more complicated. A large majority of scene text identification methods view the issue via a deep learning or feature-based lens. By fusing feature-based and deep learning-based methods, this study proposes a comprehensive system for scene text recognition, localization, and language identification. After the model generates text suggestions using Maximally Stable Extremal Regions and Stroke Width Transform, it refines the proposals using Generative Adversarial Network. Lastly, the language of the scene texts that were recognised is determined using a model that is built on Convolution Neural Networks. Standard datasets such as KAIST, COCO, CTW1500, CVSI, and ICDAR, as well as an in-house multi-lingual Indic scene text dataset, have all been used to test the suggested model, and the results have been acceptable [6].

Aradhya, Manjunath & Basavaraju, H.T. & Guru, Devanur. (2021)

A useful representation would be text inside a video or picture, as it gives semantic information about each frame in the media. In the realms of video processing and machine learning, the recognition of textual content from movies is now a very stimulating and demanding topic of study. Indexing, efficient retrieval, keyword-based picture search, event recognition, and other modern applications rely heavily on text detection. Low resolution, complicated backgrounds, misalignment of text, and size, colour, and style variations are just a few of the obstacles that text area identification from video must overcome. Many studies have focused on text detection; however, they have all used various criteria to isolate the text area in a video frame. Horizontal text detection, arbitrarily oriented text detection, and multilingual text detection (Indian scenario and non-Indian scenario) methods are the main categories into which this paper's studies of video text detection techniques fall. Understanding the significance of the text detection process requires an understanding of the many difficulties that might arise, each of which is shown with an example. For the benefit of the readers, tables are included for each category.

We conclude by outlining potential future directions across all categories and evaluating methods on various datasets, including ICDAR 2003, ICDAR 2013, ICDAR 2015, Nusdataset, TrecVId, YVT, MSRRC, SVT, MSRA, KAIST, Hau's, Neocr, artificial text, oriented scene text, and our own horizontal, arbitrarily oriented, multilingual text datasets [7].

Research Methodology Multi-Script Text Detection

Architecture of LIGHT-YOLOV3

While YOLOv3 [11] is more accurate than YOLOv2, it is slower than YOLOv2. The structure that helped increase its accuracy is similar to Feature Pyramid Network (FPN) and uses residual blocks, which are similar to RESNET, to assist feature learning. It also helps identify at three scales and captures both low-level and high-level object information. Figure 1 shows how YOLOv3 performed on the COCO dataset when tested against various deep learning models executed on a Titan X GPU hardware [11]. From this, it is evident that YOLOv3 outperforms all of the other approaches while requiring much less time for inference. The Light-YOLOv3 text detection system, whose architecture is seen in Figure 2, is used for text identification in the ICDAR 2015, COCO-Text ICDAR 2017, ICDAR MLT 2017, and MLT 2019 [12, 13] datasets.

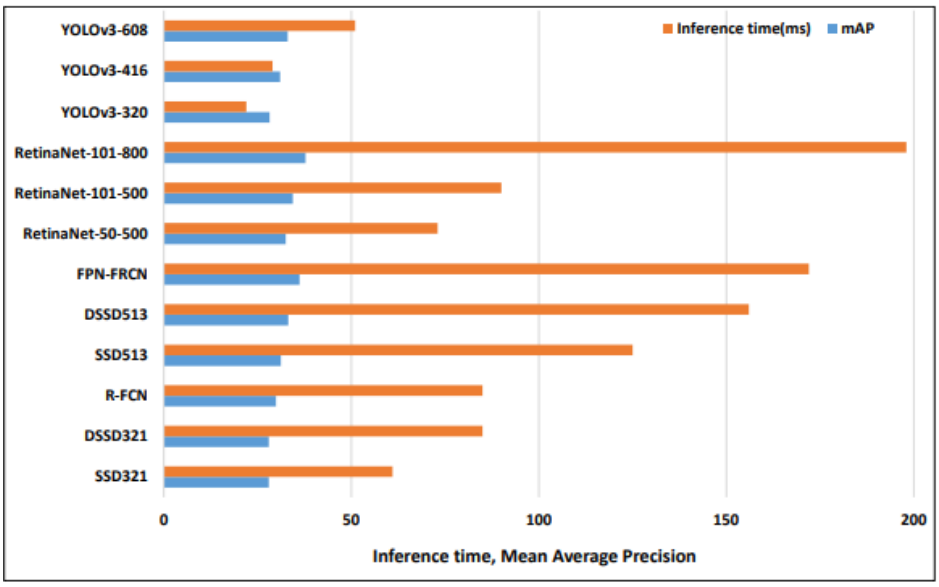


Figure 1: Deep Learning Models' Effectiveness

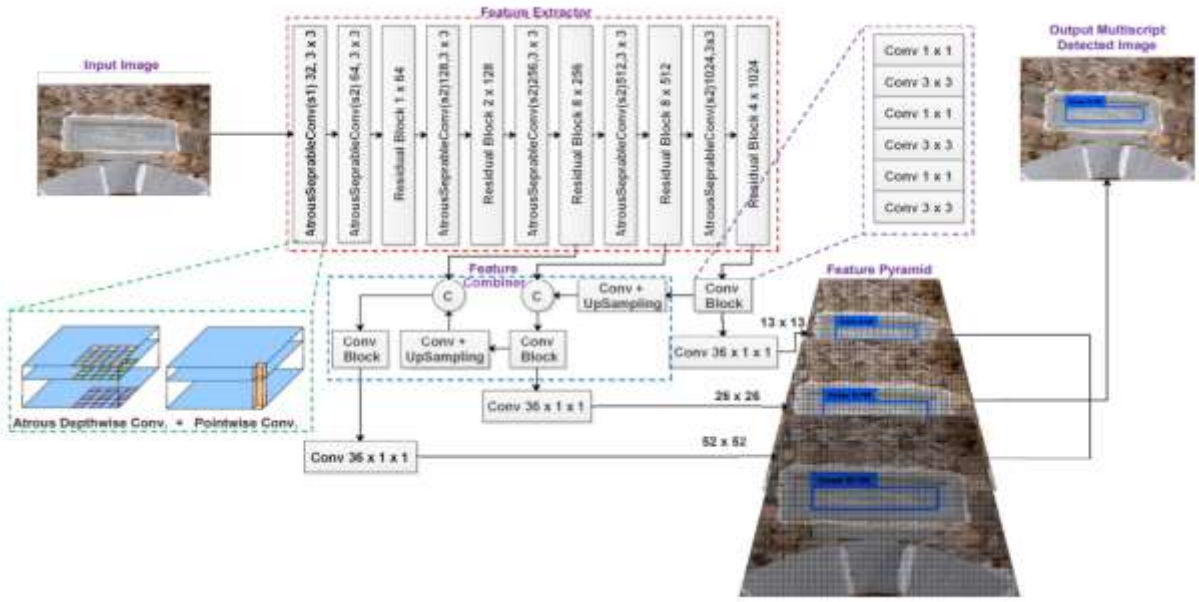


Figure 2: System for Detecting Light-YOLOv3 Texts

In Figure 2, the feature maps that aid in detecting text with large, medium, and tiny fonts are shown as 13×13, 26×26, and 52×52 pixels, respectively, from these three scales. The "Conv block" in Figure 2 is the convolutional block that comes before each feature map. It consists of three sets of 1×1 and 3×3 layers, where the filter size changes depending on the output of the preceding layer.

Table 1: AtrousSeparableConv 1024

	Filter Shape		Parameters
Standard	filter	1024	
	kernel	3×3×3	119,808
ASC (1st step)	filter	3	
	kernel	3×3×1	
ASC (2nd step)	filter	1024	22,528
	kernel	1×1×3	

Atrous Seperable Convolution:

Atrous convolution is an idea that Deeplab introduces. A parameter called rate is utilised to govern the productive field of view of the convolution in this generalised variant of the convolution process. Equation (1) gives the generalised form of atrous convolutions. Using Equation (1), atrous convolution is conducted across the input feature map x for each point j on the output feature map y, using a convolution filter f.

$$y[j] = \sum_{k} x[j + r.k] f[k]$$

The stride used to sample the input signal is directly correlated with the atrous rate r in Equation (1). "Standard convolution" occurs when r= 1.

Prediction:

In addition to a confidence score and a class at three distinct scales, Light-YOLOv3 forecasts four bounding box coordinates. According to [11], logistic regression and separate logistic classifiers are used to forecast the confidence score for every perimeter box. The ICDAR COCO-Text datasets from 2015 and 2017 include a single text class. In contrast, legitimate scripts are associated with seven distinct classes in MLT datasets (MLT 2017) and eleven distinct classes in MLT 2019 (MLT 2019). Depending on the number of classes it predicts, the system uses the tensor as N×N×[3×(4 + 1 + 1)] to predict three boxes at each scale. For the ICDAR 2015 and COCO-Text datasets, this means N×N×18, for MLT 2017, N×N×36, and for MLT 2019, N×N×48. Here, N×N represents the spatial size of the last convolutional feature map. Figures 3 (a), (b), (c), and (d) exhibit the corresponding successful qualitative results of this system on incidental scene text ICDAR 2015, COCO-Text ICDAR 2017, ICDAR MLT 2017 tasks1 and task2, and ICDAR MLT 2019 task1. This method is capable of detecting text in photos with different font sizes and in environments with several languages as well [20].

Figure 3: Benchmark ICDAR scene text datasets for text detection

When dealing with task 2 under the MLT dataset, Algorithm 1 is used to determine the appropriate script for a given word picture in cases when there are numerous predictions for the same image.

Algorithm 1: Discover an appropriate script

Input: Cropped word image I_w with predicted script S_p and confidence score C in a csv file

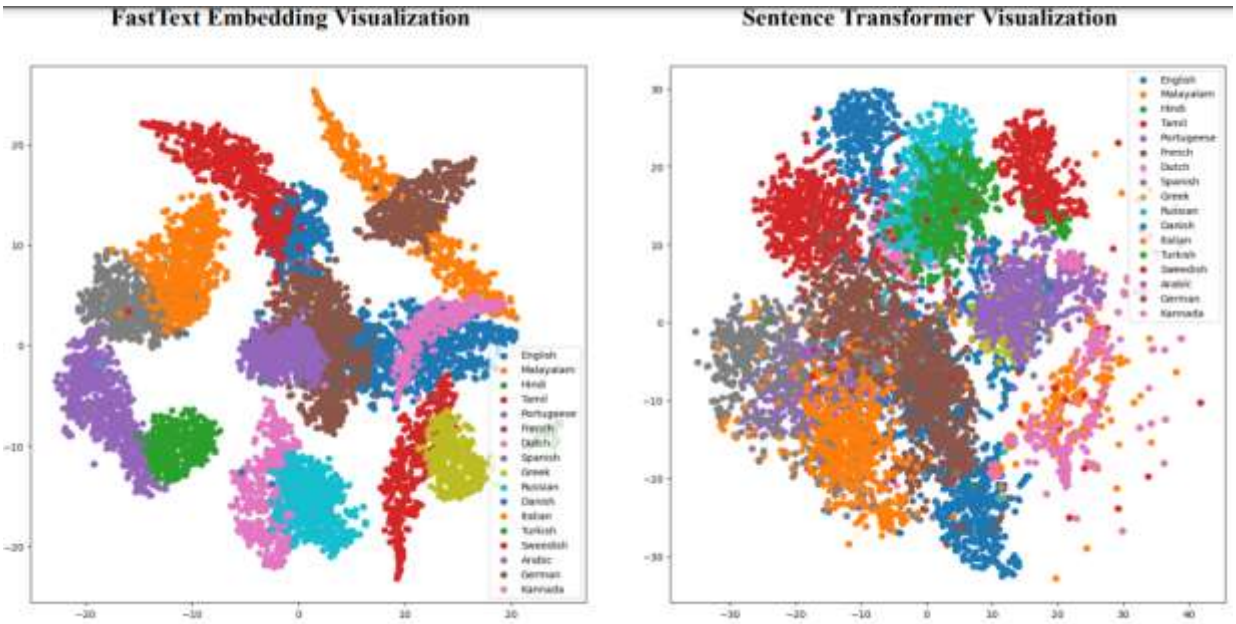
Output: Valid script S_v
for *cropped word image* I_w **do**
  if I_w *exists only once* **then**
    $S_v = S_p$ break
  end
  while *no more multiple predictions for the same* I_w **do**
    Sort the predicted scripts S_p by the confidence scores C.
    Start from the top score.
    if *any previous* S_p *has the same script with the current* S_p **then**
      Increment the count of that particular script.
      Ignore the current S_p.
    else if *the script is different* **then**
      Consider the one with majority as the S_v of that particular I_w.
    end
  end
end

Language Detection:

We used three separate built-in modules—LangDetect, LangId, and FastText—to assess language detection algorithms. Two rule-based language identification models, LangDetect and LangId, can determine the language of a document by applying a set of predetermined rules. One model for language identification that uses neural networks is FastText, which can learn several language representations of text automatically. For every language identification model, we calculated its recall, accuracy, and precision.

Embedding Generation:

The text data was embedded using Sentence Transformer. A 16-dimensional FastText embedding and a 384-dimensional Sentence Transformer embedding were both compared. Word-level representations provide the basis of FastText embeddings and sentence-level representations of Sentence Transformer embeddings [15]. The embeddings were represented using t-SNE (t-Distributed Stochastic Neighbour Embedding), which helped to decrease their dimensionality and facilitate better comprehension. By maintaining pairwise distances, t-SNE is able to transform high-dimensional data into a lower-dimensional space.



3-Dimensional t-SEN Visualization of FT-Embeddings

3-Dimensional t-SEN Visualization of ST-Embeddings

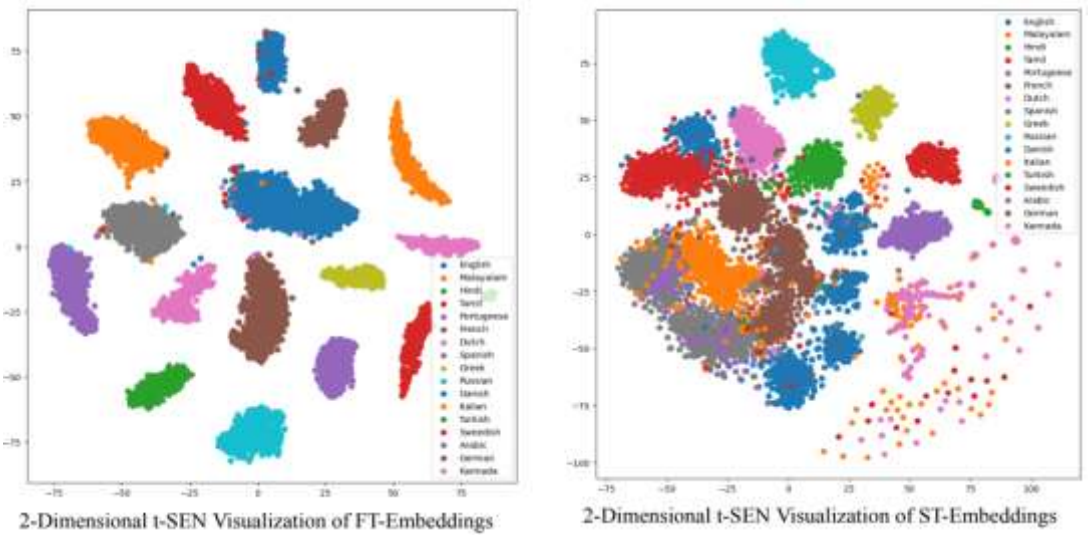


Figure 4: 2D and 3D t-SEN Visualization of FT and ST-Embeddings

Statistical Analysis:

Language classification models, such as MLP, CNN, and LSTM, were tested using a comprehensive statistical analysis. We determine the statistical significance of observed differences and examined the effect of different word embeddings on the model's performance. Furthermore, we have created visual aids, such as the FastText Confusion Matrix, to demonstrate the MLP model's accuracy and loss as a function of epoch. To better visualise our results, we also used the Sentence Transformers Confusion Matrix.

Data Analysis: Multi-Script Text Detection Ablation Study:

This technology is more successful than the original YOLOv3, according to a variety of trials and ablation studies. Figure 4 shows the results of evaluating the models on the ICDAR 2017 MLT validation datasets using metrics like average precision (AP), inference time, and number of parameters. Figure 4 shows a comparison of these values between original YOLOv3 and Light-YOLOv3. Detection time is increased by 50% with an accuracy percentage of 42.2% after including ASC into the YOLOv3 backbone, which almost halves the number of parameters compared to the original YOLOv3.

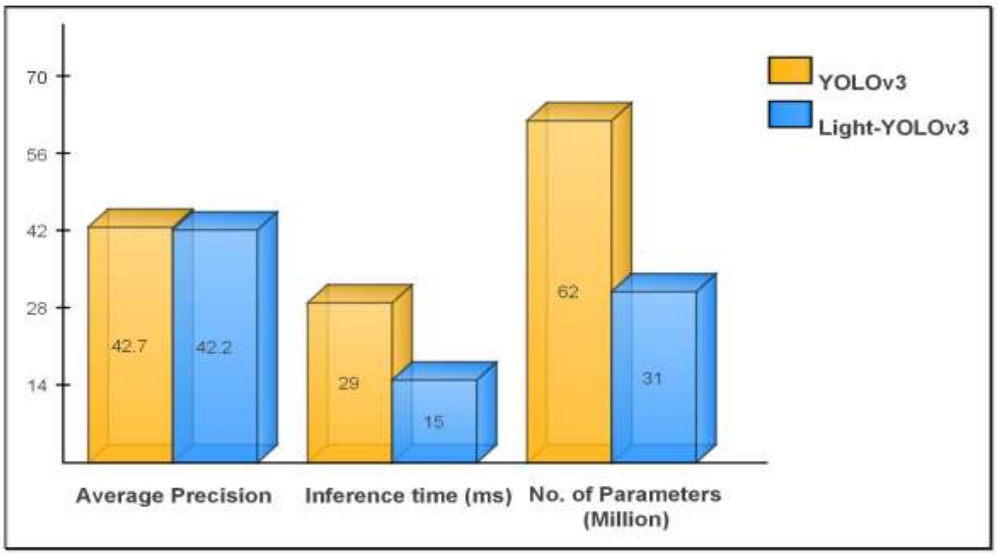


Figure 5: Evaluation of Results

Table 2 lists the confidence scores of the example pictures displayed in Figure 3, which demonstrate that the scores are rather high, leading to excellent performance. Table 2 provides numerical evidence that backs up the findings shown in Figure 3. In Figure 3, the matching detected images are ordered sequentially from (a) to (e) or (g) in Table 2, under the picture label.

Table 2: Confidence Scores

Dataset	Imagelabel	Confidencescore
ICDAR2015	(a)Text	93.28%
	(b)Text	97.42%
	(c)Text	98.56%
	(d)Text	99.48%
	(e)Text	98.80%
ICDAR2017COCO	(a)Text	96.34%
	(b)Text	88.83%
	(c)Text	85.72%
	(d)Text	86.57%
	(e)Text	99.67%
ICDAR2017MLTTask1	(a)Arabic	99.77%
	(a)Latin	98.72%
	(b)Bangla	99.94%
	(b)Latin	99.6%
	(c)Symbols	97.85%
	(c)Latin	99.96%
	(d)Japanese	58.58%
	(d)Latin	98.15%
	(e)Latin	85.0%
	(f)Korean	99.52%
	(g)Chinese	99.81%
ICDAR2017MLTTask2	(a)Korean	99.74%
	(b)Bangla	99.96%
	(c)Arabic	98.42%
	(d)Japanese	92.87%
	(e)Symbols	97.68%
	(f)Latin	98.2%
	(g)Chinese	99.08%
ICDAR2019MLTTask1	(a)Hindi	91.1%
	(b)Bangla	86.1%
	(c)Latin	89.1%
	(d)Arabic	76.1%
	(e)Chinese	63.1%

Embedded Visualisation and Deep Learning for Multilingual Text Classification and Identification:

A Comparative Analysis Comparison of CNN, LSTM, and MLP in terms of Performance:

Table 3 shows that the three models—MLP, LSTM, and CNN—perform differently in language classification. This might be because they are designed differently and can learn to identify various kinds of text. If MLPs are superior at detecting both local and global patterns in the data, then maybe they explain why the MLP model outperformed LSTM and CNN. Multi-layer perceptrons (MLPs) may develop intricate connections between input data because of their many neuronal layers. Machine learning paves the way for accurate language predictions in language categorization by learning to spot key characteristics and patterns in embeddings. Contrarily, LSTM and CNN models could experience distorted or lost data because of their unique architectures. A kind of recurrent neural network, long short-term memories (LSTMs) aim to detect data relationships in a sequential fashion. But, as the sequence length grows, they could run into problems with long-range dependencies and possibly lose crucial information.

While convolutional neural networks (CNNs) work well for processing images, they could struggle to grasp the sequential structure of linguistic input. In contrast to MLPs, CNNs may not be able to take long-range dependencies and minor language subtleties into account because to the feature extraction process's reliance on the local context window [18, 19].

Table 3: Comparative Analysis

Classifier	EmbeddingType	EmbeddingDimension	Accuracy	Precision	Recall	F1-Score
LangDetect	-	-	0.75	0.75	0.75	0.74
LangId	-	-	0.74	0.74	0.74	0.73
MLP	FastText	16	0.99853	0.99854	0.99853	0.99853
MLP	SentenceTransformer	384	0.9573	0.9585	0.9573	0.9566
LSTM	FastText	16	0.9861	0.9865	0.9861	0.9861
LSTM	SentenceTransformer	384	0.6321	0.6357	0.6321	0.6172
CNN	FastText	16	0.9960	0.9960	0.9960	0.9960
CNN	SentenceTransformer	384	0.9520	0.9553	0.9520	0.9494

With scores of 0.99853 for accuracy, 0.99855 for precision, 0.99853 for recall, and 0.99853 for F1 score, the FastText multi-layer perceptron model emerged as the clear winner. However, the multi-layer perceptron model used by Sentence Transformer was able to get a score of 0.9566, recall of 0.9573, precision of 0.9585, and accuracy of 0.9573 [16, 17]. Based on its training on a large multilingual corpus, FastText embeddings display unambiguous clustering in the 2D visualisation, and the findings demonstrate that the dimensionality of the embeddings significantly influenced the grouping of languages.

Conclusion:

In conclusion, automatically identifying a language from a provided document's text is known as text-based language identification. Languages from the same family are more difficult to distinguish from one another than languages from other families. We have created Light-YOLOv3, a Convolutional Neural Network (CNN) architecture, which is based on modified YOLOv3 with atrous separable convolution. Its purpose is to recognise and classify areas in natural scene photos that include multi-script text. Compared to the original YOLOv3 network, the detection time and quantity of parameters are lowered with ASC added into the YOLOv3 backbone. In comparison to the conventional convolution process, ASC requires less calculations to extract dense multi-scale local area features, which in turn reduces complexity. In this research, we compare and contrast several methods for language recognition and categorization that make use of deep learning and embedded visualisation. According to our findings, the FastText model that used a 16-dimensional embedding performed the best when it came to language categorization.

For researchers and practitioners interested in building language detection and classification systems, our work lays the groundwork for future work in multilingual text classification. As a follow-up to this work, a lot of avenues need further investigation. It is possible to investigate the use of several techniques for area of interest identification besides the MSER approach. The YOLO network is only one of several Convolutional Neural Networks (CNNs) that can be trained to recognise scene text using a variety of different loss functions.

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A Study on Impact of Social Media on Academic Performance of College Students

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Abstract:-
Social media is a tool that is becoming very popular these days due to its various features for its users. Social media platforms like Facebook, Instagram, Twitter, WhatsApp, You Tube and many more are giving people an opportunity to connect with each other at a distance. Especially the youth is one of the biggest users of social media. Social media usage in India is increasing among the new generation youth and college students. In today's world, the use of social media has become an integral part of a person's daily life. The purpose of this paper is to examine the positive and negative impact of social media on college students' academic performance. The new age has embraced the social networking culture and is getting a great response from them. Studies have shown that social media has both positive and negative effects on college students.

Key Words: - Social Media, Impact and College Students

Introduction:-
Social Media is a platform through which we connect with society. Internet is the main medium in this. Social media is a platform where we connect with people we know and also with strangers. Friendship happens through social media. Some people also use it for academic and professional purposes. Social media use has grown over the last decade and is now more prevalent than ever, even among college students. The length of its usage, the characteristics of students who use it, and how social media use connects to students' academic achievement and well-being have all been studied. Furthermore, the benefits and drawbacks of social media for college students are examined

Statement of Problem:-
It has been observed that students are paying more attention to social media than their studies. The increased proximity of students to social networks has become part of the discussion in recent times. Instead of reading books, students are spending more of their time on social media. Because when you don't read, you can't do well academically. It is a common sight to see students chatting in the lecture hall

In recent times, social media has created a prominent place in the minds of students. Therefore, students, teachers and educational institutions should consider the impact of social media use on students' academic performance. All students should use social media for studying. Whether social media promotes learning is a question that needs to be answered. Thus, the issue that this study explores is the impact of social media networks on the academic performance of college students.

Social Media in Education:-
There are several ways in which people are linked to social media. People are using social media for a variety of reasons. Students use the internet for academic purposes, to stay in touch with friends, and to maintain their online presence. Social media is very important to the student's education. Students are forming groups on social media platforms in order to share information about a common goal. This study establishes social media's place in education. It is critical to assess whether students use social media for work assignment..

Objective of the Study:-
1. To evaluate the impact of social media on academic performance among college students.
2. To discover the advantages received by college students from using social media
3. To find out the reasons why college students use social networking platforms.

Sources of Data Collection:

Collection of Data:-
The data required for the present research is collected by using both Primary and Secondary Sources.

Primary Sources:-
The researcher used a self-structured questionnaire to acquire primary data from college students.

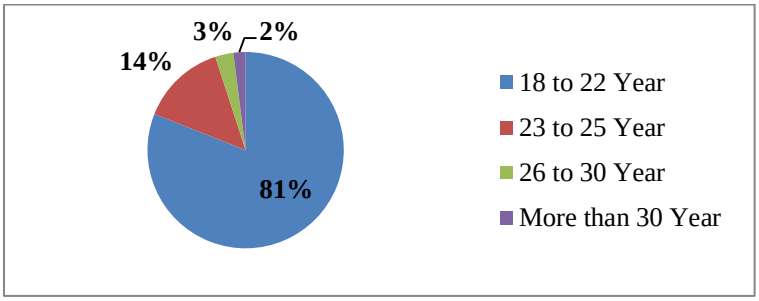
Secondary Sources:-
Secondary data has been collected from various articles, journals, magazines.

Sample Size:-
It has been noted that the study's population is very large. Due to a shortage of time, 100 college students were chosen as a sample for the survey in order to increase the study's accuracy.

Data Analysis:-

Details of Age Group of the Respondents:

Graph No – 1

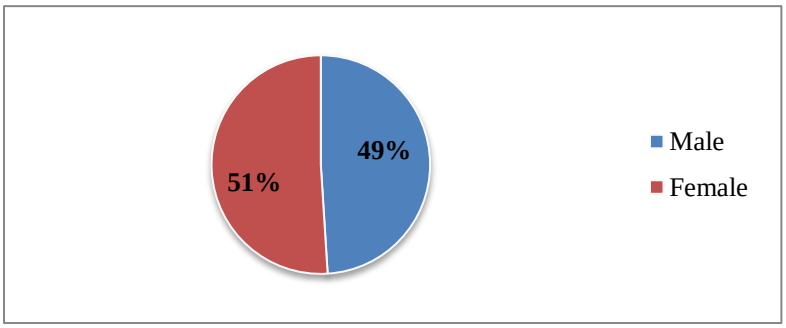


Source: Primary Data

From the above Graph no. 1, it is inferred that 81% of the respondents belongs to the age group of 18-22, 14%, 3%, and 2% of respondents belongs to the age group of 23-25, 26 to 30 and more than 30 years respectively

Details of Gender of the Respondents

Graph No – 2

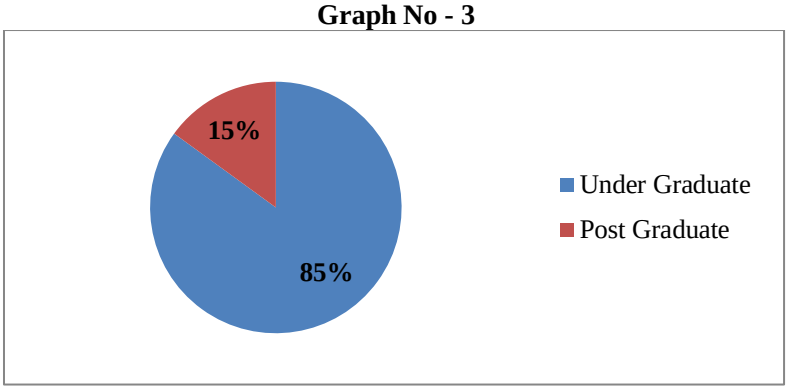


Source: Primary Data

From the above Graph no. 2, it can be observed that 49% of the respondents are male and 51% are female.

Educational Qualification:-

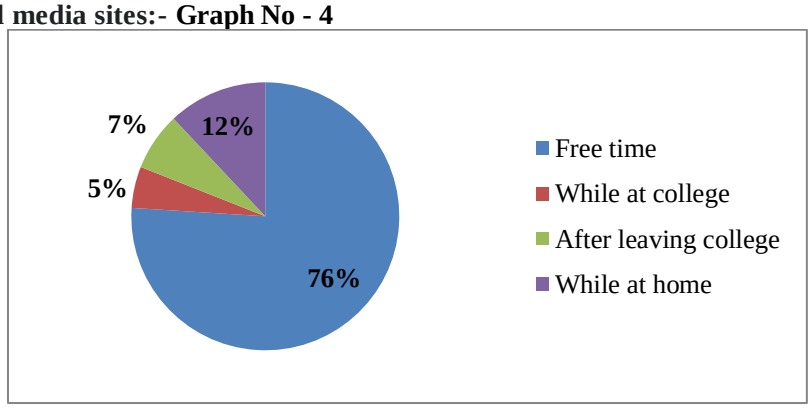
Graph No - 3



Source: Primary Data

From the above Graph no-3, it can be stated that 85% of respondents are undergrads and 15% are postgraduates.

When do use social media sites:- Graph No - 4

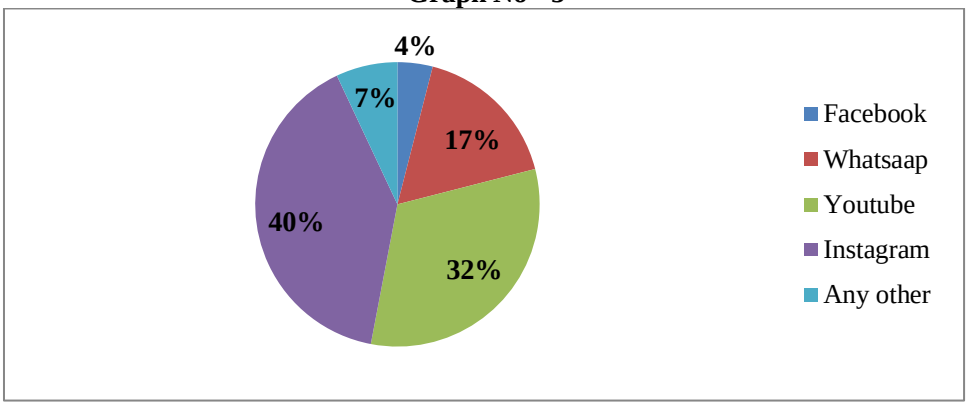


Source: Primary Data

From the above Graph no. 4, it is inferred that 76% of the respondents used social media sites at free time , 5%, 7%, and 12% of respondents used social media sites at while at college, after leaving college and while at home respectively

Which is favourite social media sites:-

Graph No - 5

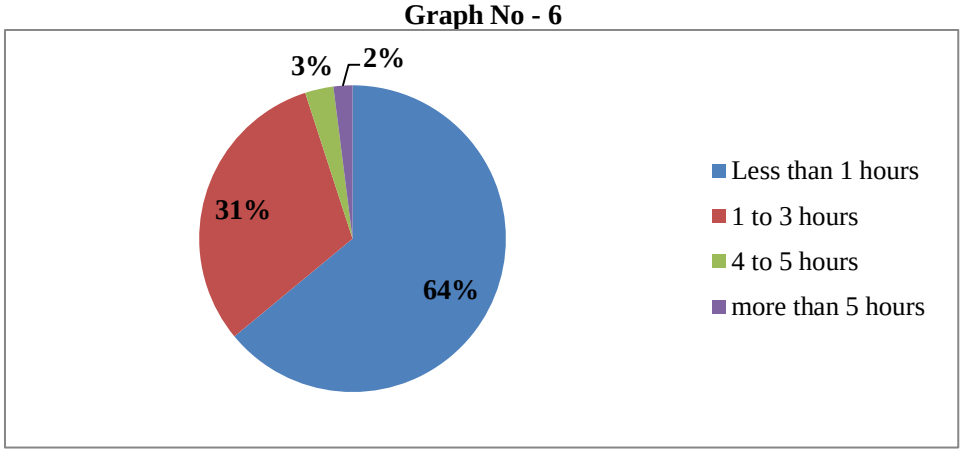


Source: Primary Data

Based on graph no. 5, it can be deduced that 40% of respondents consider Instagram to be their preferred social media platform. YouTube comes in second (32%), followed by WhatsApp (17%), Facebook (7%) and any other (4%) in that order. It is evident that college students' preferred social networking platform is Instagram.

How much time spends on social media sites per day:-

Graph No - 6

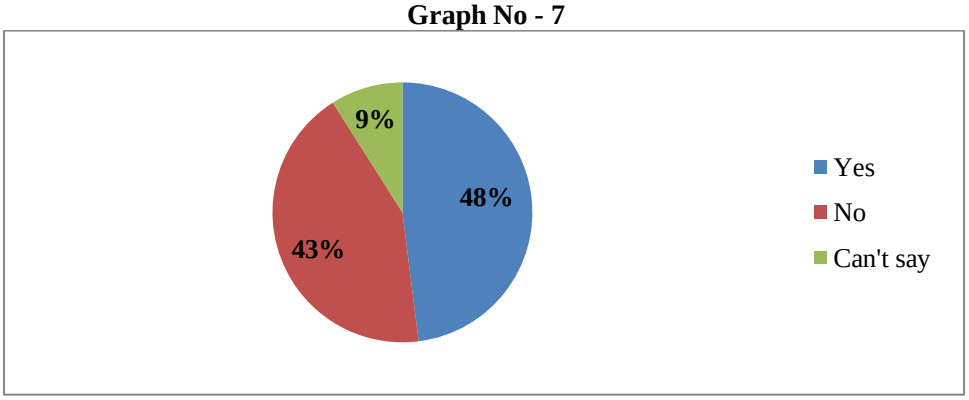


Source: Primary Data

From the above graph, No-6, it can be observed that 64% of respondents spend less than one hour per day on social media, 31% spend 1 to 3 hours, 3% spend 4 to 5 hours, and 2% spend more than 5 hours.

Does social media affect academic performance:-

Graph No - 7



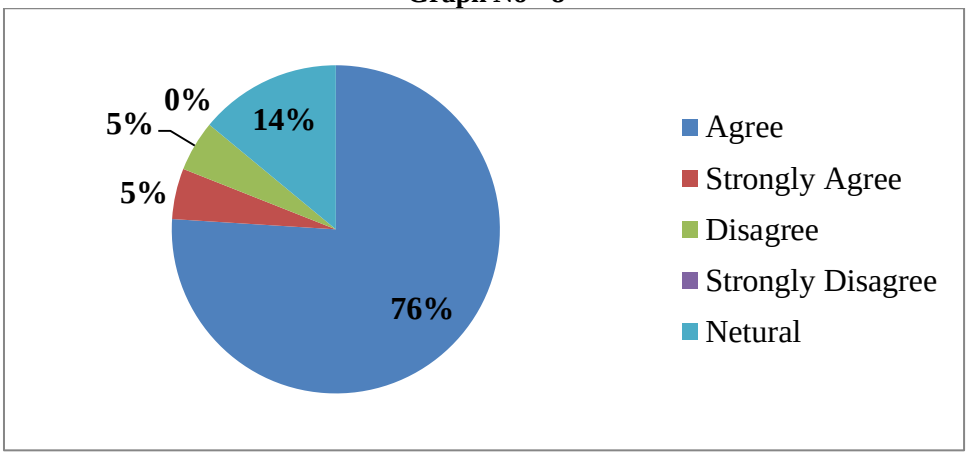
Source: Primary Data

Graph No. 7 makes it evident that 48% of respondents said that using social media influences their academic performance, while 43% said that it has a negative impact. Just 9% of the respondents expressed uncertainty about the potential impact of social media use on academic performance. According to the research, 48% of respondents said

that using social media significantly affects their academic work and studies.

Social media is improving academic performance:-

Graph No - 8

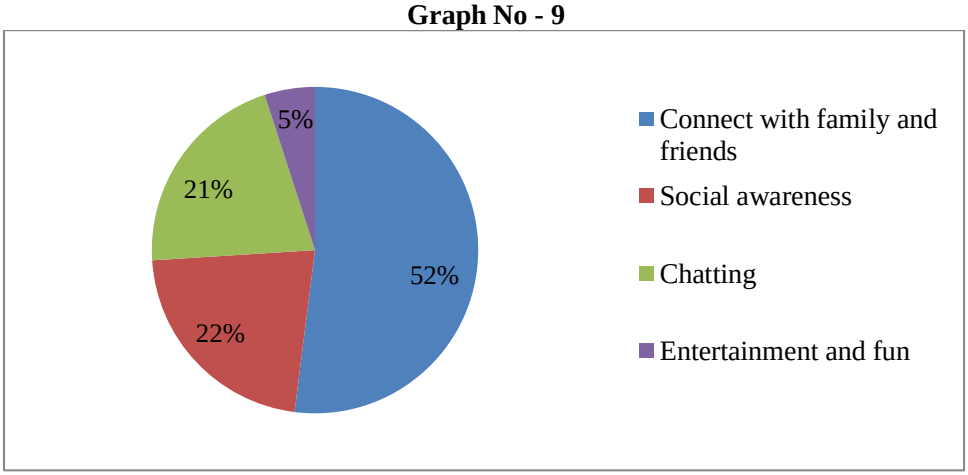


Source: Primary Data

Graph No. 8 makes clear that while 76% of respondents expressed agreement with the question, 5% of respondents strongly agreed with it. Conversely, 14% of respondents expressed netural and 5% of respondents disagreed, which indicates they expressed a negative opinion about the question. Thus, it can be said that college students' usage of social media enhances their academic performance.

Purpose behind using social networking sites:-

Graph No - 9

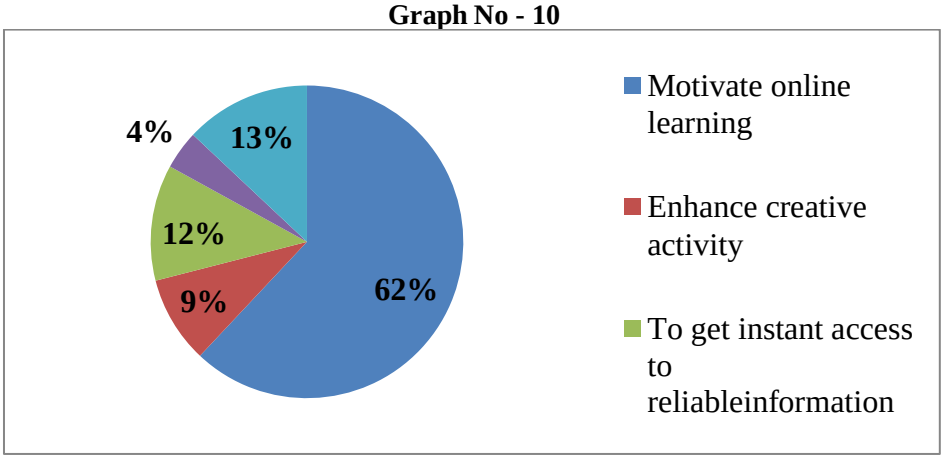


Source: Primary Data

Based on above Graph No. 9, it can be noticed that 52% of respondents said they used social media to connect with friends and family, 22% said they used it to create social awareness, 21% said they primarily used it for chatting, and 5% said they used it for fun and entertainment.

How has the use of social media positively affected:

Graph No - 10

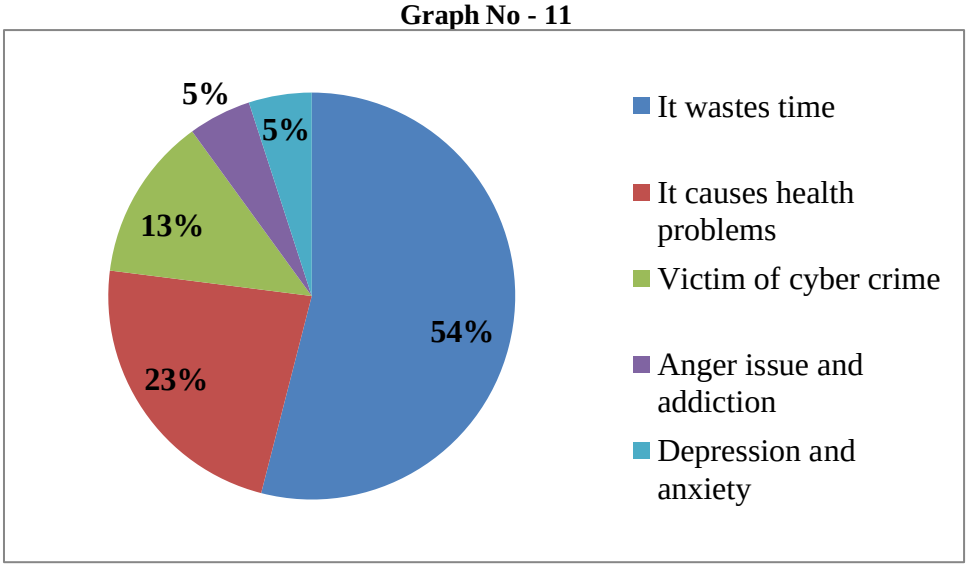


Source: Primary Data

According to the above Graph No. 10, 62% of respondents stated that online learning had a positive impact on them. Another 13% of respondents said that they benefited from job opportunities, 12% said that they benefited from instant access to reliable information, 9% said that they benefited from enhanced creative activity, and 4% said that they benefited from improved communication.

How has the use of social media negatively affected

Graph No - 11



Source: Primary Data

According to the above Graph No. 11, 54% of respondents claimed that using social media was a waste of time, 23% claimed that it causes health problems, 13% claimed to have been a victim of cybercrime, 5% claimed to have problems with anger and addiction, and another 5% claimed to have problems with depression and anxiety

Findings and Suggestions:-

Findings:-

This study examined the impact of social media on college students. Results revealed that 62% of the respondents said that they have benefits/ positive impact of motivate online learning from social media and another 13% of the respondents got benefits of job opportunities, 12% of the respondents get benefits like instant access of reliable information, 9% of the respondents benefited by enhance creative activity and 4% of the respondents got benefits for lead to better communication. Results also show that social media use negatively impacts addiction and anger management, leads to time wastage, and increases the risk of cybercrime. Users must keep in mind social conventions and cultural values when utilizing social media

Suggestions:-

It is recommended that social media users keep in mind why they are using the platform, continue to visit educational websites, and be mindful of the privacy risks associated with utilizing social networking sites.

Students can make better use of their time on social media by spending it on meaningful conversations and postings on platforms like Facebook, YouTube, WhatsApp, Instagram, and Twitter, rather than wasting it on unofficial conversations.

In order to safeguard children's futures, educators and parents must to investigate what their children are truly doing on social media.

Conclusion:-

According to the studies, social media has both beneficial and harmful effects on our college students. Students need to understand why they are using social media, how long they stay online in order to benefit their personal and social networking goals.

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Plagiarism Detection: Tools, Policies, and Challenges

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Abstract:

With the increased incidence of cheating and plagiarisms, plagiarism detection has become an essential tool in enforcing integrity in written work. This abstract examines the landscape of plagiarism detection by focusing on three crucial aspects: tools, policies and issues.

Tools: Modern tools applied to plagiarism detection keep computers algorithms and data bases which compare the submitted texts with a wide range of source materials, including the papers, Web-sites, and publications. Some of the familiar tools that include Turnitin, Grammarly and Copyscape use features including text match, fingerprint, and semantic check, respectively, to identify cases of plagiarism. Every tool is characterized by features and performance based on the underlying technology and the range of databases it covers.

Policies: In this regard, the fight calls for efficient policies required in handling and preventing plagiarism cases. These policies describe what koruppla is, how and when it will be identified and acted upon and the penalties to be imposed. It means that current practices cannot be neither too rigid nor narrowly defined and must take into account ongoing changes in the media environment and the differences between the subjects. They should also reflect certain ethical premises and goals of the institution where the educational process is being carried out, as well as using punitive measures in conjunction with educational.

Challenges: Hence several challenges are detected in plagiarism detection even with advancement in technology and good policies in place. These include the possibility of Type I errors, that is mistaking genuine citations for plagiarism, and Type II errors where real plagiarism is not picked from the rest. In particular, content that is posted online is virtually dynamic and constantly changing; the strategies used by cheaters also evolve and become more sophisticated. Secondly, there is always a dilemma on whether the main emphasis should be placed on the detection or on teaching the students about citation policies.

Keywords: Plagiarism detection, academic integrity, detection tools, plagiarism policies, challenges, text-matching, semantic analysis, false positives, false negatives.

Introduction:

Most scholars have listed plagiarism, the act of presenting or copying someone else's work and/or ideas as his or her creation, as a major stumbling block particularly in scholarly practice, professional careers and arts. More content in the digital environment means that there is even greater freedom and therefore greater potential for both accidental or intentional plagiarism. This calls for effective measures in check of plagiarism in order to ensure that academic works are credible and research is done rightfully.

The tools used at present for detecting plagiarism include common match detecting software all the way to far more complex machine learning products. These tools have become very vital especially in educational institutions where issue to do with learners' integrity is of so much concern.

However, practical technologies coupled with plagiarism awareness policies relevant from one institution to another are way of heading towards a responsible academic world.. Thus, Institutions need to install detection tools that in turn need to make the students and the staff aware of the concept of plagiarism and its implications.

In general, the fight against plagiarism is a problem with potential difficulties. Concerns as the appearance of noise, static nature of materials, and the question of the extent of control and enforcement of policy against the free learning make the problem less straightforward. Additionally, as better technologies and techniques develop for plagiarism detection, so similar strategies are adopted by people who wish to avoid them.

The purpose of this paper is to identify the available tools and methods for plagiarism detection, review the policy issues related to their utilization, and describe current and anticipated difficulties of combating plagiarism at the individual and institutional levels. Understanding these components enhances awareness of the challenges of keeping integrity in today's worldly connected society.

Tools for Plagiarism Detection

Software Solutions:

This market has grown and developed various solutions for detecting plagiarism – tools that can help recognize cases of cheating on the part of

students. Some of the most prominent tools include:

- Turnitin: Turnitin is a very popular tool among academic institutions due to its opportunities to check the papers, plagiarism database with published sources and students' papers as well as internet sources. It gives similarity reports indicating possible matches as well as for extensive indexing is recognized.
- Grammarly: Although incorporated as a spell and grammar checker, Grammarly has incorporated the plagiarism check-on option that compares a document against millions of academic papers and web content.
- Copyscape: This tool is less general and is mainly aimed at web content and reception by authors of articles, blogs, and SEO specialists. It matches text with web data to check for similarity.
- Plagscan: Plagscan generates a thorough report on plagiarism and is easy to use by individuals seeking the service. Both universities and various companies work with it.
- Plagiarism Checker by Small SEO Tools: CoSchedule's free version is great for a basic scan of online content. Certainly, as compared with paid tools, the identified functionality is not very extensive; however, it allows to determine the basic level of plagiarism.

Technological Innovations:

Recent advancements in technology have led to the development of more sophisticated plagiarism detection methods:

- Machine Learning: Plagiarism is being identified as machine learning algorithms applied in an attempt to learn patterns into texts. Other algorithms in these cases can help to detect paraphrasing and other more subtle form of plagiarism.
- Natural Language Processing (NLP): NLP techniques allow tools to look at the context, and therefore recognize whether content has been copied and only slightly rewritten.
- Blockchain Technology: The use of blockchain technology presents a possibility to preserve the authenticity of academic work through record keeping of authorship.

Policies for Addressing Plagiarism

Institutional Policies:

Institutions implement a range of policies to prevent and address plagiarism:

- Honor Codes: A case of the policy is that many educational institutions have honor codes, which usually students sign, and among them are the provisions for both plagiarism and penalties for its punishment.
- Academic Integrity Policies: These guidelines define what form of cheating as plagiaries, how cases of plagiaries will be addressed and the consequences which shall be enacted against those found wanting.
- Educational Programs: Schools use sensitization activities such as seminars and trainings to create awareness to the learners and workers of the facets of plagiarism, correct referencing and issues of integrity.

Legal and Ethical Considerations:

- Copyright Law: Plagiarism is closely related to copyright, which gives author's rights protection against copies and imitation. Awareness of the legal repercussions of plagiarism is beneficial for institutions and persons according to the presented theories.
- Ethical Guidelines: Scholarly and professional societies provide rules of conduct which require the authors to adhere to standards of originality in the work they perform and the cold engrave citations.

International Perspectives:

Measures against plagiarism depend in many cases on cultural and educational requirements. Targeted research findings show that though some countries have highly effective anti-plagiarism policies, others either lack strict measures or have no real means of enforcing them.

Challenges in Plagiarism Detection:

Complexity of Detection:

- Paraphrasing: Just as it is often difficult to recognize plagiarism that has been committed directly, one of the most difficult tasks is to recognize content that has been paraphrased. It is not easy to identify cases when one has copied a text and merely rephrased instead of quoting it.
- False Positives: This implies that detection tools may also detect common word phrases or commonly used terminologies in a course as plagiarized and thus, very many of them have to undergo routine examination.
- Database Limitations: It means that no tool may work with all the potential sources of plagiarism. To some extent, the applicability of a detection tool is constrained by the number of entries in its database.

Technological Limitations

- Adaptation by Plagiarists: In the next decade, reflecting trends in improvement of the various detection tools, the techniques applied by individuals who wish to avoid detection also advance. This ensures that there are hard copies of assignment's source documents in addition to using techniques to frustrate efforts by tools to capture all other forms of plagiarism such as using synonyms or changing sentences.
- Resource Constraints: There are some powerful tools to detect the degree of plagiarism which can be rather expensive, and therefore not all institutions may afford to use them.

Cultural and Contextual Differences

- Varying Standards: That is why depending on the academic culture and discipline there are different requirements to the acceptable use of sources. It goes without saying that such fluctuation may cause certain challenges in case of applying the unified anti-plagiarism policies.
- Translation Issues: Also at global level, academic publications helps in overcoming difficulties faced in identifying cases of Plagiarism across various languages. Some tools may not work as quietly in all the languages or can fail to identify an incidence of plagiarism in a translated piece.

Case Studies:

Academic Institutions:

Several academic institutions have made strides in combating plagiarism through innovative policies and tools:

- University of Oxford: Academic integrity policy and plagiarism detection and prevention: Oxford has also a well formulated academic integrity that check for plagiarism. It focuses on both, technology and learning.
- Stanford University: To curb plagiarism at Stanford, the institution has used both Turnitin and its local techniques. All their policies aim at enhancing equality and/maximizing transparency regarding the detection techniques to be used.

Publishing Industry:

The publishing industry also faces challenges related to plagiarism:

- Peer Review: To ensure the publication output the quality and originality of published works, publishers have incorporated plagiarism detection as part of submission peer review.
- Retraction Policies: Of the journals, some have provided policies for retracting articles with an element of serious plagiarism, showing that integrity needs to be uphold in this academic processes.

Conclusion:

First of all, it is necessary to mention that plagiarism detection is a complex problem that deals with the combination of high technologies, strict regulation, and constant problems. As more content is produced, how effectively tools for plagiarism detection work and how sound and watertight policies are will be again important in maintaining the integrity of a profession. Despite changes in competency, plagiarists require one to step up their game to ensure every other hardworking individual benefits from reinvention of techniques that support originality and integrity of work produced be it in academia or any other field.

While more and more information flows profusely in the field, the issue of plagiarism continues to be a key problem in academic and career fields. Preventing plagiarism is crucial to preserving the standards of academic work and promote originality and integrity in research. In this paper, the author has elaborated on different available tools for identifying plagiarism and the technology that is used in them and need to embrace them into learning institution. Consequently, it is important to implement strong polices that describe the exact meaning of plagiarism as well as sanctions for the vice. When students and the faculty learn the importance of academic integrity, the institutions begin creating a culture that supports innovation and appropriate conduct during research. But the fight against plagiarism is not without its challenges which are explained in the following sections. The ongoing flow of evolved digital contents, refinement of evading strategies, and possibilities of false positive also make lot of burdens for educators and institutions. Such matters therefore require intervention that uses technology, policy, and education intervention in order to solve the problems effectively. In the future, while using such powerful detection tools, it is necessary to ensure that students know the basics of ethical scholarly behaviors. Talking about its benefits such actions will allow them to maintain integrity and, in this way, promote the development of academic and professional fields at a high level, relying on respect and trust.

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Library Finance in collection development in academic libraries

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Abstract:
For the purpose of expanding the library's collection, items should be chosen with the users' present and future needs in mind. Print and non-print items in libraries are referred to as library collections. The difficulties involved in developing and organizing a collection are covered by new rules, principles, techniques, and procedures. The librarian must use caution when building the collection in order to preserve the library's quality.

Keywords: Collection Development, Methods, Policy, Finance

Importance of Finance:

Finance is the motive power. Finance is essential for running any institution properly. The authorities should guarantee stable and adequate financial support to the various institutions created by them. This becomes all the more important if the institutions are to render satisfactory and efficient service to the community. No scheme or plan can meet any appreciable success in the absence of adequate funds.

Importance of library finance:

finances for the proper functioning of the library system are as important and as necessary as water for the production of bumper crops. If the irrigation system fails to provide sufficient water the crops are likely to be damaged. Similarly, if the educational system of the country fails to provide sufficient financial resources for its libraries, library services are bound to be disrupted, poor, and inadequate. If the provision for money to run the library system is inadequate and scarce it is frequently spent less wisely. Good library management depends on adequate funds.

Finance plays an important and significant role in the development of the collections in the libraries. A balanced collection can be attributed to a well-planned distribution of the financial resources available to the library. For this purpose, it is necessary to evolve some standards for allocation of finance for acquisition in libraries. The main factor is" the use of the collection is very well utilized in the allocation of funds for library acquisition "

Sources of library finance:

Income is the basic need for the operation of library services and providing library funds is a crucial question. Being an ever-growing and spending institution, the library must have some sources of income to meet its expenditure. The financial resources should be made available in such a way that the growing needs of libraries are met adequately.

The sources of colleges and universities for getting grants can be viewed under two categories viz.

Primary sources

1. The University Grants Commission (UGC)
2. The Governments (union as well as state)
3. Endowment funds
4. College or University Grant
5. Grant from Agencies

Secondary sources:

1. Membership fee
2. Fine
3. Membership fees by non-students and teachers

Library fund:

The UGC Commission on University and College Libraries suggested for creation of a library fund. Important recommendations in this regard are:

1. The library fund of a university or a college should be maintained and operated as a separate library account.
2. To make the spending of book funds useful and to avoid it being dissipated on the rush purchase of any of the materials readily available in the nearby market, the inappropriate amount of the budget should not be lost to the library, but should be carried forward to the credit of the library and be available for inclusion in the budget of the next year, as an addition to the normal allotment. Our chief book market is now thousands of miles away. Scholarly treaties, research material, and particularly back volumes of learned periodicals take a long time to search and procure. Therefore this provision for the revival of unspent balance in the next year's budget is quite essential.
3. Each library should

a. Spread the utilization of the grants received from the commission for reading and kindred

materials as uniformly as possible over the entire period of 17 months allowed for purchase;

b. Avoid hastening to spend the grant somehow on the purchase of whatever is available for immediate delivery without fully satisfying itself about the actual or anticipated demand of the reading materials purchased;
c. Complete all administrative or technical work on the reading materials and release them for use by the readers as expeditiously as possible, say, Within less than one month of their receipt in the library.

Conclusion:

The library is a trinity of readers, resources, and staff, that deals with the interpretation of library development and collection development practices for digital library environments. When creating a qualitative collection for users' benefit, a number of things are taken into account. To determine their use and further improve the usefulness of collection development in electronic contexts, evaluations of collections are equally important. The librarian plays a crucial role in achieving the aim and promoting the usage of library resources. The collection was primarily created with readers' requirements in mind.

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Comparative Study of the Challenges Faced by Indigenous Peoples: Global and Local Perspectives

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Abstract:
Indigenous peoples across the globe face a multitude of challenges stemming from historical injustices, socio-economic marginalization, and cultural erasure. This study explores these challenges from a comparative perspective, analyzing global trends and local case studies. The research focuses on indigenous communities' struggles with land rights, cultural preservation, access to education, and political representation, emphasizing the intersectionality of these issues in the context of globalization. Particular attention is given to indigenous populations in India, the Americas, and Oceania. The study aims to identify patterns of resilience, highlight best practices for advocacy, and propose actionable solutions. The findings underscore the need for inclusive policies, global solidarity, and sustained efforts to address systemic inequities.

Keywords: Indigenous Peoples, Cultural Preservation, Land Rights, Globalization, Marginalization, Advocacy, Resilience, Policy Inclusion

Introduction:

Indigenous peoples, comprising approximately 476 million individuals across 90 countries, represent a significant yet often overlooked demographic globally. Their unique cultures, languages, and traditional knowledge systems are invaluable to humanity's collective heritage. Despite this, they continue to face systemic discrimination, loss of ancestral lands, and socio-economic exclusion. This comparative study examines the challenges indigenous peoples encounter globally and locally, offering a nuanced understanding of their struggles and resilience.

The focus on global and local perspectives aims to shed light on commonalities and differences in the experiences of indigenous communities. From the dispossession of Native Americans in the United States to the cultural erosion of tribal groups in India, these narratives converge on themes of historical oppression and modern inequities. This study advocates for a holistic approach to addressing these challenges, emphasizing the importance of indigenous agency and collaboration in policy-making processes. Indigenous peoples represent some of the most diverse and historically rich communities in the world. With their unique cultures, languages, traditions, and profound connections to their ancestral lands, indigenous communities embody a vital part of humanity's shared heritage. Despite their invaluable contributions, they remain among the most marginalized groups globally, grappling with historical injustices and systemic inequalities. This study delves into the comparative challenges faced by indigenous peoples across the world and in India, exploring the nuances of their struggles, the impact of policies, and the resilience they exhibit in the face of adversity.

Significance of Indigenous Peoples:

Indigenous peoples are custodians of biodiversity, stewards of traditional ecological knowledge, and exemplars of sustainable living practices. From the Maori in New Zealand to the tribal communities in India's North-Eastern states, they provide insights into harmonious coexistence with nature. Yet, globalization, climate change, and socio-economic development have threatened their existence. The struggles for recognition, land rights, and cultural preservation highlight a global pattern of marginalization rooted in colonial history.

Global Perspectives:

Worldwide, indigenous communities have faced systemic displacement, cultural assimilation, and socio-economic exclusion. In the Americas, colonial expansion led to large-scale dispossession of Native American lands and erasure of their cultural identities. In Australia, the Aboriginal communities experienced similar oppression through forced assimilation policies. Indigenous peoples in Africa and Asia have struggled against encroachment on their ancestral lands due to industrialization and mining activities. Despite these adversities, movements like Standing Rock and advocacy through the United Nations have brought their concerns into global discourse.

Local Context: India:

India is home to approximately 104 million Scheduled Tribe (ST) individuals, accounting for

8.6% of the total population (Census 2011). These communities, often referred to as "Adivasis," are among the oldest inhabitants of the Indian subcontinent. Their cultures, languages, and practices enrich the nation's diversity. However, the challenges faced by India's tribal communities are deeply rooted in socio-political, economic, and historical contexts. From the colonial era to modern times, Adivasis have faced displacement due to large-scale development projects, loss of cultural identity, and systemic exclusion from mainstream governance.

Historical Injustices:

Colonial policies often exploited indigenous lands for economic gains, displacing native populations and disrupting their cultural frameworks. Post-independence, industrialization and infrastructure projects further alienated tribal communities from their resources. These challenges are compounded by contemporary issues like deforestation, land acquisition, and political marginalization, leaving many communities in perpetual cycles of poverty and disempowerment.

Current Challenges

Indigenous peoples face a wide array of challenges, including:

Land Rights: The dispossession of ancestral lands remains a significant issue, threatening their identity and livelihood.

Cultural Preservation: Modernization and globalization have endangered indigenous languages, art forms, and spiritual practices.

Access to Resources: Many communities face barriers to education, healthcare, and economic opportunities, perpetuating cycles of marginalization.

Political Representation: Despite their numbers, indigenous peoples often lack adequate representation in policy-making processes.

Impact of Climate Change: Indigenous lands, often rich in biodiversity, are disproportionately affected by environmental degradation, exacerbating their vulnerabilities.

Resilience and Advocacy

Despite these adversities, indigenous communities worldwide have displayed remarkable resilience. Movements like the Chipko Movement in India and global initiatives like the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) have paved the way for greater recognition of their rights. The rise of indigenous leaders and activists has also brought critical issues to international attention, challenging narratives of victimhood and emphasizing empowerment.

Purpose of the Study:

This study aims to compare the challenges faced by indigenous peoples globally and locally, with a focus on India. It seeks to identify commonalities, understand region-specific nuances, and propose sustainable solutions to foster inclusion, equity, and empowerment. By analyzing historical contexts, current trends, and future prospects, this research provides a comprehensive understanding of the state of indigenous peoples and their ongoing struggles for recognition and justice. Indigenous peoples' journeys reflect the broader challenges of equity and justice in a rapidly modernizing world. Their stories are not merely about survival but also about resilience, creativity, and the pursuit of self-determination. Recognizing and addressing their challenges is essential not only for their well-being but also for the broader goals of global sustainability, cultural diversity, and human rights. This study contributes to this imperative by exploring their struggles and successes in depth.

Definitions

1. **Indigenous Peoples**: Communities that have historical continuity with pre-colonial societies and maintain distinct cultural, social, and economic practices.
2. **Cultural Preservation**: Efforts to safeguard the traditions, languages, and practices of a community.
3. **Land Rights**: Legal recognition and protection of indigenous peoples' ownership and use of ancestral lands.

Need for the Study

Indigenous peoples are vital custodians of biodiversity and traditional knowledge systems.

However, their marginalization threatens not only their survival but also the loss of irreplaceable cultural and ecological heritage. Understanding and addressing these challenges are imperative for fostering global equity and sustainability.

Aims and Objectives Aims

To analyze the challenges faced by indigenous peoples globally and locally, and to propose actionable solutions for their empowerment and inclusion.

Objectives

1. To identify the socio-economic and cultural challenges faced by indigenous communities.
2. To compare global trends with local case studies, focusing on India, the Americas, and Oceania.
3. To evaluate the role of policy frameworks in mitigating these challenges.
4. To suggest measures for enhancing indigenous agency and resilience.

Hypothesis

Indigenous communities globally face similar structural challenges, but local socio-political contexts significantly influence the nature and extent of their struggles.

Research Methodology:

1. **Research Design**: Comparative and qualitative analysis.
2. **Data Collection**: Secondary data from reports, academic articles, and case studies; primary data from interviews with community leaders.
3. **Data Analysis**: Thematic and content analysis to identify patterns and variations across different regions.

Strong Points of Present Research Study

1. Unique insights into the intersectionality of indigenous struggles.
2. Comprehensive global and local perspective.
3. Proposes actionable recommendations grounded in empirical evidence.

Indigenous peoples possess unique and enduring strengths that have allowed them to thrive for centuries despite persistent challenges. These strong points are fundamental to their identity and resilience and serve as critical assets in addressing contemporary global issues. Below is an in-depth exploration of these strong points, emphasizing their cultural, ecological, social, and political significance.

Cultural Diversity and Rich Heritage

Indigenous communities are the custodians of diverse cultures, languages, traditions, and knowledge systems. This cultural richness enhances global diversity and contributes to humanity's collective heritage.

- **Linguistic Diversity**: Indigenous languages encode centuries of knowledge and worldview, with many serving as a bridge to understanding local ecosystems.
- **Oral Traditions**: Storytelling, rituals, and folklore sustain cultural continuity and serve as tools for intergenerational learning.
- **Art and Crafts**: Indigenous art forms reflect deep connections to nature, spirituality, and identity, contributing to global artistic expressions.

Environmental Stewardship and Traditional Ecological Knowledge (TEK)

Indigenous peoples have a profound relationship with their environment, making them invaluable stewards of biodiversity and natural resources.

- **Sustainable Practices**: Techniques like shifting cultivation, water conservation, and forest management exemplify long-term sustainability.
- **Climate Resilience**: Indigenous knowledge systems provide practical solutions to climate adaptation and mitigation, such as seed preservation and disaster prediction.
- **Guardians of Biodiversity**: Indigenous territories house an estimated 80% of global biodiversity, making them essential for conservation efforts.

Resilience in the Face of Adversity

Despite centuries of colonialism, exploitation, and systemic marginalization, indigenous peoples exhibit remarkable resilience and adaptability.

- **Preservation of Identity**: Communities continue to uphold their traditions, resisting external pressures to assimilate.
- **Grassroots Activism**: Movements like Standing Rock (U.S.), the Chipko Movement (India), and global advocacy have demonstrated their ability to organize and resist exploitation.
- **Global Advocacy Networks**: Indigenous leaders play a critical role in international forums like the United Nations Permanent Forum on Indigenous Issues (UNPFII).

Contribution to Sustainable Development Goals (SDGs)

Indigenous practices align closely with several SDGs, offering pathways to achieve global sustainability.

- **Zero Hunger (SDG 2)**: Indigenous farming methods improve food security without harming ecosystems.
- **Clean Water and Sanitation (SDG 6)**: Traditional water conservation practices ensure access to clean water in arid regions.
- **Life on Land (SDG 15)**: Their custodianship of forests and biodiversity aids in achieving conservation goals.

Strong Community Ties and Social Systems

Indigenous societies prioritize collective well-being, fostering strong community bonds that promote social cohesion and support.

- **Egalitarian Values**: Many indigenous communities practice shared resource ownership, reducing inequalities.
- **Conflict Resolution**: Traditional systems of justice and mediation emphasize restorative justice and community harmony.
- **Support Networks**: Extended families and clans provide a robust safety net, especially in times of crisis.

Political and Legal Advocacy

Indigenous peoples are increasingly asserting their rights through legal and political avenues, challenging systems of oppression.

- **International Legal Frameworks**: Instruments like the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) and International Labour Organization (ILO) Convention 169 bolster their rights.
- **Constitutional Provisions**:

  In India, Scheduled Tribes are protected under special provisions that recognize their distinct identity and rights.
- **Indigenous Leadership**:

  The rise of indigenous politicians, activists, and scholars strengthens advocacy efforts.

Spiritual and Philosophical Contributions

Indigenous belief systems, often rooted in a deep reverence for nature, offer alternative worldviews that challenge anthropocentric paradigms.

- **Holistic Perspectives**: Their philosophies integrate human, ecological, and spiritual dimensions, promoting harmony with nature.
- **Influence on Global Movements**: Concepts like "Mother Earth" (Pachamama) resonate in global environmental movements and policy frameworks.

Economic Contributions and Potential

Indigenous enterprises rooted in traditional knowledge and local resources contribute to economic development while respecting sustainability.

- **Eco-tourism**: Indigenous communities attract global tourists seeking authentic cultural experiences.
- **Handicrafts and Local Products**: Traditional crafts and agricultural products command significant market value, both domestically and internationally.
- **Innovative Entrepreneurship**: Many communities are adapting their knowledge to modern markets, creating niche industries like herbal medicine and organic farming.

Advocacy for Human Rights and Social Justice

Indigenous peoples have historically been at the forefront of human rights struggles, advocating for land, culture, and equality.

- **Global Solidarity**: Their struggles have inspired broader movements for environmental and social justice.
- **Legal Landmarks**: Cases like the Supreme Court of India's Samatha judgment (1997) affirm indigenous rights and land protection. The strong points of indigenous peoples highlight their vital role in preserving cultural diversity, sustaining ecosystems, and advocating for human rights. These strengths are not just assets for their communities but also offer valuable lessons and solutions for addressing global challenges. Recognizing, respecting, and leveraging these strengths can pave the way for a more equitable and sustainable future.

Weak Points of Present Research Study

Despite their remarkable strengths and resilience, indigenous peoples face systemic challenges and vulnerabilities that hinder their progress and threaten their way of life. These weak points are the result of historical injustices, socio-economic disparities, and modern-day challenges, which collectively impact their ability to thrive. Below is a comprehensive exploration of these weak points.

Historical Marginalization and Dispossession

- **Colonial Exploitation**: Historical colonization stripped indigenous peoples of their lands, resources, and autonomy, leaving a legacy of socio-economic deprivation.
- **Land Alienation**: Forced evictions and land grabbing have disrupted traditional livelihoods and dislocated communities.
- **Cultural Suppression**: Policies aimed at assimilation often resulted in the loss of languages, traditions, and identity.

Economic Disparities

- **Poverty**: Indigenous communities often suffer from high poverty rates due to limited access to resources and opportunities.
- **Unemployment**: Employment opportunities for indigenous peoples are often limited to low-paying, insecure jobs.
- **Underutilization of Resources**: Despite rich natural resources in their territories, indigenous communities rarely benefit from them due to external exploitation.

Limited Access to Education

- **Language Barriers**: Education systems often prioritize dominant languages, marginalizing indigenous languages and cultures.
- **Lack of Infrastructure**: Many indigenous areas lack basic educational facilities, such as schools, trained teachers, and learning materials.
- **High Dropout Rates**: Economic pressures and cultural disconnection contribute to low educational attainment.

Poor Health Outcomes

- **Limited Healthcare Access**: Many indigenous communities lack access to quality healthcare services, facilities, and trained professionals.
- **Higher Disease Burden**: Indigenous peoples face higher rates of malnutrition, infectious diseases, and chronic conditions like diabetes.
- **Cultural Incompatibility**: Healthcare systems often disregard traditional healing practices, alienating indigenous patients.

Political Exclusion

- **Underrepresentation**: Indigenous peoples are often underrepresented in political institutions and decision-making bodies.
- **Weak Advocacy Mechanisms**: In many regions, indigenous communities lack strong platforms to voice their concerns.
- **Policy Neglect**: Governments frequently overlook or fail to implement policies that safeguard indigenous rights.

Legal Vulnerabilities

- **Weak Land Rights Protections**: Legal systems often fail to recognize customary land tenure, exposing indigenous territories to exploitation.
- **Judicial Ineffectiveness**: Prolonged legal battles and weak enforcement of laws exacerbate vulnerabilities.

- **Discrimination in Legal Systems**: Indigenous individuals often face bias and limited access to justice in mainstream legal frameworks.

Threats to Cultural Identity

- **Globalization**: Modern influences often erode traditional practices, languages, and knowledge systems.
- **Media Misrepresentation**: Indigenous peoples are often stereotyped or ignored in mainstream narratives, perpetuating cultural erasure.
- **Generational Disconnect**: Younger generations may feel disconnected from their cultural heritage due to external influences and migration.

Environmental Challenges

- **Climate Change**: Rising temperatures, changing rainfall patterns, and extreme weather disproportionately affect indigenous territories.
- **Deforestation and Resource Depletion**: Large-scale industries such as mining, logging, and agriculture degrade indigenous lands.
- **Loss of Biodiversity**: Environmental degradation undermines the ecological balance that sustains indigenous livelihoods.

Social Challenges

- **Discrimination and Racism**: Indigenous peoples face systemic racism and social exclusion in many parts of the world.
- **Gender Inequality**: Indigenous women often experience compounded disadvantages due to intersecting cultural and gender biases.
- **Substance Abuse and Mental Health Issues**: Marginalization, trauma, and socio-economic challenges contribute to high rates of substance abuse and mental health problems.

Dependence on External Aid

- **Aid Reliance**: Many indigenous communities rely heavily on government or NGO assistance, which can create dependency.
- **Unfulfilled Promises**: Development aid often fails to address indigenous needs effectively, leading to frustration and mistrust.
- **Loss of Autonomy**: External interventions sometimes undermine traditional governance and self-determination.

Challenges in Leveraging Technology

- **Digital Divide**: Indigenous communities often lack access to digital infrastructure, limiting their ability to engage with modern technologies.
- **Exploitation of Traditional Knowledge**: Without adequate protections, indigenous knowledge is often commercialized without fair compensation.
- **Cultural Disconnection**: Overemphasis on technology can alienate communities from their traditional practices and social structures.

Policy and Governance Failures

- **Inadequate Implementation**: Even when policies exist, poor implementation often undermines their impact.
- **Fragmented Governance**: Lack of coordination among government agencies creates gaps in service delivery.
- **Neglect of Indigenous Voices**: Policy formulation often excludes indigenous perspectives, leading to unsuitable or ineffective programs. The weak points of indigenous peoples highlight systemic inequities and persistent challenges that require urgent attention. Addressing these weaknesses demands a holistic approach, combining respect for indigenous knowledge systems, inclusive policy-making, and sustained advocacy. Recognizing and mitigating these vulnerabilities can empower indigenous peoples to thrive while preserving their invaluable cultural and ecological contributions to the world.

Current Trends

1. Increasing advocacy for indigenous rights through global platforms like the UN Permanent Forum on Indigenous Issues.
2. Recognition of traditional knowledge in combating climate change.
3. Growing emphasis on digital inclusion and education for indigenous youth.

Indigenous peoples worldwide are experiencing a dynamic interplay of challenges and opportunities, shaped by environmental, socio-political, and economic factors. Understanding these current trends is essential for developing effective policies and initiatives that support indigenous communities.

Climate Change Impacts and Adaptation

Indigenous communities are disproportionately affected by climate change due to their close relationship with the environment. Rising temperatures, altered precipitation patterns, and extreme weather events threaten their traditional livelihoods and cultural practices. Despite these challenges, indigenous peoples are actively developing and implementing adaptation strategies grounded in traditional ecological knowledge. These strategies include sustainable land management, biodiversity conservation, and climate-resilient agricultural practices. Their contributions are increasingly recognized in global climate discussions, emphasizing the importance of integrating indigenous knowledge into broader climate action frameworks.

Advocacy for Land Rights and Resource Management

Securing land rights remains a central issue for indigenous peoples. Efforts to reclaim ancestral lands and protect territories from exploitation are gaining momentum. Legal victories and international support have bolstered these

movements, leading to increased recognition of indigenous land claims. Collaborative management of natural resources between indigenous communities and governments is emerging as a model for sustainable development, ensuring that resource exploitation does not compromise indigenous rights or environmental integrity.

Integration of Traditional Knowledge in Biodiversity Conservation

Indigenous peoples are stewards of significant portions of the world's biodiversity. Their traditional knowledge systems offer valuable insights into sustainable ecosystem management. There is a growing trend to incorporate this knowledge into national and international conservation strategies. Initiatives such as the establishment of Indigenous Protected Areas and the inclusion of indigenous representatives in environmental policy-making bodies reflect this shift towards collaborative conservation efforts.

Political Mobilization and Representation

Indigenous communities are increasingly asserting their rights through political engagement. This includes participation in electoral processes, formation of indigenous political parties, and representation in legislative bodies. Such involvement ensures that indigenous perspectives are considered in policy decisions affecting their communities. Internationally, indigenous leaders are active in forums like the United Nations Permanent Forum on Indigenous Issues, advocating for global recognition and enforcement of their rights.

Cultural Revitalization and Education

Efforts to preserve and revitalize indigenous languages, arts, and traditions are gaining traction. Educational programs that incorporate indigenous languages and curricula are being implemented to foster cultural pride among youth. Technology plays a significant role in these initiatives, with digital platforms being used to document and share indigenous knowledge, making it accessible to broader audiences and future generations.

Economic Development and Entrepreneurship

Indigenous entrepreneurs are leveraging traditional knowledge and resources to create sustainable businesses. Sectors such as eco-tourism, artisanal crafts, and organic agriculture provide economic opportunities while promoting cultural heritage. Support from governmental and non-governmental organizations in the form of funding, training, and market access is crucial for the success of these ventures.

Health and Well-being Initiatives

Addressing health disparities in indigenous communities is a growing focus. Integrating traditional healing practices with modern medicine has shown promise in improving health outcomes. Community-led health programs that respect cultural practices and involve indigenous health workers are being developed to provide more effective and culturally sensitive care.

Legal Recognition and Human Rights Advocacy

There is an increasing trend towards the legal recognition of indigenous rights at national and international levels. This includes the ratification of treaties, implementation of court rulings favoring indigenous claims, and the establishment of legal frameworks that protect indigenous peoples from discrimination and exploitation. Organizations like Indigenous Peoples Rights International play a pivotal role in monitoring and advocating for the enforcement of these rights. Indigenous peoples are actively engaging with contemporary challenges and opportunities. Their resilience and adaptability are evident in their efforts to secure rights, preserve cultures, and contribute to global sustainability. Recognizing and supporting these trends is essential for fostering inclusive and equitable development.

History of Present Research Study

The history of indigenous peoples is a tapestry of resilience, survival, and resistance against systemic challenges posed by colonization, globalization, and modernization. From ancient times to the present day, indigenous communities have encountered numerous obstacles, shaped by external forces and internal dynamics. This historical exploration delves into their journey across different eras, highlighting the significant challenges and triumphs they have experienced globally and locally.

Ancient Period: Flourishing Indigenous Civilizations

Indigenous communities have existed since the dawn of human civilization, thriving in harmony with their natural surroundings. During this period:

- Indigenous knowledge systems flourished, reflecting sustainable practices in agriculture, medicine, and architecture.
- Communities established complex governance systems, rooted in collective decision-making and respect for nature.
- Cultural expressions such as art, folklore, and oral traditions became central to their identity.

However, isolation from larger civilizations often left these communities vulnerable to external invasions and environmental changes.

Medieval Era: Early Encounters with Expansionist Powers

The medieval period saw the emergence of larger empires that often clashed with indigenous groups:

- Indigenous territories were frequently annexed by expanding kingdoms.
- Exploitation of indigenous labor and resources became prevalent, particularly in regions with valuable natural wealth.

- Missionary activities began to challenge traditional beliefs and practices, leading to cultural erosion.

This era marked the initial phases of marginalization as indigenous peoples struggled to retain autonomy over their lands and customs.

Colonial Period: Systematic Oppression and Displacement

The colonial period represented a watershed moment in the history of indigenous peoples, characterized by:

- **Land Seizures**: Colonizers appropriated vast indigenous territories for agriculture, mining, and urban development.
- **Cultural Suppression**: Indigenous languages, religions, and traditions were systematically eroded through missionary activities and colonial education systems.
- **Forced Labor and Slavery**: Many indigenous populations were subjected to exploitative labor systems, including encomiendas in Latin America and indentured servitude in Asia.
- **Genocide and Epidemics**: Entire communities were decimated by violence and diseases introduced by colonizers.

Notable examples include the Trail of Tears in the United States, where Native Americans were forcibly relocated, and the reduction of Aboriginal populations in Australia due to frontier violence and discriminatory policies.

Post-Colonial Period: Struggles for Recognition and Rights

The end of colonial rule did not mark the end of challenges for indigenous peoples:

- Many newly independent nations continued to exploit indigenous lands and resources.
- Indigenous voices were often excluded from political processes, leading to continued marginalization.
- Industrialization and development projects, such as dam constructions and mining activities, displaced countless indigenous communities.

The post-colonial period, however, also witnessed the rise of indigenous movements demanding recognition and rights. Organizations such as the World Council of Indigenous Peoples (WCIP) emerged to advocate for their cause on international platforms.

Global Recognition Era: Late 20th to Early 21st Century

The late 20th century marked a turning point in the global acknowledgment of indigenous issues:

- **United Nations Involvement**: The establishment of the UN Permanent Forum on Indigenous Issues (2000) and the adoption of the UN Declaration on the Rights of Indigenous Peoples (2007) were landmark achievements.
- **Legal Victories**: Indigenous groups secured significant legal victories in countries like Canada, Australia, and New Zealand, reclaiming land and cultural rights.
- **Cultural Revitalization**: Efforts to preserve and revive indigenous languages, arts, and traditions gained momentum.

Despite these advancements, indigenous peoples continued to face challenges such as climate change, land encroachments, and systemic inequalities.

Current Era: Navigating Modern Challenges

The contemporary period presents a complex landscape for indigenous peoples:

- **Climate Change**: Indigenous lands, often rich in biodiversity, are disproportionately affected by climate crises.
- **Globalization**: Economic and cultural globalization threatens the preservation of indigenous identities.
- **Technological Integration**: While technology provides tools for advocacy and education, it also poses risks of cultural homogenization.
- **Political Marginalization**: Many governments fail to implement policies that effectively address the unique needs of indigenous populations.

Indigenous Movements: A Global Phenomenon

From the Chipko movement in India to the Idle No More movement in Canada, indigenous peoples have mobilized to protect their rights and heritage. These movements emphasize the importance of land, culture, and self-determination, challenging oppressive systems and advocating for equitable futures.

Indigenous Peoples in India: A Local Perspective

India, home to diverse indigenous communities (referred to as Scheduled Tribes), presents a microcosm of global indigenous issues:

- **Historical Marginalization**: Colonial land policies and industrial projects displaced many indigenous groups, disrupting their way of life.
- **Post-Independence Challenges**: Despite constitutional safeguards, Scheduled Tribes face socio-economic inequalities, limited access to education, and political underrepresentation.
- **Resistance and Resilience**: Movements like the Narmada Bachao Andolan highlight the agency and activism of indigenous groups in India.

A Legacy of Resilience

The history of indigenous peoples is a testament to their resilience and ability to adapt to adversities. Despite centuries of marginalization, indigenous communities continue to assert their rights and contribute to global cultural and ecological diversity. Recognizing and addressing their historical struggles is crucial for building an inclusive and equitable world.

Discussion

The study reveals that challenges such as land dispossession, cultural erosion, and socio-economic exclusion are universal among indigenous peoples.

However, the responses and resilience strategies vary significantly. Local contexts, such as India's caste dynamics and the Americas' history of colonization, influence these experiences.

Results

The analysis identifies key drivers of indigenous marginalization and highlights successful interventions, such as community-led land restoration projects and policy reforms.

Conclusion

Indigenous peoples are at a critical juncture, balancing the preservation of their identities with integration into modern socio-economic frameworks. Global and local efforts must converge to address their challenges holistically. The journey of indigenous peoples, marked by resilience and challenges, serves as a profound testament to the enduring spirit of humanity. From ancient self-sustaining societies to contemporary struggles against systemic inequities, the history and present circumstances of indigenous communities underscore the intricate relationship between culture, identity, and survival.

The Legacy of Resilience

Indigenous peoples have consistently demonstrated remarkable resilience in the face of oppression, displacement, and cultural erosion. Whether through preserving their languages, reclaiming ancestral lands, or revitalizing traditional practices, their perseverance has been central to maintaining their unique identities in a rapidly changing world.

The Challenge of Equity

Despite significant progress, indigenous peoples remain among the most marginalized groups globally. They face disproportionate impacts from poverty, climate change, and political exclusion. These disparities highlight the urgent need for inclusive policies, legal protections, and socio-economic investments tailored to their unique circumstances.

Global and Local Perspectives

The global struggle of indigenous peoples is mirrored in local contexts, each reflecting unique socio-political and historical dynamics. For example:

- Globally, the adoption of the UN Declaration on the Rights of Indigenous Peoples (2007) has laid a foundation for advocacy.
- In India, the constitutional provisions for Scheduled Tribes represent an attempt to address historical injustices, though implementation remains a challenge.

Intersection of Modernity and Tradition

Indigenous communities stand at the crossroads of modernity and tradition. While technological advancements and globalization offer opportunities for integration and advocacy, they also pose threats to cultural preservation and self-determination. The balance between these forces will shape the future trajectory of indigenous societies.

Role of Advocacy and Activism

Indigenous movements have emerged as powerful agents of change, challenging oppressive systems and advocating for environmental conservation, cultural preservation, and socio-political inclusion. These movements not only uplift indigenous voices but also contribute to global discourses on equity and sustainability.

Policy and Legal Interventions

The role of governments, international bodies, and civil society organizations is critical in addressing the challenges faced by indigenous peoples. Effective implementation of laws, equitable resource allocation, and meaningful political participation are essential for bridging the gaps between rights and realities.

The Call for Global Solidarity

The plight of indigenous peoples is not an isolated issue but a global concern that intersects with environmental sustainability, human rights, and cultural diversity. Collaborative efforts between nations, communities, and organizations are imperative for fostering a world where indigenous peoples can thrive with dignity and autonomy.

Vision for the Future

A sustainable and inclusive future for indigenous peoples requires a multi-faceted approach:

- **Empowerment through Education**: Providing access to culturally relevant education that respects indigenous knowledge systems.
- **Economic Inclusion**: Supporting sustainable livelihoods that align with indigenous values and environmental stewardship.
- **Cultural Preservation**: Investing in initiatives to document, celebrate, and protect indigenous languages, traditions, and arts.
- **Climate Action**: Recognizing the role of indigenous communities as stewards of biodiversity and involving them in global environmental strategies.

The story of indigenous peoples is not merely a narrative of survival but a call to action for justice, equity, and respect for diversity. It is a reminder of the collective responsibility to honor their contributions, address historical injustices, and ensure a future where indigenous communities can flourish as integral members of the global society. Their resilience and wisdom hold lessons for humanity in navigating the challenges of coexistence, sustainability, and cultural harmony.

Suggestions and Recommendations

1. Strengthen legal frameworks for land rights and cultural preservation.
2. Enhance education and digital access for indigenous youth.
3. Promote indigenous participation in policy-making processes.

4. **Future Scope**
5. Expanding research to include underrepresented indigenous communities.
6. Exploring the role of technology in empowering indigenous peoples.
7. Longitudinal studies on the impact of policy interventions.

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Are Life-Saving Drugs a Commodity or a Public Good? Ethical Questions in Patent Law

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Abstract:
The debate surrounding whether life-saving drugs should be treated as commodities or public goods represents a critical ethical, economic, and legal challenge. This study delves into the complexities of patent laws governing life-saving drugs and their implications for accessibility, affordability, and innovation. It explores the ethical tensions between pharmaceutical companies' rights to profit from their innovations and the societal need for equitable healthcare. Drawing on global examples, the study examines current patent frameworks, public health policies, and international agreements like TRIPS (Trade-Related Aspects of Intellectual Property Rights). It highlights the challenges of balancing corporate interests with public welfare and suggests pathways for reconciling these competing priorities.

Keywords: Life-saving drugs, public good, patent law, pharmaceutical ethics, TRIPS agreement, healthcare accessibility, innovation, public health, intellectual property, global health equity.

Introduction:

Life-saving drugs are pivotal in addressing global health crises and improving the quality of life. However, their classification as either commodities or public goods raises significant ethical and practical questions. While patents incentivize innovation by granting exclusivity, they can also lead to monopolistic pricing, making essential medicines unaffordable for marginalized populations. The COVID-19 pandemic underscored the urgency of addressing these challenges, as access to vaccines and treatments became a matter of global equity. This paper explores the multifaceted debate, examining the ethical dimensions, legal frameworks, and practical implications of treating life-saving drugs as commodities versus public goods. The debate surrounding the classification of life-saving drugs as either commodities or public goods lies at the intersection of ethics, economics, and law. Medicines, especially those that save lives, are more than just commercial products; they are essential tools for safeguarding public health and ensuring societal well-being. However, the current framework of intellectual property law, particularly patent law, often places life-saving drugs squarely in the domain of commodities. This commodification raises pressing ethical questions about the accessibility and affordability of essential medicines, especially for vulnerable populations in low- and middle-income countries.

The issue is further complicated by the vast resources required for drug research and development (R&D), which pharmaceutical companies argue necessitate strong patent protections. The high costs of R&D, including clinical trials and regulatory approvals, are often cited to justify the premium pricing of patented drugs. This exclusivity, while incentivizing innovation, can lead to monopolistic practices that restrict access to essential medicines, creating a disparity between those who can afford life-saving treatments and those who cannot.

Globally, the tension between innovation and accessibility has been brought into sharp focus during health crises, such as the HIV/AIDS epidemic and the COVID-19 pandemic. The fight for affordable antiretroviral drugs in the early 2000s and the recent push for patent waivers on COVID-19 vaccines have highlighted the urgent need to balance intellectual property rights with public health imperatives. These crises have sparked debates on alternative models for drug development and distribution, such as public funding for pharmaceutical research, differential pricing, and compulsory licensing.

The ethical question of whether life-saving drugs should be considered a public good—a resource accessible to all regardless of economic status—is pivotal. Public goods are typically non-excludable and non-rivalrous, meaning that their use by one individual does not diminish their availability to others. Life-saving drugs, when

viewed through this lens, should ideally be accessible to all, given their role in safeguarding human lives and advancing global health equity.

This paper aims to delve into this multifaceted issue by exploring the historical evolution of patent laws, their impact on drug pricing and accessibility, and the ethical dilemmas inherent in treating life-saving drugs as commodities. It will also examine the role of international agreements, such as the Trade-Related Aspects of Intellectual Property Rights (TRIPS), and the emerging challenges posed by technological advancements in drug discovery. Furthermore, the study will discuss the current global trends, including the increasing use of generic drugs, the role of public-private partnerships, and the growing advocacy for patent waivers during health emergencies.

The study's findings aim to contribute to the ongoing discourse by proposing actionable recommendations for policymakers, healthcare providers, and pharmaceutical companies. By addressing the ethical and practical challenges associated with life-saving drugs, this research seeks to promote a more equitable and sustainable approach to healthcare, ensuring that no life is valued less due to economic constraints.

The introduction sets the stage for a comprehensive exploration of the critical question: Should life-saving drugs remain commodities governed by market forces, or should they be reclassified as public goods, ensuring universal access and fostering global health equity? This inquiry is not merely academic; it is a matter of life and death for millions worldwide, underscoring the urgency of finding a just and effective resolution.

Definitions:

1. **Commodity**: A marketable item produced to generate profit, subject to supply-demand dynamics.
2. **Public Good**: A product or service that is non-excludable and non-rivalrous, ensuring access for all without depletion.
3. **Patent**: A legal right granted to inventors, allowing exclusive production and commercialization of an innovation for a defined period.
4. **TRIPS Agreement**: An international legal framework setting standards for intellectual property rights, including pharmaceuticals.

Need:

The increasing global demand for life-saving drugs, coupled with disparities in accessibility, necessitates a re-evaluation of patent laws. Addressing ethical dilemmas in drug pricing and availability is critical for ensuring healthcare equity and public health security.

Aims:

- To analyze the ethical and legal dimensions of patent laws for life-saving drugs.
- To evaluate the impact of patents on drug accessibility and affordability.
- To explore alternative models for incentivizing pharmaceutical innovation.

Objectives

1. To examine the history and evolution of patent laws for pharmaceuticals.
2. To analyze the ethical implications of treating life-saving drugs as commodities.
3. To assess global case studies highlighting successes and failures of current systems.
4. To propose actionable recommendations for balancing innovation and accessibility.

Hypothesis

If life-saving drugs are treated as public goods rather than commodities, global health outcomes will improve without significantly hindering pharmaceutical innovation.

Research Methodology

- **Approach**: Mixed-method analysis incorporating qualitative and quantitative data.
- **Data Sources**: International patent laws, case studies, World Health Organization (WHO) reports, TRIPS agreement analyses.
- **Methods**: Literature review, stakeholder interviews, and comparative analysis of global pharmaceutical policies.

Strong Points

1. **Ethical Imperative for Access**: Life-saving drugs are essential for safeguarding human life and dignity. Treating them as public goods aligns with the fundamental principle of healthcare as a human right. Universal access to these medicines is not just a moral responsibility but also a cornerstone of equitable societal development.
2. **Global Health Security**: Ensuring widespread access to life-saving drugs contributes to global health security by reducing the spread of infectious diseases, lowering mortality rates, and mitigating the economic and social impacts of health crises. Public availability of such medicines helps prevent pandemics and other health emergencies from spiraling out of control.
3. **Innovation vs. Accessibility Balance**: Strong patent systems incentivize pharmaceutical innovation by protecting intellectual property, leading to the development of advanced therapies and treatments. However, there is growing evidence of alternative models like public-private partnerships and open-source platforms that can encourage innovation while prioritizing accessibility.
4. **Economic Efficiency of Public Good Classification**: Classifying life-saving drugs as

public goods can lead to more efficient resource allocation in healthcare systems. Governments and global organizations could coordinate funding and distribution mechanisms, reducing redundancy and ensuring medicines reach the most vulnerable populations.

5. **Precedents for Public-Private Collaboration**: Programs like the Global Fund, GAVI (the Vaccine Alliance), and the Medicines Patent Pool illustrate that partnerships between public and private entities can effectively address accessibility challenges without compromising innovation or profit motives.
6. **Historical Success of Generics**: The availability of generic versions of antiretroviral drugs drastically reduced the cost of HIV/AIDS treatment, saving millions of lives. This demonstrates the potential impact of policy interventions such as compulsory licensing and the relaxation of patent laws in emergencies.
7. **Technological Advancements in Drug Discovery**: Advances in artificial intelligence, biotechnology, and big data analytics have accelerated drug discovery and development processes. This technological shift reduces dependency on extended patent monopolies by enabling faster, more cost-effective production pipelines.
8. **International Frameworks for Equitable Distribution**: Instruments like the Doha Declaration on TRIPS and Public Health provide a framework for balancing intellectual property rights with public health needs. Compulsory licensing and patent pooling under such frameworks have shown promise in enhancing accessibility to life-saving drugs.
9. **Public Awareness and Advocacy**: Growing public awareness and advocacy for affordable medicines have put pressure on governments and pharmaceutical companies to adopt more inclusive policies. Movements like the #NoProfitOnPandemic campaign during the COVID-19 crisis reflect the shifting public sentiment against monopolistic practices in healthcare.
10. **Economic Growth and Productivity**: Accessible healthcare and medicines lead to healthier populations, enhancing workforce productivity and economic growth. Investing in public access to life-saving drugs is not only ethically sound but also economically prudent in the long term.
11. **Legal and Policy Innovations**: Emerging legal frameworks, such as compulsory licensing for essential medicines, tiered pricing models, and patent waivers, offer viable mechanisms to reconcile the needs of pharmaceutical companies with the urgency of equitable access.
12. **Humanitarian Impact of Reclassifying Drugs**: Treating life-saving drugs as public goods can prevent avoidable deaths and improve quality of life for millions, especially in low-income and marginalized communities. This reclassification can also strengthen the global reputation of pharmaceutical companies as socially responsible entities.
13. **Role of International Organizations**: Bodies like the World Health Organization (WHO), United Nations (UN), and World Trade Organization (WTO) play pivotal roles in advocating for the accessibility of essential medicines, creating a supportive environment for addressing these challenges on a global scale.
14. **Alignment with Sustainable Development Goals (SDGs)**: Accessible life-saving drugs directly contribute to achieving SDG 3 (Good Health and Well-Being) and indirectly support other goals like poverty eradication, gender equality, and economic development, reinforcing their classification as a global priority. By emphasizing these strong points, stakeholders can build a compelling case for the ethical, economic, and practical necessity of rethinking the classification and accessibility of life-saving drugs.

Weak Points

1. **High Research and Development Costs**: Developing life-saving drugs requires significant investment in research, clinical trials, regulatory compliance, and manufacturing processes. Pharmaceutical companies argue that without strong patent protections, they may lack the financial incentive to undertake such high-risk endeavors, potentially stalling innovation.
2. **Lack of Universal Healthcare Infrastructure**: Even if life-saving drugs are reclassified as public goods, many countries, especially in the Global South, lack the necessary healthcare infrastructure to distribute these drugs effectively. Issues such as inadequate storage facilities, poor supply chains, and logistical challenges can hinder accessibility.
3. **Monopolistic Practices and Profit Motives**: Pharmaceutical companies often prioritize profit over public health, leading to monopolistic pricing strategies. The reclassification of drugs as public goods may face fierce opposition from industry players, as it threatens their existing business models and profitability.
4. **Weak Enforcement of Global Agreements**: Despite international agreements like the Doha Declaration on TRIPS, many nations struggle to enforce provisions such as compulsory licensing or parallel importation. This is due to legal loopholes, political pressure from powerful

nations, or lack of technical expertise in navigating complex trade agreements.

5. **Limited Funding for Alternatives**: Public funding for drug research and development is insufficient to replace private sector investments. Government and non-government organizations may struggle to allocate resources for innovation, leaving a gap in the creation of new and effective treatments.
6. **Challenges in Patent Reform**: Implementing reforms to weaken or override patent protections can be legally and politically challenging. Strong lobbying by pharmaceutical corporations and international trade implications make it difficult to introduce changes in intellectual property laws.
7. **Risk of Counterfeit Medicines**: Reduced patent protections and increased accessibility can inadvertently encourage the proliferation of counterfeit drugs. This poses significant health risks and undermines public trust in accessible medicines.
8. **Dependence on Voluntary Participation**: Mechanisms like patent pools and tiered pricing models often rely on the voluntary participation of pharmaceutical companies. Their effectiveness is limited if companies choose not to collaborate, as seen in the unequal global distribution of COVID-19 vaccines.
9. **Regional Disparities in Access**: Even with policies aimed at universal access, regional disparities persist. Wealthier countries or regions often benefit disproportionately from global health initiatives, while poorer areas continue to face barriers to affordable drugs.
10. **Ethical Dilemmas in Tiered Pricing**: While tiered pricing aims to make drugs more affordable in low-income countries, it creates ethical questions about why life-saving treatments are not universally priced equitably. This model often perpetuates inequality rather than eliminating it.
11. **Impact on Small and Medium Pharmaceutical Companies**: Large pharmaceutical corporations may absorb the financial impact of reduced patent protections, but smaller companies could face significant challenges. This could stifle competition and lead to market consolidation.
12. **Complexities in Defining Life-Saving Drugs**: The definition of what constitutes a "life-saving drug" is subjective and can vary by region, health conditions, and medical practices. This ambiguity complicates policy decisions and prioritization.
13. **Public Misconceptions about Drug Pricing**: Public debates often oversimplify drug pricing issues, failing to account for the complexities of research funding, regulatory costs, and market dynamics. This can lead to unrealistic expectations and public backlash against pharmaceutical companies.
14. **Risk of Overregulation**: Overregulation in the push for equitable access could inadvertently slow down drug approval processes, delaying the availability of new treatments. Striking a balance between accessibility and innovation is challenging.
15. **Limited Technological and Human Resource Capacity**: Many low- and middle-income countries lack the technical expertise and skilled workforce needed to produce generic versions of life-saving drugs locally, even when patents are bypassed.
16. **Impact on Future Innovation**: Weakening patent protections could disincentivize innovation in the pharmaceutical sector. Companies may shift their focus to developing less critical but more profitable treatments, such as lifestyle drugs, at the expense of life-saving innovations.
17. **Geopolitical and Trade Implications**: Nations with strong pharmaceutical industries may resist global reforms to patent laws, using economic sanctions or diplomatic pressure to safeguard their interests. This creates a contentious environment for implementing equitable policies.
18. **Cultural and Behavioral Barriers**: Public mistrust of vaccines and medicines in certain regions, driven by misinformation or cultural beliefs, can limit the impact of policies designed to improve accessibility.
19. **Sustainability Concerns**: The cost of making life-saving drugs universally accessible could strain government budgets and global health organizations, raising questions about the long-term sustainability of such initiatives.
20. **Lack of Global Consensus**: Achieving international agreement on reclassifying life-saving drugs as public goods is challenging due to divergent interests, priorities, and economic capabilities of different countries. Addressing these weak points requires multifaceted solutions involving governments, international organizations, pharmaceutical companies, and civil society. Balancing ethical considerations with economic realities is crucial for creating sustainable policies that benefit humanity at large.

Current Trends in Addressing the Ethical Questions of Life-Saving Drugs in Patent Law

1. **Expansion of Compulsory Licensing Mechanisms**: Governments worldwide are increasingly using compulsory licensing to bypass patent restrictions for life-saving drugs. Countries such as India, Brazil, and South Africa have set precedents by granting

compulsory licenses for essential medicines like HIV/AIDS treatments and cancer drugs, ensuring broader access.

2. **Global Collaborations for Equitable Access**: Initiatives like the COVAX Facility, the Medicines Patent Pool (MPP), and the WHO's Access to COVID-19 Tools (ACT) Accelerator emphasize global collaboration to make essential medicines and vaccines accessible, especially in low- and middle-income countries.
3. **Push for Open Science and Innovation**: The open-access movement in pharmaceuticals advocates for sharing research and data to accelerate drug development. Open-source platforms are becoming more prevalent, allowing for collaboration across borders without the constraints of proprietary patents.
4. **Increasing Role of Generic Drug Manufacturing**: Generic manufacturers play a crucial role in making life-saving drugs affordable. Nations like India, known as the "pharmacy of the world," have expanded their capabilities to produce generic versions of patented drugs, especially for low-income markets.
5. **Tiered Pricing Models**: Pharmaceutical companies are increasingly adopting tiered pricing models, offering drugs at lower costs in low-income regions while maintaining higher prices in wealthier markets. This trend seeks to balance profit motives with social responsibility.
6. **Integration of Artificial Intelligence (AI) in Drug Development**: AI and machine learning are revolutionizing drug discovery by reducing research timelines and costs. These technologies enable rapid identification of drug candidates, which could eventually lower the prices of life-saving medicines.
7. **Philanthropic Funding for Research**: Organizations such as the Bill & Melinda Gates Foundation and the Global Fund are investing heavily in R&D for diseases predominantly affecting developing nations, reducing the dependence on commercial pharmaceutical companies.
8. **Advocacy for Patent Reforms**: A growing movement advocates for reforming the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement to prioritize public health over patent protection. Recent debates, especially during the COVID-19 pandemic, have highlighted the need for more flexible patent laws.
9. **Local Manufacturing Initiatives**: Countries are building domestic pharmaceutical manufacturing capabilities to reduce reliance on imports and mitigate supply chain disruptions. This trend is particularly evident in Africa, where initiatives like the African Medicines Agency aim to enhance drug production.
10. **Crowdsourced Funding for Drug Development**: Crowdfunding platforms and cooperative R&D models are emerging as alternative funding mechanisms for developing life-saving drugs, bypassing traditional profit-driven models.
11. **Universal Health Coverage Programs**: Nations are increasingly implementing universal health coverage (UHC) policies to ensure that citizens have access to essential medicines without financial hardship. This trend emphasizes the government's role in subsidizing or providing life-saving drugs.
12. **Focus on Neglected Tropical Diseases (NTDs)**: There is a renewed focus on addressing diseases that predominantly affect impoverished regions. Pharmaceutical companies, governments, and NGOs are collaborating to develop and distribute treatments for NTDs like malaria, tuberculosis, and leprosy.
13. **Public-Private Partnerships (PPPs)**: Partnerships between governments, NGOs, and pharmaceutical companies are expanding to address accessibility issues. PPPs have been instrumental in developing and distributing vaccines, such as the Global Alliance for Vaccines and Immunization (GAVI).
14. **Emergence of Biosimilars**: Biosimilar drugs, which are similar to biologic medicines but not identical, are becoming a cost-effective alternative for expensive biologics. The FDA and EMA have streamlined approval processes for biosimilars, making them more accessible.
15. **Increased Role of Advocacy Groups**: Patient advocacy groups are influencing policies by raising awareness about the high costs of life-saving drugs and lobbying for greater transparency in pricing. Movements like "Medicines for All" are gaining momentum globally.
16. **Innovative Financing Models**: Advanced market commitments, social impact bonds, and pooled procurement models are being explored to fund and distribute life-saving drugs more equitably.
17. **Legislative Push for Drug Price Transparency**: Governments in several countries, including the U.S., are introducing laws to ensure transparency in drug pricing, including R&D costs and profit margins, to curb exploitative pricing practices.
18. **Emphasis on Preventative Care**: There is a growing shift toward preventative measures such as vaccines and health education to reduce the long-term dependency on expensive life-saving drugs.

19. **Global Pressure on Big Pharma**: Public outrage over price gouging has intensified scrutiny on pharmaceutical giants. Companies are under pressure to adopt fair pricing models and prioritize access over profits.
20. **Rise of Community-Based Healthcare Models**: Decentralized healthcare systems, especially in rural areas, are leveraging telemedicine and mobile clinics to ensure the last-mile delivery of essential medicines. These trends reflect a growing consensus on the ethical imperative to treat life-saving drugs as public goods rather than mere commodities, balancing innovation with equitable access.

History of the Ethical Considerations Surrounding Life-Saving Drugs and Patent Law

The ethical debate over life-saving drugs as commodities or public goods is deeply rooted in the historical evolution of healthcare, pharmaceuticals, and intellectual property laws. The historical timeline highlights pivotal moments that have shaped the contemporary discourse.

Ancient and Pre-Industrial Period

1. **Medicinal Practices in Early Civilizations**:
- Ancient civilizations, such as Mesopotamia, Egypt, India, and China, considered medicine a communal responsibility. Traditional healing practices relied on shared knowledge passed down through generations.
- The concept of "public good" was inherent in these systems, as healing knowledge and medicinal plants were shared without proprietary claims.
2. **Hippocratic Ethics in Ancient Greece (5th Century BCE)**:
- Hippocrates emphasized the moral responsibility of physicians to prioritize patient welfare over personal gain. This philosophy laid the foundation for viewing medicine as a service to humanity.
3. **Medieval Period**:
- The Islamic Golden Age (8th–13th centuries) advanced medical sciences, with scholars like Avicenna compiling medical knowledge for the greater good.
- Medicine remained primarily a communal resource, with healthcare often provided by religious institutions or charity.

Renaissance and Early Modern Era

4. **Emergence of Patent Systems (15th–17th Century)**:
- The Venetian Patent Statute of 1474 marked one of the earliest formalized systems to protect inventors' rights, including pharmaceutical discoveries.
- The focus on rewarding innovation began to clash with the ethical concerns of accessibility.
5. **Industrial Revolution (18th–19th Century)**:
- The pharmaceutical industry began to take shape, with major breakthroughs in drug discovery and production.
- Governments started granting patents to incentivize innovation. However, this often led to monopolies, restricting access to life-saving medicines for the poor.
6. **Smallpox Vaccine and the Public Good Debate (1796)**:
- Edward Jenner's smallpox vaccine was initially shared freely. However, debates arose as pharmaceutical production scaled, leading to discussions about public versus proprietary rights.

20th Century: Formalization of Patent Laws and Ethical Dilemmas

7. **Birth of Modern Pharmaceutical Industry**:
- The 20th century witnessed the rise of pharmaceutical giants. Discoveries like penicillin (1928) and insulin (1921) highlighted the tension between commercialization and humanitarian needs.
- The developers of insulin sold their patent for $1 to ensure public access, setting a moral benchmark.
8. **Post-World War II Developments**:
- The establishment of the World Health Organization (WHO) in 1948 emphasized global health equity.
- The pharmaceutical industry expanded, leading to increased reliance on patent protection for revenue.
9. **Development of International Intellectual Property Frameworks**:
- The Paris Convention (1883) and the TRIPS Agreement (1995) standardized patent laws globally. TRIPS, in particular, drew criticism for prioritizing corporate profits over public health.
10. **Access to HIV/AIDS Medications (1980s–1990s)**:
- The HIV/AIDS epidemic highlighted disparities in drug access. Antiretroviral therapies were priced beyond the reach of low-income countries, leading to global outrage.
- Activism and pressure from groups like Médecins Sans Frontières (MSF) forced pharmaceutical companies to lower prices and license generic production.

21st Century: The Rise of Global Health Movements

11. **Generic Drug Manufacturing and India's Role**:
- India emerged as a leader in generic drug production, challenging multinational monopolies. Its Patent Act of 1970 allowed for the production of cost-effective generics, saving millions of lives.

12. **TRIPS Flexibilities and Compulsory Licensing**:
- The Doha Declaration (2001) clarified that public health could take precedence over patent rights. This enabled countries to issue compulsory licenses for essential medicines.

13. **COVID-19 Pandemic (2020s)**:
- The pandemic reignited debates over patent laws, with calls for patent waivers on vaccines. The WHO's COVAX initiative sought equitable vaccine distribution, but wealthier nations dominated early access.
- Pharmaceutical companies faced criticism for prioritizing profits during a global health crisis.

Legal and Ethical Milestones

14. **Landmark Legal Cases**:
- **Novartis v. Union of India (2013)**: India's Supreme Court denied a patent for the cancer drug Glivec, prioritizing access over patent rights.
- **South Africa v. Pharmaceutical Companies (1998)**: A coalition of companies withdrew a lawsuit against South Africa for importing cheaper HIV drugs, bowing to public pressure.

15. **Advances in Technology and Personalized Medicine**:
- The rise of biotechnology and personalized medicine in the 21st century has further complicated the public good versus commodity debate.

16. **Global Movements for Equitable Access**:
- Activist groups and NGOs continue to challenge exploitative pricing, advocating for alternative models like open-source drug development.

The history of life-saving drugs and patent laws is marked by a recurring tension between innovation incentives and ethical imperatives. While the patent system has driven medical advancements, its implementation often exacerbates inequalities, especially in low-income regions. The ongoing evolution of global health policies, legal frameworks, and technological innovations reflects humanity's struggle to balance profit motives with the moral responsibility to save lives.

Discussion:

The ethical and practical implications of patent laws require balancing incentives for pharmaceutical innovation with the moral obligation to ensure equitable access. The divergence between developed and developing nations' priorities highlights the need for international cooperation and revised frameworks.

Results:

Findings indicate that treating life-saving drugs purely as commodities exacerbates global health inequalities. However, alternative models like public-private partnerships and compulsory licensing offer promising pathways for addressing these issues.

Conclusion:

Resolving the ethical dilemmas surrounding life-saving drugs as commodities versus public goods necessitates systemic changes in patent laws and pharmaceutical policies. Equitable healthcare should be prioritized without undermining innovation incentives. The debate over whether life-saving drugs should be considered a commodity or a public good has evolved significantly through history, presenting a complex intersection of ethical, legal, economic, and social issues. Over the years, the tension between the need for pharmaceutical innovation and the imperative of ensuring public access to essential medicines has sparked considerable legal, academic, and activist discourse.

In the ancient and medieval periods, healthcare was primarily a communal responsibility, with knowledge and medicinal practices often shared freely. However, with the advent of intellectual property systems in the Renaissance, a new framework for protecting individual inventions and encouraging innovation was established. This began to lay the groundwork for the modern understanding of patents as tools for rewarding inventors. The rise of industrial capitalism in the 18th and 19th centuries further entrenched the commodification of medical knowledge, as large pharmaceutical companies emerged with the capacity to control access to life-saving drugs.

The 20th century, with its breakthroughs in the pharmaceutical industry, intensified the ethical dilemmas surrounding access to medicines. The discovery of critical drugs, such as penicillin, insulin, and the advent of vaccines, brought to the forefront the challenge of ensuring these life-saving treatments were available to the masses, particularly in lower-income countries. The controversy surrounding the pricing of HIV/AIDS medications in the 1980s and 1990s underscored the tensions between corporate profit motives and the ethical responsibility to address public health needs.

In the modern era, international intellectual property agreements such as the TRIPS Agreement have solidified the global framework for patent law, but they have also faced significant criticism for perpetuating disparities in access to essential medicines. The pharmaceutical industry's monopoly on critical drugs continues to challenge global health systems, particularly in the Global South, where access to necessary treatments is often obstructed by high costs.

However, the recent history of life-saving drugs has also been marked by significant progress in advocating for the primacy of public health over patent law. Landmark legal cases, such as India's Novartis ruling and the global push for the right to compulsory licensing under the TRIPS Agreement,

have shifted the conversation, allowing countries to prioritize public health over intellectual property rights. The emergence of generic drug manufacturing, particularly in India, has further exemplified the positive impact that breaking patent monopolies can have on drug accessibility.

The COVID-19 pandemic has reignited the global discussion about the accessibility of vaccines and treatments. It highlighted the urgent need for collaboration and equitable distribution of life-saving drugs, while also exposing the flaws in the patent system and the moral hazards associated with prioritizing corporate interests during a global health crisis. Activists, governments, and international organizations have increasingly pushed for more equitable solutions, such as patent waivers and the establishment of global health initiatives aimed at ensuring affordable access to vaccines and treatments worldwide.

As we look to the future, the global conversation around life-saving drugs will likely continue to evolve in response to emerging technologies, such as biotechnology and personalized medicine. The rise of these technologies presents new challenges for patent law and healthcare policy, as they may further complicate the balance between incentivizing innovation and ensuring equitable access to medicines. Furthermore, the development of novel methods of drug delivery, such as through digital health technologies or artificial intelligence, may further challenge traditional models of pharmaceutical patenting and distribution.

The question of whether life-saving drugs should be treated as a commodity or a public good is not only a matter of law but also a moral and philosophical dilemma. While intellectual property rights play a vital role in driving innovation, it is clear that without measures to ensure equitable access to essential medicines, the full promise of modern medicine cannot be realized. The continued efforts of international organizations, governments, and the global health community will be crucial in shaping a future where life-saving drugs are accessible to all, regardless of economic status or geographical location.

Ultimately, the future of life-saving drug accessibility will require a careful balancing of innovation, ethics, and equity. It is essential for policymakers, legal experts, and global health advocates to work together to develop solutions that ensure the benefits of medical advancements are shared fairly and justly across the globe. The lessons learned from past challenges should guide future approaches, ensuring that the health and well-being of all people, particularly those in underserved regions, remain a primary focus of the global healthcare system.

Suggestions and Recommendations:

1. Promote compulsory licensing during health emergencies.
2. Implement differential pricing models based on economic capacity.
3. Encourage public funding for pharmaceutical research.
4. Strengthen global frameworks for drug accessibility.

Future Scope

1. Exploring the impact of artificial intelligence on pharmaceutical R&D.
2. Evaluating emerging markets' role in generic drug production.
3. Assessing the effectiveness of international agreements like TRIPS+ in promoting health equity.

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Factor Affecting on Customer Satisfaction on Green Banking Services

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Abstract:

With an emphasis on the significance of demographic variables like gender, marital status, age, and educational attainment, this study explores the elements affecting customer satisfaction in the context of online banking. The study sought to find any notable variations in customer satisfaction levels according to these demographic characteristics by thoroughly examining customer feedback and data. The study looked at a number of variables that affect customer satisfaction, such as responsiveness, security, accessibility, ease of use, and personalized services. The "Combined factors" variable was used to gauge the general level of customer satisfaction. The study investigated the connection between demographic factors and customer satisfaction using a post-hoc Tukey HSD analysis and an independent samples t-test. The study's conclusions showed that age, marital status, gender, and level of education had no discernible effects on green banking customers' satisfaction. Regardless of their marital status or educational background, customers of both sexes reported comparable levels of satisfaction. Additionally, consumers' satisfaction levels with green banking services were similar across age groups.

Keywords: Customer Satisfaction, green banking

Introduction:

The way people manage their accounts and carry out financial transactions has been completely transformed by electronic banking, or green banking. Internet banking, mobile banking apps, and other digital financial services are all included in the broad category of green banking services. As the popularity of these services has grown, a number of factors have surfaced that have a big impact on how customers perceive and interact with them. Banks and other financial institutions must comprehend these elements in order to deliver a first-rate green banking experience and keep happy clients. These are some of the main elements influencing users of online banking services. Privacy and Security: Since consumers expect their sensitive financial information to be shielded from fraud, unauthorized access, and data breaches, security is crucial in green banking.

Strong security features like encryption, two-factor authentication, and frequent security audits must be implemented by green banking platforms in order to reassure users that their data is secure. User-Friendly Interface: Customer satisfaction is significantly impacted by the green banking platform's usability and intuitiveness. The overall customer experience is improved and repeat business is encouraged with an intuitive interface that has easy-to-understand features, straightforward transaction procedures, and clear navigation. Availability and Accessibility Consumers appreciate having access to their accounts and banking services around-the-clock. Regardless of their location or time zone, clients can conduct transactions and access account information whenever they need it with a dependable and accessible green banking platform.

Customer Service In green banking, prompt and effective customer service is essential. Consumers may need help with a variety of services, run into technical difficulties, or have questions regarding transactions. Customer satisfaction rises when these issues are promptly resolved by a knowledgeable and approachable customer service team. Speed of Transaction: Customers expect transactions to be quick and easy in the fast-paced world of today. Frustration and discontent may result from green banking platform delays, slow processing times, or bugs. Experience with Mobile Banking: Mobile banking apps are growing in popularity as smartphones become more and more ingrained in people's daily lives. Attracting and keeping clients who prefer to handle their money while on the go requires a smooth and feature-rich mobile banking experience.

Fee and Charge Transparency: Customers of online banking value openness regarding fees, charges, and interest rates. Uncertain pricing structures or hidden fees can erode customer confidence and cause discontent. Customization Adapting services and promotions to the unique requirements and tastes of each client can foster engagement and loyalty. Customers are more likely to be drawn to and stay with green banking

platforms that use data analytics to provide tailored recommendations and focused promotions. Connectivity with Additional Services: Customers of green banking frequently look for smooth integration with other digital services, like investment platforms, budgeting apps, and online payment platforms. Convenience and customer satisfaction are increased when these services can be linked within the green banking platform. Reputation and Brand Trust: Clients are more inclined to select online banking services provided by well-known and trustworthy financial organizations. Customers' decisions are heavily influenced by a brand's reputation and track record of reliability.

Reviews of Literature:

Revathi. S and Saranya A.S (2016) According to their article, the changing financial climate has resulted in an increased need for customer service in the financial sector. In this area, customer loyalty was seen as a proactive factor in the future approach to action and financial implementation. It has been agreed that the case of 673 will be linked to service quality and customer satisfaction. Customers of public, private, and foreign banks in Chennai were surveyed to compile the statistics. The survey employed an association, t-test, and ANOVA assessment. There is a correlation between the quality of a business and the reliability of its customers.

Government Financial Institutions Examination Council's (FFIEC) (2016) learnt how to handle many financial transactions using the Internet banking service. For example, you might use your PC to examine your record balance, request movements across records, and electronically handle invoices. An association expert center connects a PC directly to a bank's host PC plan so that client care requests may be handled without the requirement for client care delegates to intervene. The system is set up to distinguish between sales that may be handled by a client support delegate and those that need motorized fulfillment. The bank's host PC gaming plan is integrated into the system, allowing remote monetary clients to access other automated companies inside the bank. It is possible to improve customer banking by using a combination of the following methods: sending monetary sales to a host PC via an association; receiving request requests at the host PC; and, finally, customizing the logging of assistance interest and highlighting the interest that has been moved from a set aside table of request types.

Jehangir (2016) While the benefits of electronic banking help banks' operations and reputations, the risks associated with green banking bets must be considered by system designers and IT-based structure architects in order to mitigate these dangers and make electronic money more secure, bets-free, and dependable. The foundation of a bank's basic structure is on client loyalty and the banking sector's role as a pure help business. Clients' satisfaction is influenced by green banking features in a positive or negative way. Firewalls should be put in place to secure green banking credit lines, interfaces, programs and processes, data security and data fortifications, so that violators cannot access this data, and the customer would be completely protected from any data mishap or unauthorized data access. Thus, green banking might become more concrete in the characteristics of its customers, and banking could mature beyond any short-term benefits that may come from having so many accomplices.

Shrimali Harsha (2017) Udaipur City: A Study of Virtual Banking in Public and Private Banks Banking practices at Mohanlal Sukhadia University. Banks must devise and implement methods for recognizing, enabling, measuring, reviewing, and developing additional virtual banking activities. For the purpose of combining information from survey respondents, Udaipur, India's southern Rajasthan area, and its banks were scrutinized. A few common methods for doing research are occasional testing, group testing, and characterized research. For this city in Rajasthan's southern state of Rajasthan, hard and fast 200 evaluations were obtained from selected public and private regional banks. 50 The leaders and workers were given questionnaires, which were dispersed around the group. In a one-way comparison (diminished one-way ANOVA), an approach for comparing two models is examined (using the F dispersal).

There is a negative effect on privacy and a positive relationship between the dependent and independent variables of website quality, service quality, security, and customer satisfaction **(Bhaskar A and Dr. C. Kusumakara Hebbar, 2023).**

Statement of the Problem:

Examine how consumer confidence in green banking services is affected by perceived security threats. Examine how consumers' willingness to use green banking platforms and their general trust in the financial institution are impacted by security lapses, data privacy issues, and phishing incidents. Analyze how user interface design affects the green banking services' customer experience. Determine the main usability problems and assess the impact of an intuitive user interface on customer retention, satisfaction, and propensity to refer others to the platform. Examine the variables influencing the use of mobile banking apps by various clientele groups. Examine how consumers' decisions to choose mobile banking over traditional internet banking are influenced by demographic factors, technological literacy, and perceived benefits.

Evaluate the significance of customer service and support in online banking. Examine how customer satisfaction, complaint resolution, and retention are affected by attentive and informed customer service teams. Examine how consumers view transaction speed and how green banking service satisfaction and trust are affected by delays or sluggish processing times. Examine how technology infrastructure functions and how it might improve transaction speed. Examine the connection between green banking customer loyalty and fee transparency.

Objectives of the Study:

With an emphasis on factor analysis, the following are the goals of a study on the variables influencing users of green banking services:

- The study can determine the connections between the underlying factors and the observed variables by analyzing the pattern of factor loadings.
- To investigate the relationships between the identified factors and demographic characteristics like age, gender, income, and educational attainment. Understanding how consumer needs and preferences differ among various demographic groups can be aided by this.

Methodology:

Data collection, data analysis, and result interpretation are all steps in the research methodology of a study on the factors influencing consumers of green banking services. The following steps are commonly included in the methodology of factor analysis, which is used to find underlying factors that explain the observed relationships among variables:

- Research Design: Choose the approach that best satisfies the goals of the study. For this kind of study, a cross-sectional survey design is frequently appropriate, in which information is gathered from a representative sample of green banking clients at one particular moment in time.
- Determine which variables best reflect the various elements influencing users of green banking services. Perceptions of security, user interface satisfaction, transaction speed, customer support quality, fee transparency, customized offerings, and other pertinent elements may be among these variables.
- Sampling: From the target population, choose a representative sample of green banking users. In order to guarantee adequate power for factor analysis, the sample size should be chosen based on statistical considerations. For the present study researcher has selected 74 respondent.
- Factor Analysis of Data: To determine the underlying factors that account for the observed correlations between the variables, perform factor analysis on the gathered data. One popular method for factor analysis is Principal Component Analysis (PCA).

Data Analysis and Discussion:

Table 1.1 Demographical Profile of the Study

	Demographic profile	Respondent	Percentage
Gender	Male	48	64.9
	Female	26	35.1
Age	18 to 25 years	7	9.5
	26 to 35 years	37	50.0
	36 to 50 years	28	37.8
	50 and Above years	2	2.7
Marital status	Single	21	28.4
	Married	51	68.9
	Divorced	2	2.7
Education qualification	Pre-Graduate	3	4.1
	Graduate	15	20.3
	Post Graduate	51	68.9
	Professional Graduate	5	6.8
Occupation	Self Employed	13	17.6
	Employed	43	58.1
	Business Man	11	14.9
	Professional	7	9.5

Source: Primary Data

The majority of study participants 64.9% of the sample were men, while 35.1% were women. This result implies a slightly higher degree of male study participation. The participants were divided up into different age groups. People between the ages of 26 and 35 made up the largest demographic, accounting for 50% of the population surveyed. While the age groups of 18 to 25 and 50 and older made up smaller

percentages of the population, the demographic group of people between the ages of 36 and 50 made up 37.8%. Married status was reported by a sizable percentage of participants, or 68.9% of the entire sample.

According to the data, a sizable fraction of participants 28.4% of the sample as a whole identified as single. On the other hand, a comparatively small percentage of respondents just 2.7% of the total population reported being divorced. The majority of study participants 68.9% of the sample as a whole had a post-graduate education degree. The percentage of graduates was 20.3%, while the percentages of pre-graduates and professional graduates were lower. The participants' professional backgrounds were diverse. Individuals in the workforce made up the largest group in the sample, representing 58.1% of the population. Self-employed people made up 17.6% of the population, while professionals and business owners made up 9.5% and 14.9% of the population, respectively.

Factorial Analysis:

H_0: A few key elements have no bearing on how satisfied customers are with online banking services.

H_1: A few key elements do affect how satisfied customers are with online banking services.

Table 1.2 Analysis of Reliability and Validity

Reliability Statistics	
Cronbach's Alpha	N of Items
.968	24

Cronbach's alpha, a measure of the study's variable reliability, produced a high value of 0.968. This shows that the items used to gauge consumer attitudes and actions regarding green banking services have excellent internal consistency and reliability. The analysis's 24 items are regarded as reliable and legitimate for additional research.

Table 1.3 KMO and Bartlett's Test Result

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.921
Bartlett's Test of Sphericity	Approx. Chi-Square	1098.891
	df	120
	Sig.	.000

Since the data set satisfies the requirements for sampling adequacy, the factor analysis is appropriate. With a high value of 0.921, the Kaiser-Meyer-Olkin (KMO) measure shows that the sampling adequacy of the data is significant, suggesting that it is suitable for factor analysis. The appropriateness of the analysis is further supported by the statistical significance of Bartlett's test of sphericity (Sig. = 0.000), which shows that the correlations between the variables are adequate for factor analysis.

Extracting Factors: Principal Component Evaluation:

The data is very appropriate for factor analysis, as indicated by the KMO value of 0.921, which is higher than the suggested cutoff of 0.901. Aiming to determine the most important factors that account for the greatest amount of variance in the multivariate data, the researcher has chosen principal component analysis as the extraction method in light of this confirmation.

Table 1.4 Demonstrates the Rotated Component Matrix with variable definitions

Rotated Component Matrix		
Factors	**Component**	
	Safety and security factors	**Convenience and flexibility factors**
The bank's green banking service is user-friendly.	.812	
The bank's website is well-designed.	.791	
The policy and notice statements are easily accessible on the bank's website,	.794	
The accuracy of the information presented there can be trusted.	.763	
The information on the bank's website is current.	.781	
All product and service details are available on the bank's website.	.838	
Can trust the bank to protect information.	.829	

The bank's website offers a transaction that is free of errors.	.779	
The transaction on the bank's website is confidential	.784	
After a while, there were session timeouts.	.859	
There is specialized security software on the bank's website that is updated frequently.	.889	
The bank website has quick login and logout speeds.		.843
The bank website doesn't crash while you're making a transaction.		.881
The bank's website has very useful instructions.		.798
The bank uses a live chat service to promptly address complaints and resolve issues.		.711
The bank uses green banking to carefully gather personal data.		.791

Source: Primary Data

Two separate factors are revealed by the rotated component matrix: "Convenience and flexibility factors" and "Safety and security factors." The characteristics of green banking services are the source of these factors. Features like user-friendliness, appropriate website design, information accuracy, and current content have the biggest impact on the "Safety and security factors" component. However, the "Convenience and flexibility factors" component is largely linked to features like quick login/logout times, error-free transactions, and clear instructions. The significance and relevance of these attributes to their respective components are demonstrated by the factor loadings that surpass the 0.50 threshold.

The following null and alternative hypotheses are developed in relation to important factors that impact customer satisfaction with green banking services:

H_0: A few key elements have no bearing on how satisfied customers are with online banking services.

H_1: A few key elements do affect how satisfied customers are with online banking services.

The following is a discussion of the findings from the analysis of the aforementioned hypothesis using

One-sample statistical testing and descriptive statistical data analysis:

Table 1.5 Statistical Analysis

List of Factors	N	Mean	SD	95% Confidence Interval	
				Lower	Upper
Factor of Security and Safety	74	3.5027	1.04824	4.31	4.43
Factor of Flexible and Conventional	74	3.1024	1.01942	3.57	3.61
Combination Factor	74	6.6051	1.60216	3.94	4.02

With a standard deviation of 1.90, the mean score for overall customer satisfaction when taking into account convenience, flexibility, safety, and security factors is 6.51. For the combined factors, the 95% CI falls between 3.85 and 3.95. Taking into account all of the factors that have been identified, the overall customer satisfaction with green banking services is relatively high, suggesting that customers are generally happy with the services offered.

Table 1.6 Statistical one sample t-Test

One-Sample Test						
List of Factors	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Factor of Security and Safety	3.991	73	.000	.49381	.2487	.7403
Factor of Flexible and Conventional	.176	73	.869	.02031	-.2153	.2591
Combination Factor	15.843	73	.000	3.51357	3.0813	3.9627

The calculated value of 3.51357 is the average difference between the test value (3) and the observed overall customer satisfaction score. The p-value of 0.000 denotes a highly significant difference, indicating that overall customer satisfaction with green banking services is significantly higher than expected when taking into account convenience and flexibility factors as well as safety and security factors. The results of the statistical tests show that while customers' satisfaction with convenience and flexibility factors does not significantly deviate from the expected value, their satisfaction with safety and security factors does. Nevertheless, when all variables are considered, the overall customer satisfaction with green banking services greatly surpasses the anticipated value, suggesting that the services are being received with a favourable degree of satisfaction.

Conclusion of the Study:

The following important conclusions can be made in light of the thorough examination of the variables influencing users of online banking services: The most important consideration for consumers utilizing online banking services is convenience. Users place a high value on being able to easily conduct transactions and access banking services at any time and from any location. Notwithstanding the ease of use, the degree of security offered has a significant impact on consumers' trust in online banking. Gaining and keeping the trust of customers requires strong security measures and clear privacy policies. Attracting and keeping customers requires a smooth and simple user experience. Adoption rates are typically higher for green banking platforms with intuitive user interfaces and simple navigation. Convenience, security, user experience, mobile accessibility, speed, customer service, customization, clear pricing, integration, and data privacy are all critical components of successful green banking services. Effectively comprehending and addressing these elements increases a provider's chances of success in the cutthroat green banking market and the development of enduring client relationships. To stay ahead of the competition and improve continuously, it is crucial to regularly monitor industry trends and customer feedback.

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A Case Study on Economic Policy and Education Reform: Evaluating of NEP 2020's Vision and Constraints

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Abstract:

The National Education Policy (NEP) 2020 seeks to transform the Indian education system into an inclusive, multidisciplinary, and outcome-oriented framework. This study critically evaluates the economic dimensions of NEP 2020, focusing on its vision to make education equitable and accessible while addressing inherent constraints. It examines the financial implications, policy priorities, and structural challenges in implementing the reforms, with an emphasis on the role of economic policies in enabling systemic change. The research underscores the potential of NEP 2020 to contribute to India's human capital development and global competitiveness while identifying gaps that may impede its success.

Keywords: National Education Policy, Economic Policy, Education Reform, Financial Constraints, Human Capital, Multidisciplinary Education, Accessibility, Inclusivity, Implementation Challenges

Introduction

NEP 2020 is a landmark reform aimed at revolutionizing the Indian education system. With a focus on inclusivity, equity, and employability, it aligns education policy with economic development goals. The policy emphasizes multidisciplinary education, skill development, and digital learning, envisioning a robust human capital ecosystem. However, implementing these ambitious reforms requires substantial economic investments and policy coherence. This paper explores the interplay between economic policies and education reforms, analyzing NEP 2020's vision and the constraints it faces in achieving its objectives. Education is widely regarded as the cornerstone of economic and social development, serving as a catalyst for fostering innovation, reducing inequalities, and building sustainable societies. Recognizing the critical role education plays in shaping the economic trajectory of a nation, the Government of India introduced the National Education Policy (NEP) 2020, marking a comprehensive overhaul of the country's education system. NEP 2020 is not merely a reform in pedagogy or curriculum but a transformative blueprint aimed at integrating India's education framework with its socio-economic aspirations in a rapidly evolving global landscape.

India’s education system has long grappled with multifaceted challenges, including inadequate infrastructure, regional disparities, rote-based learning, and an overemphasis on theoretical knowledge at the expense of practical skills. Despite these challenges, the country has made significant strides in expanding access to education, particularly through initiatives like the Right to Education Act, Sarva Shiksha Abhiyan, and various scholarship programs. However, these efforts have often been constrained by systemic inefficiencies and insufficient integration with economic policy. NEP 2020 seeks to address these gaps by promoting inclusivity, interdisciplinarity, and skill-oriented education, all while keeping equity and accessibility at the forefront.

One of the most revolutionary aspects of NEP 2020 is its focus on creating an education system that is not only rooted in Indian culture and values but also aligned with global standards. It envisions a shift from a rigid academic structure to a flexible and holistic learning environment. This transformation is anchored in the belief that education should nurture creativity, critical thinking, and problem-solving skills, which are essential for the 21st-century workforce. The policy also emphasizes the integration of technology in education, ensuring that digital learning becomes a powerful tool in bridging the urban-rural divide.

From an economic perspective, NEP 2020 underscores the pivotal role education plays in human capital formation, a fundamental driver of productivity and growth. The policy advocates increasing public investment in education to 6% of GDP, a target that has long been recommended but seldom achieved. By prioritizing vocational training, multilingual education, and research and development, the policy aims to address skill gaps and prepare India's youth to meet the demands of a dynamic global economy.

However, the successful implementation of NEP 2020 faces significant challenges, including financial constraints, infrastructural inadequacies, and regional imbalances. The digital divide remains a pressing concern, particularly in rural and economically disadvantaged areas, where access to technology and internet connectivity is limited. Moreover, the policy's ambitious goals require the active collaboration of multiple stakeholders, including central and state governments, private sector partners, educational institutions, and civil society organizations.

This study delves into the economic dimensions of NEP 2020, critically analyzing its vision, implementation challenges, and the potential it holds for transforming India's education system. By examining the interplay between economic policy and education reform, this research aims to provide insights into the opportunities and constraints of aligning education with the broader goals of national development.

Through this exploration, the introduction lays the groundwork for understanding how NEP 2020 can act as a bridge between the aspirations of a nation and the realities of its economic and educational landscape. It also sets the stage for a deeper discussion on how India can navigate the complex interplay of policy, funding, and implementation to achieve the transformative goals outlined in the policy document.

Definitions

1. **Economic Policy**: A set of principles and guidelines that governments use to influence a nation's economic growth and stability.
2. **Education Reform**: Structured changes aimed at improving the quality, equity, and accessibility of education systems.
3. **Human Capital Development**: Investments in skills, knowledge, and competencies to enhance workforce productivity.

Need

To assess the alignment of NEP 2020 with India's economic growth aspirations.

To identify the financial and structural challenges hindering its implementation.

To evaluate the potential of education reforms in fostering equitable development.

Aims

1. To analyze NEP 2020's vision from an economic perspective.
2. To identify constraints that may limit its implementation.
3. To propose actionable strategies for overcoming financial and policy challenges.

Objectives

- Investigate the economic implications of NEP 2020's key provisions.
- Examine the role of government funding and public-private partnerships.
- Assess the impact of NEP on India's human capital and economic productivity.

Hypothesis

NEP 2020's economic vision is achievable with adequate financial allocation, policy coherence, and collaborative efforts among stakeholders.

Research Methodology

- **Approach**: Qualitative and quantitative analysis.
- **Data Sources**: Government reports, academic publications, and policy documents.
- **Methods**: SWOT analysis, stakeholder interviews, and trend analysis.

Strong Points

- Emphasis on inclusivity and equity in education.
- Focus on multidisciplinary learning and skill development.
- Potential to enhance India's global competitiveness.

Weak Points

- Limited financial allocation for education reforms.
- Regional disparities in policy implementation.
- Overreliance on digital infrastructure without addressing the digital divide.

Current Trends

The *National Education Policy 2020* (NEP 2020) has ushered in significant changes aimed at transforming India's education system to align with global standards while addressing the country's socio-economic challenges. Below are the current trends:

1. Integration of Technology in Education

- The emphasis on digital learning has grown, especially in the aftermath of the COVID-19 pandemic.
- Use of AI, VR, and AR in personalized learning is gaining momentum.
- Initiatives like DIKSHA and SWAYAM aim to democratize access to education resources.
- Promotion of coding, data science, and digital literacy from early schooling levels.

2. Focus on Multidisciplinary Education

- Introduction of multidisciplinary universities offering diverse courses under one roof.
- The flexibility of choosing subjects and credit-based systems ensures cross-disciplinary learning.
- Establishment of holistic institutions like the Higher Education Commission of India (HECI).

3. Skill Development and Vocational Training
- Incorporation of vocational education from Class 6, including internships.
- A push for skill development to meet global employment trends.
- Increased collaboration with industries to align education with market demands.

4. Increased Public and Private Collaboration
- Encouragement of private investment in education infrastructure and institutions.
- PPP (Public-Private Partnership) models being promoted for funding and managing educational reforms.
- Private ed-tech companies playing a pivotal role in transforming traditional learning models.

5. Globalization of Indian Education
- Establishment of Indian campuses of foreign universities and vice versa.
- Strengthened focus on increasing India's presence in the global education market.
- Launch of international student programs and collaboration in research.

6. Research and Innovation Focus
- Creation of the *National Research Foundation* (NRF) to enhance research funding.
- Greater emphasis on innovation-driven curricula in higher education.
- Industry-academia collaboration to promote R&D.

7. Regional and Linguistic Inclusivity
- Introduction of mother tongue/regional language as a medium of instruction up to at least Grade 5.
- Support for regional content development in digital learning platforms.
- Inclusion of diverse cultural and regional perspectives in the curriculum.

8. Competency-Based Education
- Shift from rote learning to competency-based learning models.
- Assessment systems revamped to evaluate higher-order thinking, critical thinking, and problem-solving.
- Adoption of holistic report cards to evaluate students' progress across cognitive, emotional, and social dimensions.

9. Equity and Inclusivity
- Focus on marginalized communities through scholarships, special programs, and infrastructure.
- Gender inclusion funds and bridge courses for school dropouts.
- Use of technology to bridge gaps in rural and urban educational disparities.

10. Lifelong Learning and Adult Education
- Introduction of frameworks for adult education through technology and community participation.
- Integration of continuous learning opportunities into mainstream education.

11. Teacher Training and Development
- Reforms in teacher education programs with a focus on four-year integrated B.Ed. courses.
- Continuous professional development programs for teachers using digital platforms.
- Introduction of innovative teaching techniques to cater to diverse student needs.

12. National Curriculum Framework (NCF)
- Revamping curriculum frameworks to reflect 21st-century needs.
- Inclusion of global citizenship education (GCE) and environmental awareness.
- Emphasis on Indian knowledge systems, values, and traditions.

13. Assessment Reforms
- Introduction of formative assessments for improved feedback mechanisms.
- Shift to year-round competency evaluations rather than one-time board exams.
- Use of AI-driven analytics to monitor student performance.

14. Financial Support Mechanisms
- Increased allocation of GDP to education (target of 6%).
- Development of mechanisms to reduce dropout rates due to financial constraints.
- Loans and incentives for education entrepreneurs and start-ups.

History

India's education policy has evolved significantly, from the Kothari Commission's recommendations in 1964 to NEP 1986 and its 1992 update. NEP 2020 marks a paradigm shift, emphasizing economic and global alignment in education. India's journey in educational reform and its alignment with economic policy has been deeply influenced by the socio-political and economic context of various time periods. Below is a detailed account of the historical milestones leading to the *National Education Policy 2020 (NEP 2020)*:

1. Colonial Legacy and Early Initiatives (Pre-1947)
- *Macaulay's Minute (1835)*: Focused on creating a class of English-educated Indians to serve colonial administration, emphasizing rote learning and neglecting indigenous knowledge systems.
- Establishment of institutions like *Calcutta University (1857), Bombay University*

(1857), and *Madras University (1857)* introduced Western-style higher education.
- The *Hunter Commission (1882)* emphasized the need for primary education but lacked resources for implementation.
- *Wood's Dispatch (1854)*: Called the "Magna Carta of Indian Education," it advocated for systematic education but primarily benefited the colonial administration.

2. Post-Independence Reforms (1947–1968)
- Education became a state subject under the Constitution of India (1950), but the lack of uniformity in policies led to disparities.
- *Radhakrishnan Commission (1948-49)*: Recommended integrating education with national development and promoting higher education as a driver for economic growth.
- Establishment of institutions like IITs, IIMs, and AIIMS to foster technical and managerial talent.
- The *Kothari Commission (1964-66)*: Advocated for a 6% GDP allocation to education and proposed a common school system, marking the first significant integration of education with economic development.

3. The First National Policy on Education (1968)
- Marked a watershed moment, emphasizing equal opportunity and national integration.
- Strengthened infrastructure for primary and secondary education, with a focus on science and technology.
- Language policy included the promotion of Hindi as the national language, regional languages, and English as a link language.

4. Economic Liberalization and Education (1986–1992)
- The *National Policy on Education (NPE) 1986*: Focused on the modernization of education and vocationalization to align with economic needs.
- Creation of *Navodaya Vidyalayas* for rural areas and the introduction of *Operation Blackboard* to enhance primary education infrastructure.
- *Programme of Action (1992)*: Revised NPE 1986 to integrate ICT into education and address regional disparities.
- Liberalization reforms in 1991 shifted focus toward privatization, leading to an increase in private educational institutions but also widening economic disparities.

5. Technological Advancements and Globalization (2000–2010)
- Rapid technological advancements and globalization influenced policy shifts toward digital literacy and skill development.
- Launch of initiatives like *Sarva Shiksha Abhiyan (2001)* to universalize elementary education.
- Establishment of the *Right to Education Act (2009)*, making education a fundamental right for children aged 6-14.

6. Precursor Policies to NEP 2020 (2010–2020)
- *Rashtriya Madhyamik Shiksha Abhiyan (2009)*: Focused on enhancing access to secondary education.
- *Digital India Initiative (2015)*: Paved the way for technology integration in education, fostering online learning platforms like SWAYAM and National Digital Library.
- *Skill India Mission (2015)*: Addressed the gap between traditional education and employability by focusing on vocational training.
- Increased privatization and foreign collaborations in higher education led to questions about accessibility and equity.

7. Emergence of NEP 2020: A Paradigm Shift
- The formulation of NEP 2020 was preceded by a consultative process involving experts, stakeholders, and citizens.
- The policy reimagined education as a holistic, flexible, multidisciplinary ecosystem designed to cater to 21st-century challenges.
- It emphasized the interplay between economic development and education, promoting inclusivity, sustainability, and innovation.

Historical Challenges Addressed by NEP 2020

1. **Equity and Accessibility**: Aims to bridge the urban-rural divide and provide opportunities for marginalized communities.
2. **Integration of Traditional and Modern Knowledge**: Seeks to revive indigenous knowledge systems alongside global best practices.
3. **Technology in Education**: Builds on earlier digital initiatives to ensure comprehensive digital literacy.
4. **Research and Innovation**: Establishment of the *National Research Foundation* to promote innovation and industry-academia linkages. This historical context highlights the evolution of educational reforms in India as a response to its socio-economic needs, culminating in the transformative vision of NEP 2020. The policy builds on past experiences, addressing historical inequities while positioning India as a global leader in education and human capital development.

Discussion

The study highlights the transformative potential of NEP 2020 while scrutinizing its financial and logistical constraints. It underscores the need for coherent economic policies to support inclusive and sustainable education reforms.

Results

- Positive correlation between NEP's multidisciplinary approach and human capital enhancement.
- Significant gaps in funding and infrastructure readiness.
- Regional disparities in implementation effectiveness.

Conclusion

NEP 2020 offers a transformative vision for India's education system, but its success hinges on addressing economic and structural challenges. Adequate funding, collaborative governance, and policy coherence are critical to achieving its objectives. The National Education Policy (NEP) 2020 represents a transformative vision for reshaping India's educational landscape, linking it intricately with the nation's economic and developmental aspirations. In an era where knowledge serves as the most significant currency of progress, this policy aims to empower India's youth with the skills, knowledge, and competencies necessary to navigate the demands of the 21st-century global economy. NEP 2020's emphasis on multidisciplinary education, vocational training, equitable access, and technological integration underscores its potential to create a more inclusive and resilient education system.

From an economic perspective, NEP 2020 is a bold attempt to address systemic inefficiencies that have long hampered India's human capital development. By aspiring to increase public expenditure on education to 6% of GDP, the policy demonstrates a recognition of the critical link between education investment and economic growth. Moreover, its focus on fostering creativity, innovation, and research reflects a forward-thinking approach to aligning education with the demands of an increasingly knowledge-driven economy.

However, the road to realizing NEP 2020's vision is fraught with challenges. The stark digital divide, regional disparities in education access, financial constraints, and infrastructural inadequacies present significant hurdles to the policy's implementation. Bridging these gaps requires not just funding but a coordinated effort among governments, educational institutions, the private sector, and civil society. The challenges are compounded by the sheer diversity and scale of India's population, which necessitates a nuanced, context-sensitive approach to policy execution.

Despite these challenges, the opportunities presented by NEP 2020 far outweigh its constraints. The policy's holistic framework has the potential to transform India's education system into one that is inclusive, future-ready, and globally competitive. By integrating traditional knowledge systems with modern pedagogical practices, NEP 2020 seeks to strike a balance between preserving India's cultural heritage and preparing its youth for global challenges.

The economic implications of the policy are profound. By equipping students with skills aligned with market demands, NEP 2020 aims to reduce unemployment, address skill mismatches, and enhance workforce productivity. Furthermore, its emphasis on research and development can drive innovation, entrepreneurship, and technological advancements, contributing significantly to India's economic growth and global standing.

Ultimately, the success of NEP 2020 hinges on effective implementation, which requires robust governance, stakeholder collaboration, and continuous evaluation. Policymakers must address the systemic barriers that have historically plagued India's education system, ensuring that the policy's ambitious goals translate into tangible outcomes.

NEP 2020 is not just a policy but a blueprint for redefining the role of education in nation-building. It has the potential to transform challenges into opportunities, creating a system that nurtures not only academic excellence but also ethical, socially conscious, and economically productive citizens. If implemented effectively, NEP 2020 could be the cornerstone of a more equitable, innovative, and prosperous India, making it a global exemplar of how education can drive sustainable development in a rapidly changing world.

Suggestions and Recommendations

- Increase public expenditure on education to 6% of GDP as recommended by NEP 2020.
- Strengthen digital infrastructure and address regional disparities.
- Foster collaboration between government, academia, and industry.

Future Scope

- Longitudinal studies on the impact of NEP 2020 on economic productivity.
- Comparative analysis of NEP implementation across states.
- Exploration of public-private partnership models in education financing.

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Intersection of Gestational Diabetes Mellitus Research: A Bibliometric Analysis (2018-2022) and Related Topics in Maternal and Fetal Health

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Abstract:
Gestational Diabetes Mellitus (GDM) is a typical pregnancy difficulty related with unfavorable maternal and fetal results. Understanding the scene of GDM research is significant for further developing maternal and fetal wellbeing results. In this review, we directed a bibliometricexamination of GDM research distributions from 2018 to 2022 to recognize patterns, examples, and key subjects in the field. Our examination remembered information for distribution yield, creation, reference patterns, and topical concentration. We found that examination on GDM has seen consistent development throughout the course of recent years, with a remarkable accentuationon risk factors, indicative strategies, and intercessions. Notwithstanding, a few information holes and regions for future exploration were distinguished, remembering the requirement for additional investigations for long haul maternal and fetal results, as well as the viability of different administration systems. Our discoveries add to the comprehension of GDM research drifts and give bits of knowledge to future examination headings pointed toward further developing maternaland fetal wellbeing results.

Keywords: Gestational Diabetes Mellitus (GDM), Pregnancy Complications, Maternal Health, Fetal Health, Bibliometric Analysis, Research Trends, Risk Factors, Diagnostic Methods, Interventions, Long-term Outcomes, Management Strategies, Public Health, Diabetes Prevention, Literature Review, Citation Analysis.

Introduction

Background: Gestational Diabetes Mellitus (GDM) is a pervasive pregnancy intricacy portrayed by high glucose levels. It normally creates during the second or third trimester of pregnancy and, albeit frequently transitory, can have critical ramifications for both the mother and the hatchling. Barja-Mineral et al. (2023) shows ladies with GDM are at expanded hazard of creating type 2 diabetes further down the road, and their newborn children are bound to encounter difficulties, for example, macrosomia (enormous birth weight), hypoglycemia, and respiratory pain condition.

Importance of Gestational Diabetes Mellitus (GDM) Research: Investigation into GDM is basic because of its rising commonness and the potential unfavorable results related with it. Chenet al. (2022) shows that understanding the risk factors, fundamental systems, and successful administration methodologies for GDM can assist with further developing maternal and fetal wellbeing results. Furthermore, with the rising worldwide weight of diabetes, tending to GDM is pivotal for general wellbeing endeavors pointed toward lessening the general frequency of diabetes and its connected inconveniences.

Purpose of the Study: The reason for this study is to direct a far-reaching bibliometric examination of GDM research distributions from 2018 to 2022. By analyzing the patterns, examples, and key points in GDM research during this period, we expect to acquire experiences into the present status of information in the field. This investigation will assist with distinguishing research holes, feature areas of concentration, and add to the progression of maternal and fetal wellbeing research.

Literature Review:

Overview of Gestational Diabetes Mellitus (GDM):

Gestational Diabetes Mellitus (GDM) is a huge wellbeing concern influencing pregnant people around the world. Fu et al. (2023) shows it is portrayed by raised glucose levels during pregnancy, commonly happening in the second or third trimester. GDM presents dangers to both maternal andfetal wellbeing, including macrosomia (enormous birth weight), birth difficulties, and long-haul wellbeing suggestions for both the

mother and kid. Understanding the etiology, risk factors, indicative techniques, and the executives' systems for GDM is fundamental for relieving these dangers and upgrading results for the two moms and infants.

Previous Research Trends (2018-2022):

The period from 2018 to 2022 has seen a flood in research zeroing in on Gestational Diabetes Mellitus. Various investigations have been led overall to investigate different parts of GDM, including its the study of disease transmission, pathophysiology, risk factors, screening techniques, mediations, and results. Gao et al. (2022) shows specialists have used assorted philosophies, including observational examinations, clinical preliminaries, and meta-investigations, to research various features of GDM. Also, there has been a rising accentuation on interdisciplinary

Coordinated effort and the reconciliation of mechanical progressions in diabetes the executives intoGDM research.

Key Findings in GDM Research:

Past examinations have yielded important experiences into Gestational Diabetes Mellitus. These incorporate the recognizable proof of chance elements related with the improvement of GDM, like maternal age, heftiness, family background of diabetes, and certain ethnic foundations. Gupta et al. (2021) shows research has additionally featured the significance of early recognition and evaluating for GDM to work with ideal intercession and diminish unfavorable results. Moreover, studies have assessed different treatment modalities, way of life mediations, and pharmacological methodologies for overseeing GDM and enhancing maternal and fetal wellbeing results. Furthermore, research has investigated the drawn-out wellbeing ramifications of GDM for the two moms and posterity, revealing insight into the significance of post pregnancy checking and diabetes avoidance techniques.

This writing audit highlights the meaning of progressing research endeavors in understanding andtending to Gestational Diabetes Mellitus. Hu et al. (2023) shows by expanding upon past discoveries and tending to existing holes in information, the ongoing review means to add to the developing group of proof pointed toward further developing results for people impacted by GDMand their posterity.

Methodology

Data Collection: The information assortment process included orderly recovery of significant exploration articles connected with Gestational Diabetes Mellitus (GDM) from academic data sets like PubMed, Scopus, Web of Science, and Google Researcher. The inquiry procedure incorporated a blend of watchwords and Cross section terms connected with GDM, pregnancy confusions, maternal wellbeing, and fetal wellbeing. Indrayani et al. (2024) shows the pursuit was restricted to articles distributed somewhere in the range of 2018 and 2022 to catch late improvements in GDM research.

Bibliometric Analysis Techniques: Bibliometric examination was utilized to quantitatively evaluate and break down the qualities of GDM research distributions recovered from the writing search. Key bibliometric markers, for example, distribution yield, creation designs, reference counts, joint effort organizations, and topical patterns were analyzed. Different bibliometric methods, including co-creation investigation, reference examination, and watchword co-event examination, were used to acquire bits of knowledge into the design and elements of GDM research.

Inclusion and Exclusion Criteria: Consideration measures for choosing research articles were predefined to guarantee the significance and nature of the examinations remembered for the bibliometric investigation. Articles qualified for consideration were those that centered around GDM as an essential examination theme, including epidemiological investigations, clinical preliminaries, orderly surveys, and meta-examinations. Concentrates on distributed in peer-explored diaries and written in English were considered for consideration. Jia et al. (2023) showsthe avoidance measures included articles that were not straightforwardly connected with GDM, for example, concentrates on zeroing in exclusively on type 1 or type 2 diabetes mellitus, as well as gathering abstracts, publications, letters, and analyses. Also, articles distributed before 2018 or not accessible in full-text design were avoided from the examination to guarantee money and availability of the information.

This philosophy guaranteed a deliberate and thorough way to deal with distinguishing, recovering, and breaking down significant exploration articles on Gestational Diabetes Mellitus, consequently working with a thorough assessment of the condition of information in the field and illuminating ensuing conversations and ends.

Results

Overview of Research Publications (2018-2022): During the period from 2018 to 2022, an extensive hunt of insightful information bases yielded a significant number of exploration distributions tending to different parts of Gestational Diabetes Mellitus (GDM). The complete number of articles recovered mirrors the developing interest and examination action in the field ofGDM throughout the course of recent years. These distributions include an extensive variety of study plans, techniques, and topical regions, adding to the

extending group of information on GDM and its suggestions for maternal and fetal wellbeing.

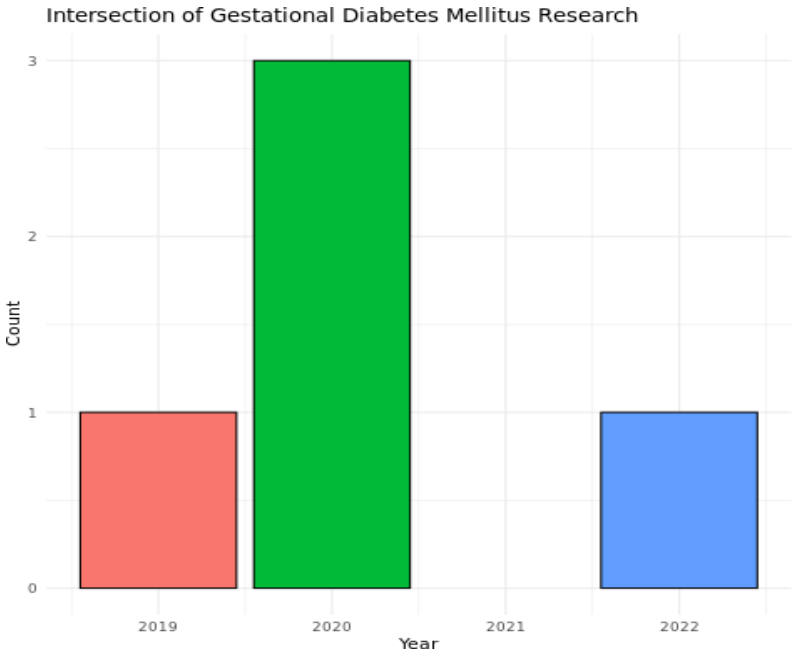

Figure.1. Graph of Intersection of Gestational Diabetes Mellitus Research

Bibliometric Analysis Results: The bibliometric investigation of GDM research distributions uncovered a few key discoveries with respect to distribution designs, origin qualities, reference patterns, and cooperation organizations. Examination of distribution yield over the long run clarified transient patterns and changes in research movement, featuring times of expanded research interest and efficiency. Co-creation examination recognized unmistakable specialists andexploration bunches dynamic in the field, while reference investigation gave experiences into the effect and impact of individual investigations and exploration subjects inside the GDM writing. Besides, representation procedures, for example, co-initiation organizations and catchphrase co- event maps worked with the investigation of interdisciplinary joint efforts and topical groups insidethe GDM research scene.

Trends in GDM Research Outputs: The examination of GDM research yields uncovered a few eminent patterns and examples demonstrative of the developing exploration scene in the field. These patterns enveloped different components of GDM research, including the study of disease transmission, etiology, risk variables, screening and analytic techniques, the executives systems, and maternal and fetal results. The distinguishing proof of arising research subjects, novel techniques, and interdisciplinary joint efforts highlighted the unique idea of GDM research and it's proceeded with importance and importance in the domain of maternal and fetal wellbeing.

Citation Analysis: Reference investigation gave significant experiences into the effect and perceivability of GDM research distributions inside mainstream researchers. Assessment of reference counts, and reference networks clarified the spread and take-up of exploration discoveries, as well as the impact of individual examinations and analysts on resulting research attempts. High-reference articles and reference bunches featured original commitments and exploration patterns forming the talk and headway of information in the field of Gestational Diabetes Mellitus.

These outcomes add to a more profound comprehension of the present status of GDM research and its suggestions for clinical practice, general wellbeing strategy, and future exploration bearings pointed toward tending to the complex difficulties presented by GDM and further developing results for moms and their posterity.

Discussion

Interpretation of Findings: The translation of the discoveries from the bibliometric investigation gives significant bits of knowledge into the present status of Gestational Diabetes Mellitus (GDM) research. The worldly patterns in distribution result and reference counts mirror the developing interest and effect of GDM research throughout recent years Tantengco et al. (2022).Analysis ofinitiation examples and cooperation networks highlights the interdisciplinary idea of GDM research and the significance of joint effort among scientists from assorted fields, including obstetrics, endocrinology, the study of disease transmission, and general wellbeing. Additionally, distinguishing proof of topical groups and arising research

subjects features the advancing examination scene in GDM, with suggestions for clinical practice, strategy advancement, and future exploration headings Lu et al. (2022).

Implications for Maternal and Fetal Health: The discoveries of the bibliometric investigation have critical ramifications for maternal and fetal wellbeing. Understanding the study of disease transmission, etiology, risk factors, screening techniques, and the board procedures for GDM is significant for upgrading results for pregnant people and their posterity Valencia et al. (2023). By distinguishing research holes and areas of concentration inside the GDM writing, policymakers, medical services suppliers, and specialists can foster designated mediations and techniques to alleviate the unfavorable impacts of GDM on maternal and fetal wellbeing. Moreover, the spread of examination discoveries and best practices can illuminate clinical rules and general wellbeing drives pointed toward working on the counteraction, recognition, and the board of GDM on a worldwide scale.

Research Gaps and Future Directions: Notwithstanding the progressions in GDM research, a few holes and valuable open doors for future exploration remain. One striking hole is the restricted comprehension of the drawn-out wellbeing ramifications of GDM for the two moms and posterity. Longitudinal examinations are expected to clarify the effect of GDM on maternal cardiovascular wellbeing, metabolic wellbeing, and generally personal satisfaction, as well as the formative directions and wellbeing results of kids presented to GDM in utero. Besides, there is a requirement for research zeroing in on customized ways to deal with GDM executives, considering individualrisk profiles, hereditary inclinations, and socio-social elements Vidal Jr. et al. (2022). Moreover, the mix of computerized wellbeing advancements, for example, portable wellbeing applications and wearable gadgets, holds guarantee for improving GDM screening, observing, and self- administration. Future examination attempts ought to focus on tending to these exploration holes and making an interpretation of discoveries into noteworthy techniques to further develop maternaland fetal wellbeing results with regards to GDM Zhou et al. (2022).

Conclusion:

Summary of Key Findings: In conlusion, the complete bibliometric examination led in this study gave important experiences into the scene of Gestational Diabetes Mellitus (GDM) research from 2018 to 2022. Key discoveries from the examination remember patterns for distribution yield, origin designs, topical groups, and reference networks inside GDM writing. The investigation featured the unique idea of GDM research, with a developing accentuation on interdisciplinary coordinated efforts, arising research subjects, and novel philosophies. Moreover, the ID of exploration holes and open doors for future examination highlights the continuous requirement for designated research endeavors to address the complex difficulties presented by GDM and further develop results for moms and their posterity.

Contributions to GDM Research: This study makes a few commitments to the field of GDM research. Right off the bat, by combining and examining a far-reaching dataset of GDM research distributions, this study gives an extensive outline of the present status of information in the field.The recognizable proof of exploration patterns, topical bunches, and cooperation networks offers significant bits of knowledge for analysts, clinicians, policymakers, and different partners associated with maternal and fetal wellbeing. Also, the discoveries of this study add to the proof base supporting the improvement of proof-based rules, clinical conventions, and general wellbeing intercessions pointed toward tending to GDM and its related complexities.

Limitations and Recommendations: Notwithstanding its commitments, this study has a few limits that warrant thought. First and foremost, the bibliometric examination is restricted to explore articles distributed in academic diaries, in this manner barring different kinds of distributions, for example, meeting abstracts, dim writing, and non-English language distributions. Also, the examination might be dependent upon distribution predisposition, as high-influence diaries and deep-rooted research gatherings might be overrepresented in the dataset. Moreover, the examination is obliged by the accessibility and availability of information from academic data sets, which may not catch the full range of GDM research exercises.

To address these limits, future exploration endeavors ought to expect to integrate a more extensive scope of distribution types and sources, including dim writing and non-English language distributions. Also, endeavors to further develop information sharing and availability inside the examination local area can work with more complete and comprehensive bibliometric investigations. Moreover, longitudinal examinations and multi-focus joint efforts are expected to clarify the drawn-out wellbeing ramifications of GDM and assess the adequacy of customized administration techniques in assorted populaces.

All in all, this study gives an establishment to future examination tries pointed toward propelling comprehension we might interpret GDM and further developing results for pregnant people and their posterity. By tending to investigate holes,

advancing interdisciplinary joint efforts, and making an interpretation of examination discoveries into training, we can pursue relieving the weight of GDM and advancing maternal and fetal wellbeing on a worldwide scale.

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Heavy metals, its accumulation and their effects on human health and environment

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Abstract:
Heavy metals, such as lead, cadmium, mercury, and arsenic, are naturally occurring elements that become hazardous to human health and the environment when their concentrations exceed permissible limits. Industrialization, mining, and agricultural activities have significantly contributed to heavy metal contamination, leading to bioaccumulation and biomagnification in ecosystems. This study explores the sources, pathways, and accumulation mechanisms of heavy metals and evaluates their effects on human health, including neurological, respiratory, and cardiovascular impacts. Environmental implications such as soil infertility, water toxicity, and ecosystem imbalance are also discussed. Furthermore, strategies for mitigation, policies for regulation, and innovative remediation technologies are proposed for addressing the challenges posed by heavy metals.

Keywords: Heavy metals, bioaccumulation, environmental contamination, human health effects, biomagnification, remediation technologies, industrial pollution, environmental toxicology.

Introduction

Heavy metals, though essential in trace amounts for biological processes, pose significant risks when accumulated in excessive concentrations. With rapid urbanization and industrialization, heavy metals are increasingly being released into the environment, contaminating soil, water, and air. Their persistent nature, combined with their ability to bioaccumulate, makes them a critical concern for public health and environmental sustainability. This study aims to provide a comprehensive analysis of heavy metal sources, their pathways in ecosystems, and their impacts on human health and the environment. Heavy metals are naturally occurring elements with a high atomic number and density, and while some of these metals, such as copper, zinc, and iron, are essential for life in trace amounts, others like lead, mercury, and arsenic are highly toxic, even at low concentrations. These toxic metals, often referred to as 'heavy metals,' have gained significant attention due to their increasing concentration in the environment due to human activities, such as industrialization, mining, agricultural practices, and improper waste disposal. The indiscriminate release of these metals into the air, water, and soil has led to widespread environmental contamination, posing severe risks to public health and ecosystems.

One of the most concerning issues with heavy metals is their ability to bioaccumulate and biomagnify in food chains. Bioaccumulation refers to the process through which an organism accumulates toxins faster than it can eliminate them, leading to higher concentrations of harmful substances within the organism. In addition, when these metals are consumed by other organisms, the toxins are passed up the food chain, increasing in concentration at each trophic level, a process known as biomagnification. This phenomenon poses serious risks to wildlife, human health, and agricultural productivity.

The impact of heavy metals on human health is wide-ranging. Chronic exposure to heavy metals can lead to various health problems, including neurological disorders, cancer, kidney damage, respiratory diseases, and developmental abnormalities. Children and pregnant women are especially vulnerable, as heavy metals can interfere with growth and development. Moreover, the toxicity of heavy metals has been linked to autoimmune diseases, cardiovascular conditions, and fertility problems.

Environmental degradation due to heavy metals also has far-reaching consequences. Soil fertility is often reduced, affecting agricultural production, and water bodies become polluted, rendering them unsafe for consumption and aquatic life. Additionally, ecosystems can be disrupted as various species experience physiological stress or fail to thrive in contaminated environments.

Despite these grave concerns, heavy metal contamination continues to grow as industrial

activities expand, urbanization accelerates, and waste management practices fall short. However, the awareness of the risks associated with heavy metals has led to a surge in research on remediation technologies, policy development, and efforts to raise awareness. Several innovative methods for removing or neutralizing heavy metals in the environment have been explored, including phytoremediation, bioremediation, and the use of nanotechnology.

This study delves into the complex issue of heavy metal contamination, analyzing the sources, pathways, and impacts of these toxic substances on both human health and the environment. It aims to provide a thorough understanding of how heavy metals accumulate, how they affect ecosystems and human populations, and what actions are being taken at local, national, and global levels to mitigate their effects. Furthermore, the study will propose effective strategies for addressing the challenges posed by heavy metal contamination and its far-reaching consequences.

In essence, heavy metals are a double-edged sword: they play a vital role in many biological processes but, when mismanaged or uncontrolled, they become potent environmental and health hazards. Understanding and addressing these challenges is critical to ensuring the long-term health and sustainability of our environment and societies.

Definitions

- **Heavy Metals**: Naturally occurring elements with high atomic weight and density, typically toxic in high concentrations (e.g., lead, mercury, arsenic).
- **Bioaccumulation**: The process by which substances such as heavy metals build up in an organism over time.
- **Biomagnification**: The increase in concentration of heavy metals as they move up the food chain.

Need for the Study

1. Rising cases of heavy metal toxicity globally, especially in industrial and agricultural regions.
2. The gap in awareness about the sources and long-term impacts of heavy metal exposure.
3. The critical need for sustainable policies and remediation strategies.

Aims

To analyze the sources, accumulation, and impacts of heavy metals on human health and the environment and suggest effective mitigation strategies.

Objectives

1. Identify primary sources of heavy metals in the environment.
2. Examine the bioaccumulation and biomagnification processes in ecosystems.
3. Investigate health effects due to heavy metal exposure in humans.
4. Evaluate the environmental consequences of heavy metal contamination.
5. Propose solutions and policies for mitigating heavy metal toxicity.

Hypothesis

Heavy metal contamination has significant adverse effects on human health and environmental sustainability, and its mitigation requires a multifaceted approach, including policy reform and advanced remediation technologies.

Research Methodology

- **Data Collection**: Secondary data from peer-reviewed journals, government reports, and environmental databases.
- **Analysis Tools**: Geographic Information Systems (GIS) for mapping contamination, and toxicity assessment using existing case studies.
- **Case Studies**: Analysis of industrial hotspots like Bhopal, India, and Flint, Michigan, USA.
- **Comparative Study**: Examining global versus local regulatory frameworks.

Strong Points

1. **Environmental Impact and Bioaccumulation**: One of the strongest points about the study of heavy metals and their effects on human health and the environment is their tendency to bioaccumulate and biomagnify in ecosystems. As heavy metals accumulate in the tissues of organisms over time, they become more concentrated as they move up the food chain. This phenomenon not only affects wildlife but also human populations, particularly those that rely on contaminated water and food sources. Understanding this process helps identify critical areas for intervention and prevention.
2. **Toxicity and Health Risks**: The study highlights the extensive toxicity of heavy metals, which pose significant health risks to humans, including neurological disorders, cancers, kidney damage, respiratory diseases, and developmental issues. Some heavy metals, like lead and mercury, have particularly harmful effects on vulnerable populations such as children and pregnant women. By raising awareness about the toxicological effects of heavy metals, this issue can be tackled more effectively through better regulatory practices and health policies.
3. **Global Health Concern**: Heavy metal contamination is a global issue, with regions across the world experiencing varying levels of exposure, particularly in

areas near industrial hubs, mining sites, or regions with inadequate waste disposal systems. By studying the spread of these metals, this research makes the case for a global approach to addressing their consequences, emphasizing the need for international cooperation and regulatory frameworks to control emissions and limit exposure.

4. **Impact on Agriculture and Food Security**: Heavy metals like cadmium, lead, and arsenic can significantly reduce soil fertility and contaminate crops, leading to a direct impact on agriculture and food security. By understanding the mechanisms through which heavy metals affect crops, researchers can devise strategies for improving soil quality, safeguarding food production, and preventing contamination in the food supply.
5. **Bioremediation and Innovative Technologies**: A strong point of the study is the exploration of innovative and sustainable methods for the remediation of heavy metal contamination. Techniques such as phytoremediation (using plants to absorb heavy metals) and bioremediation (using microorganisms to neutralize contaminants) offer cost-effective and environmentally friendly alternatives to traditional remediation methods. The application of nanotechnology for detecting and removing heavy metals from polluted environments also shows great promise in solving this environmental problem.
6. **Policy and Regulatory Frameworks**: A key strength of the research is its potential to influence policy and regulation. The study emphasizes the importance of implementing stronger environmental laws, stricter industrial regulations, and improved waste management practices. In doing so, it encourages governments and organizations to take a more proactive stance in monitoring and reducing heavy metal pollution, leading to better public health outcomes and a healthier environment.
7. **Public Awareness and Education**: The study underscores the importance of public awareness campaigns to educate communities about the dangers of heavy metal contamination, how to minimize exposure, and the need for better waste disposal practices. Educating the public can lead to grassroots movements demanding stricter regulations and environmentally responsible practices from industries.
8. **Long-term Sustainability**: The long-term sustainability of ecosystems, human health, and food security hinges on managing heavy metal contamination effectively. By identifying both the sources of pollution and the long-term effects of exposure, the study offers valuable insights into achieving sustainable development goals and ensuring the future viability of ecosystems.
9. **Global Monitoring and Collaboration**: The research highlights the importance of global monitoring systems for tracking heavy metal pollution and its impact. International organizations, research institutions, and governments can collaborate to create databases, share research findings, and implement solutions to combat heavy metal contamination on a global scale. This collaboration could be crucial in addressing transboundary pollution issues.
10. **Interdisciplinary Approach**: The study's strength lies in its interdisciplinary nature, bringing together environmental science, toxicology, health policy, and technology to address a multifaceted problem. This holistic approach is vital for developing comprehensive solutions that address both the sources and the consequences of heavy metal pollution.

In summary, the study's strong points lie in its thorough investigation of the sources, impacts, and innovative solutions for addressing heavy metal contamination. It has the potential to inform policy, drive technological advancements in remediation, and contribute to global efforts in reducing pollution and its harmful effects on human health and the environment.

Weak Points

1. **Lack of Uniform Global Standards**: One of the significant weak points in addressing heavy metal contamination is the absence of uniform global standards and regulations regarding acceptable levels of heavy metals in the environment. While some countries have strict regulatory frameworks, others lack the infrastructure or political will to enforce such measures. This inconsistency can lead to uneven levels of contamination and hinder the global efforts to tackle the problem effectively. Without a coordinated global approach, the issue of heavy metal pollution remains a challenge that is difficult to address comprehensively.
2. **Incomplete Data on Long-Term Health Effects**: While there is substantial research on the immediate health effects of heavy metal exposure, there remains a lack of long-term data on the chronic and cumulative health effects. The complexities

of bioaccumulation and biomagnification make it difficult to predict and assess the full impact of exposure over extended periods, especially in populations with low-level, long-term exposure. This data gap hinders the development of effective public health policies and preventive measures.

3. **Insufficient Monitoring and Surveillance**: In many regions, there is a lack of comprehensive monitoring and surveillance systems to track the presence and concentration of heavy metals in the environment. Without proper data collection, it is difficult to pinpoint pollution hotspots, measure the success of mitigation efforts, or assess the overall trend of heavy metal contamination. Insufficient monitoring also prevents timely interventions, allowing pollution levels to rise unchecked in some areas.
4. **Limited Access to Effective Remediation Technologies**: While there are several promising remediation techniques, such as bioremediation and phytoremediation, their practical application remains limited, especially in developing regions where the necessary technology, expertise, and financial resources are often unavailable. These methods may also not be scalable for large-scale contamination, leaving many regions without effective solutions for dealing with heavy metal pollution.
5. **Economic and Political Challenges**: Addressing heavy metal contamination often requires significant investments in infrastructure, research, and regulatory enforcement. In many developing countries, economic constraints, coupled with political instability or corruption, make it difficult to implement or enforce policies aimed at controlling pollution. The challenge of balancing economic growth with environmental protection further complicates efforts to reduce heavy metal contamination.
6. **Lack of Public Awareness**: Despite the growing body of research on the dangers of heavy metals, public awareness about their health and environmental risks remains relatively low, especially in rural areas and developing countries. A lack of education about the sources and risks of heavy metal exposure makes it challenging to inspire collective action, and it may lead to continued exposure through unsafe practices, such as improper disposal of industrial waste or contamination of local water sources.
7. **Environmental Justice Issues**: Heavy metal contamination often disproportionately affects marginalized communities, including low-income populations and indigenous groups who may not have the resources or political influence to advocate for themselves. These communities are often located near industrial sites, mining operations, or waste disposal facilities, making them more vulnerable to contamination. The lack of equitable access to remediation efforts and healthcare services exacerbates existing social inequalities.
8. **Complexity of Remediation Processes**: Even though certain techniques like phytoremediation or bioremediation show promise, the complexity of heavy metal contamination makes it difficult to develop one-size-fits-all solutions. Different metals require different remediation approaches, and factors such as soil types, climate, and the extent of contamination complicate the effectiveness of remediation efforts. This variability makes large-scale solutions difficult to implement.
9. **Interdisciplinary Challenges**: The complexity of heavy metal pollution requires an interdisciplinary approach, involving experts from fields like toxicology, environmental science, public health, and engineering. However, collaboration across disciplines is often difficult due to differing research priorities, methodologies, and terminologies. This lack of coordination can hinder progress and the development of comprehensive solutions to the issue of heavy metal contamination.
10. **Resistance to Change from Industries**: Many industries that contribute to heavy metal pollution are resistant to change due to the high costs involved in switching to more sustainable practices or adopting stricter environmental standards. The pressure to maintain profits often leads to reluctance in investing in cleaner technologies or waste management practices. Additionally, there may be lobbying efforts that prevent governments from passing stronger regulations, further delaying progress in reducing heavy metal contamination. Thile there are strong points in the research and initiatives regarding heavy metal contamination, the study and management of this issue still face several significant weak points. These include a lack of uniform global regulations, limited access to effective remediation

technologies, insufficient monitoring, economic and political barriers, and inadequate public awareness. Addressing these challenges will require coordinated efforts at the global, national, and local levels, along with substantial investments in both technology and public education.

Current Trends in Heavy Metals, Accumulation, and Their Effects on Human Health and Environment

1. **Increased Focus on Environmental and Health Impact Studies**: Recent studies have shown a growing recognition of the long-term health impacts of heavy metal exposure. Researchers are increasingly focusing on understanding the cumulative effects of long-term low-level exposure to heavy metals like lead, mercury, and cadmium. There has been a surge in studies on their effects on neurological health, endocrine systems, and development in children. This trend has contributed to heightened awareness about the risks associated with these metals, leading to more rigorous public health campaigns.
2. **Use of Bioremediation Techniques**: Bioremediation, which uses plants, bacteria, or fungi to remove or neutralize heavy metals from the environment, has gained prominence. Phytoremediation (using plants to absorb contaminants from soil and water) and microbial remediation (using bacteria to break down toxins) have become key areas of research. These techniques are gaining attention due to their eco-friendly nature, lower costs, and potential for scalability. Researchers are continuously developing more efficient plant species and microorganisms to enhance the uptake and degradation of heavy metals.
3. **Development of Nanotechnology for Cleanup**: Nanotechnology is increasingly being explored as a cutting-edge solution for removing heavy metals from the environment. Nanomaterials like nanoparticles of iron oxide, carbon nanotubes, and magnetic nanomaterials have shown potential in adsorbing and removing heavy metals from water, soil, and air. This technology is rapidly evolving, with researchers focusing on improving its effectiveness, environmental impact, and cost-efficiency for large-scale remediation projects.
4. **Heavy Metals in E-Waste**: The growing issue of electronic waste (e-waste) and its contribution to heavy metal pollution is gaining significant attention. Electronic devices contain several toxic metals like lead, cadmium, mercury, and arsenic. E-waste disposal, particularly in developing countries, has become a major source of heavy metal contamination. Current trends are focusing on improving e-waste recycling methods, minimizing the environmental impact of electronic waste, and implementing regulations to control its disposal.
5. **Green Chemistry and Alternative Materials**: With the increasing awareness of the harmful effects of heavy metals, there is a notable shift towards the development of green chemistry solutions that replace toxic substances with safer, more sustainable alternatives. Research in material science is actively seeking safer and less toxic alternatives to heavy metal-based materials used in industries such as batteries, pigments, electronics, and construction materials.
6. **Policy and Regulatory Reforms**: Governments around the world are increasingly recognizing the threat posed by heavy metals and are implementing stricter regulations. Environmental protection agencies are tightening regulations concerning industrial emissions, water and soil contamination, and the disposal of hazardous waste containing heavy metals. In India, for example, the government has introduced stricter norms for the mining and industrial sectors, with more rigorous monitoring of water quality and soil contamination.
7. **Heavy Metals in Agriculture and Food**: The growing concern over heavy metals in agriculture is another emerging trend. Fertilizers and pesticides, often used in large quantities in conventional farming, have been found to contain trace amounts of heavy metals. Additionally, heavy metals may accumulate in crops from contaminated soil and water. There is a rising trend in organic farming and sustainable agricultural practices that aim to reduce the accumulation of heavy metals in food sources, ensuring a healthier and more sustainable food chain.
8. **Focus on Risk Assessment and Toxicology**: The field of toxicology has seen major advancements in assessing the risk posed by heavy metals, especially with regards to cumulative and synergistic exposure. Researchers are developing models to study the interaction of various heavy metals in the body and their combined effects. These models help in understanding the risks posed by multiple

environmental exposures, such as air pollution combined with water and soil contamination.

9. **Public Awareness and Citizen Science**: There is a significant increase in public awareness of the environmental and health impacts of heavy metals. With the rise of citizen science initiatives, communities are taking a more active role in monitoring their environments. There is an increase in grassroots efforts to identify and address contamination sources, particularly through the testing of water and soil in local areas. Public education campaigns are spreading knowledge on how to reduce exposure and mitigate the effects of contamination.
10. **Collaboration Between Environmental Agencies and Industries**: Increasingly, there is collaboration between environmental protection agencies, non-governmental organizations (NGOs), and industries in addressing heavy metal contamination. Many industries are now taking steps to reduce their environmental footprint by investing in cleaner technologies, waste management systems, and pollution control measures. Companies are being encouraged to adopt corporate social responsibility (CSR) strategies that include initiatives to reduce or eliminate the release of heavy metals into the environment.
11. **Human Health and Environmental Justice**: There is an increasing focus on the disproportionate impact of heavy metal pollution on marginalized communities, especially in low-income areas and developing countries. Environmental justice movements are pushing for policy reforms that ensure vulnerable communities are protected from the adverse health effects of heavy metal exposure. Research on social inequality and heavy metal contamination is gaining momentum, advocating for more inclusive and equitable environmental health policies.
12. **Climate Change and Heavy Metals**: The intersection of climate change and heavy metal pollution is becoming more evident. Climate change can exacerbate heavy metal contamination by affecting the distribution of pollutants, altering rainfall patterns, and influencing the bioavailability of heavy metals in soil and water. Current research trends are addressing the compounded effect of global warming and heavy metals, emphasizing the need for a more integrated approach to managing both environmental crises.

Current trends in the study and management of heavy metal contamination reflect a growing awareness of the long-term health and environmental consequences. These trends involve the development of innovative technologies, stricter regulations, and a stronger emphasis on public awareness and community action. However, despite the progress being made, significant challenges remain in addressing heavy metal pollution on a global scale. Continued research and international cooperation will be essential to mitigate the risks posed by heavy metals in the environment.

History

The toxic effects of heavy metals have been recognized for centuries, with notable incidents such as the Minamata disease in Japan caused by mercury poisoning in the 1950s. Over time, industrialization and technological advancements have escalated the release of heavy metals, necessitating stricter environmental regulations worldwide. The study of heavy metals and their impact on both human health and the environment dates back several centuries, although it was only in the last two centuries that the widespread recognition of their harmful effects has led to significant scientific inquiry and regulation.

Early Recognition and Initial Research (Pre-1900s)

The understanding of heavy metals began with the observation of their toxic effects on humans, particularly in miners and workers who came into direct contact with metals like lead, mercury, and arsenic. In ancient civilizations, the use of metals such as lead in plumbing, utensils, and cosmetics inadvertently led to poisoning. The famous Roman use of lead pipes for water transportation and its link to chronic lead poisoning in the population is one of the earliest recorded examples.

In the 18th century, mercury exposure was linked to the toxic effects seen in individuals working with this metal in hat-making and other industries. The term "mad hatter" comes from the neurological symptoms observed in workers who handled mercury to treat felt. As industry expanded during the Industrial Revolution, more attention was paid to the negative impact of heavy metals, particularly in mining regions, where exposure to metals like arsenic and mercury became common.

Scientific Advancements and Understanding (1900s to Mid-20th Century)

The early 20th century marked a pivotal moment in the recognition of the harmful effects of heavy metals. The burgeoning field of toxicology began to expand, with a focus on understanding how substances like lead, mercury, cadmium, and arsenic could accumulate in the human body and cause long-term harm.

In the 1920s and 1930s, studies on lead poisoning, especially in workers exposed to lead-based paints and gasoline, gained prominence. This was a turning point in the global understanding of how industrialization was accelerating the spread of heavy metal contamination. Medical advancements in the study of kidney disease and other health issues also revealed how metal accumulation in the body could lead to chronic conditions.

The Rise of Environmental Awareness (Post-World War II)

Following World War II, there was a significant rise in industrial activities, and the environmental movement began to take shape. The 1950s and 1960s saw increased concern over pollution and the effects of human activities on natural resources. With the proliferation of chemical industries, mining, and manufacturing, the environmental impact of heavy metals became a prominent issue. Researchers began studying the role of these metals in air, water, and soil pollution.

By the 1960s, scientific research recognized that heavy metals such as mercury and lead were not only causing health issues for workers but also affecting the broader ecosystem. The Minamata disease, a mercury poisoning incident in Japan, became internationally known as a tragic example of how toxic heavy metals could poison entire communities.

The Environmental and Health Impacts (Late 20th Century to Early 21st Century)

As awareness grew, the impact of heavy metals on both human health and ecosystems was better understood. Studies throughout the 1970s and 1980s linked heavy metal pollution to a variety of health problems, including cancer, neurological disorders, developmental delays in children, and damage to internal organs such as the liver and kidneys.

The environmental effects were also becoming increasingly clear. Mercury contamination in fish populations, cadmium in soils, and the accumulation of lead in urban areas and water sources became a major concern. The growing body of research led to public campaigns advocating for the reduction of heavy metal emissions from industrial sources.

The Regulation and Global Efforts (Late 20th Century to Present)

By the 1990s and early 2000s, a significant amount of global attention was focused on regulating heavy metal pollutants. The establishment of agencies like the U.S. Environmental Protection Agency (EPA) and the European Environment Agency (EEA) took a key role in setting standards for acceptable levels of heavy metals in water, soil, and air. International frameworks like the Stockholm Convention on Persistent Organic Pollutants and the Basel Convention on the control of hazardous waste were also put in place to control the movement and disposal of toxic substances.

In the 21st century, research on the accumulation of heavy metals in agricultural products became a crucial topic, with growing concerns over food safety and contamination. Efforts to develop new technologies for removing heavy metals from the environment, such as bioremediation and nanotechnology, began to gain traction.

The growing trend of e-waste, particularly in developing countries, has emerged as a major source of heavy metal contamination. Discarded electronic devices contain a mix of toxic metals like lead, mercury, and cadmium, contributing to hazardous exposure when improperly disposed of.

Climate Change and Heavy Metals

More recently, the intersection of climate change and heavy metal contamination has become a subject of increasing concern. Research has shown that climate change may exacerbate the spread of heavy metals in the environment. Changing rainfall patterns, for example, can cause the leaching of metals from contaminated soil into waterways. Similarly, rising temperatures could influence the behavior of metals in the atmosphere and make them more bioavailable to both humans and wildlife.

Modern Research and Technological Advances

In the present day, technological advancements such as nanotechnology and the use of genetically engineered organisms for remediation purposes are at the forefront of addressing heavy metal contamination. There is also an increasing emphasis on sustainable practices, such as green chemistry, to reduce or replace heavy metal-based materials in industrial processes.

The Road Ahead

The history of heavy metal contamination, from its early recognition to modern-day research and regulatory action, has shown that while significant progress has been made, the fight against heavy metal pollution is far from over. Increased industrial activity, the impact of climate change, and the growing challenges posed by e-waste continue to make the issue relevant today. Moving forward, the emphasis will likely continue to be on innovative remediation strategies, better regulation, and raising public awareness to reduce human and environmental exposure to heavy metals.

In conclusion, the history of heavy metals, their accumulation, and their effects on health and the environment have evolved from early scientific observations to a global environmental issue that demands comprehensive, coordinated action at local, national, and international levels. The future will likely see more integrated approaches to understanding and managing heavy metal contamination.

Discussion

The study delves into the dual role of heavy metals in natural processes and as environmental contaminants. The biological mechanisms of toxicity and their link to chronic illnesses are discussed in-depth. Moreover, the inefficiency of current mitigation measures in industrial regions and the need for global cooperation are analyzed.

Results

1. High accumulation of heavy metals in industrial and mining regions.
2. Evident correlation between heavy metal exposure and health disorders such as cancer and neurological diseases.
3. Soil and water quality degradation due to persistent contamination.

Conclusion

Heavy metal contamination represents a grave challenge to human health and environmental sustainability. This study underscores the urgent need for comprehensive policies, enhanced awareness, and cutting-edge technologies to mitigate these challenges effectively.

Suggestions and Recommendations

1. Implementing stricter regulations on industrial emissions.
2. Promoting community-based awareness programs.
3. Investing in advanced remediation technologies.
4. Strengthening global cooperation for transboundary pollution control.

Future Scope

1. Developing cost-effective and scalable remediation methods.
2. Exploring the role of nanotechnology in heavy metal detection and removal.
3. Assessing the socio-economic impacts of heavy metal contamination.
4. Establishing a global database for monitoring heavy metal contamination trends.

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Utilization of Print and Electronic Resource by Users of Selected Private Universities in Bengaluru: A Study

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Abstract:
This study aims to analyze the utilization of print and electronic resources by the users of selected private universities in Bengaluru, India. In the era of digitalization, it is essential to understand how academic users are engaging with both traditional print resources and electronic resources such as e-books, online journals, and databases. The study investigates the preferences, frequency of usage, and effectiveness of these resources in supporting academic activities. It is hoped that the findings will guide the enhancement of library services in private universities by offering insights into resource utilization patterns.

Keywords: Print Resources, Electronic Resources, Library Usage, Private Universities, Bengaluru, Academic Libraries, User Preferences, Library Services.

Introduction

ith the rapid advancements in technology, libraries in academic institutions have been undergoing a significant transformation. In private universities, the shift from print resources to electronic resources is a notable trend. Electronic resources like e-journals, e-books, and online databases provide easy access to academic materials, reducing dependency on physical copies. However, print resources still play a crucial role in supporting academic activities. Understanding how students and faculty utilize both print and electronic resources in these private universities is crucial for improving library services and meeting users' academic needs.In today's digital age, libraries in academic institutions are undergoing a significant transformation, driven by the increased use of electronic resources and the shift towards digital learning environments. Libraries have long served as the cornerstone of academic success, providing access to books, journals, and other scholarly materials essential for students, faculty, and researchers. However, the proliferation of technology and the widespread use of the internet have radically altered how these resources are accessed, leading to the integration of print and electronic resources in library services. While print resources continue to hold significant value in academic settings due to their tactile nature and long-standing presence in traditional education, electronic resources have seen an exponential rise in use due to their convenience, portability, and ability to provide up-to-date, global access to information.

The changing landscape of academic resources in libraries has been particularly evident in private universities in India, including those in Bengaluru, where both print and electronic resources are extensively used to meet the academic needs of students, faculty, and researchers. Electronic resources, such as e-books, online journals, and databases, offer quick and easy access to vast amounts of information that were previously restricted to print media. These resources are available on digital platforms, enabling 24/7 access from various devices, which is especially valuable in today's fast-paced, technology-driven educational environment.

Despite the rise of digital resources, print materials are far from obsolete. Many students and faculty members still prefer print versions for research, as they can engage with the material in a more focused and tangible manner. Moreover, certain resources, such as reference books and textbooks, may not be easily available in digital formats or may not meet the specific needs of users in certain disciplines. As such, academic libraries are faced with the challenge of balancing the provision of both print and electronic resources to cater to a diverse user base with varying preferences.

Bengaluru, home to several prominent private universities, has been at the forefront of adopting digital technologies within educational institutions. This city has witnessed a significant rise in the use of e-resources, which complement the print-based collections maintained by libraries. The shift towards digital learning, coupled with the demand for more accessible, immediate, and diverse academic resources, has made it essential to study the patterns of usage and effectiveness of these

resources within the context of private universities in Bengaluru.

The study will focus on assessing how print and electronic resources are being utilized by students and faculty members in selected private universities in Bengaluru. It will examine the frequency of usage, the preferences of users, and the factors influencing their choice between print and electronic formats. Additionally, the study will explore the challenges faced by users in accessing these resources, such as digital literacy, internet connectivity, and access to the necessary technology. By identifying these patterns and challenges, the study aims to provide valuable insights into how libraries can improve resource accessibility, service delivery, and overall user satisfaction.

In an era where information is increasingly digital, understanding how users interact with both print and electronic resources is crucial for academic institutions to stay relevant and meet the evolving needs of their academic communities. By focusing on libraries in Bengaluru, this study hopes to contribute to the broader discourse on resource utilization in academic libraries and help guide the development of effective library strategies in India's higher education sector.

Through this research, the study will identify key factors driving the use of print and electronic resources in academic libraries, offer recommendations to improve service delivery, and shed light on the impact of resource accessibility on student learning and academic success. As private universities continue to embrace digital education, understanding the integration of print and electronic resources will play a vital role in shaping the future of library services, ensuring that they remain an essential part of the academic ecosystem.

Definitions

- **Print Resources**: Tangible, physical materials such as books, journals, newspapers, and magazines housed within the library.
- **Electronic Resources**: Digital materials including e-books, e-journals, online databases, and multimedia resources available online or on the library's digital platform.

Need

There is a growing trend in the use of electronic resources due to the convenience, accessibility, and vast range of information they offer. However, print resources continue to serve as vital tools in academic work, particularly for reference materials. The study addresses the need to understand the balance between print and electronic resource usage among the users of private universities in Bengaluru, to ensure libraries are equipped to cater to these evolving needs.

Aims

- To assess the level of utilization of print and electronic resources among university students and faculty.
- To understand the factors influencing the use of these resources in selected private universities in Bengaluru.
- To examine the impact of these resources on academic success and research activities.
- To explore user preferences and satisfaction levels regarding print and electronic resources.

Objectives

- To identify the type of print and electronic resources most frequently used by the university users.
- To examine the frequency of usage of print versus electronic resources.
- To analyze the challenges faced by users in accessing both types of resources.
- To evaluate the satisfaction level of users with respect to the availability and accessibility of print and electronic resources in the library.

Hypothesis

- H1: There is a significant difference in the usage frequency of print and electronic resources among users in private universities in Bengaluru.
- H2: The use of electronic resources has a positive correlation with students' academic success.

Research Methodology

This study adopts a mixed-method approach, combining both qualitative and quantitative research methods. A structured questionnaire will be distributed among students and faculty members of selected private universities in Bengaluru to collect data on their usage patterns. In-depth interviews will also be conducted with library staff to understand the challenges and opportunities associated with resource utilization.

- **Sampling Method**: Random sampling will be used to select participants from various departments of the selected universities.
- **Data Collection**: Surveys, interviews, and observation will be employed to gather information.
- **Data Analysis**: The quantitative data will be analyzed using statistical software, while the qualitative data will be analyzed thematically.

Strong Points

- Provides insights into how print and electronic resources are used by academic users, offering valuable data for decision-making in university libraries.
- The study addresses both students' and faculty's perspectives, covering a broad spectrum of resource usage.
- It explores user satisfaction and identifies areas for improvement in library services.

1. **Relevance to Modern Educational Needs**: This study focuses on the evolving landscape of academic resources in private universities, addressing the changing dynamics of print and electronic resource usage. It highlights the importance of understanding these shifts to cater to the modern needs of students, faculty, and researchers in higher education institutions, especially in a tech-driven era.
2. **Comprehensive Resource Evaluation**: The study covers a comprehensive analysis of both print and electronic resources, providing a balanced perspective on how both mediums serve the academic community. By evaluating the usage patterns of these resources, the study offers a holistic view of resource utilization in contemporary academic libraries.
3. **Focus on Private Universities in Bengaluru**: Bengaluru is a hub for many prestigious private universities in India, and studying the resource utilization in these institutions provides valuable insights into the challenges and opportunities specific to urban, privately funded academic settings. This regional focus allows for a nuanced understanding of local library practices and challenges.
4. **Impact on Student Learning and Success**: By exploring how students and faculty members engage with print and electronic resources, the study sheds light on the direct impact of resource accessibility on student learning outcomes and academic success. This helps to underscore the importance of resource management in achieving educational goals.
5. **Relevance to Current Trends in Digital Education**: The study aligns with current trends in higher education, particularly the rise of digital learning environments and the increasing integration of technology in the classroom. Understanding how these trends affect resource usage will help libraries adapt to the shifting needs of academic communities.
6. **Emphasis on User Preferences and Behaviour**: A strong point of the study is its focus on understanding the preferences and behavior of library users—students, faculty, and researchers—regarding print and electronic resources. By focusing on these preferences, the study provides actionable insights into user needs and how libraries can improve service offerings.
7. **Identification of Challenges and Barriers**: The study delves into the challenges and barriers that users face in accessing print and electronic resources, such as digital literacy, internet access, and the availability of technology. Identifying these issues is crucial for developing effective strategies to enhance resource accessibility and usage in academic libraries.
8. **Contribution to Library Service Improvements**: The findings of the study can be used to suggest improvements in library services, helping libraries design more effective resource management strategies, offer better user support, and ensure equitable access to both print and electronic resources.
9. **Insights for Policy Makers and Academic Administrators**: The study offers valuable insights that can inform policy decisions in academic institutions. By understanding how students and faculty interact with library resources, administrators can develop policies that better align with users' needs and preferences, ultimately improving the overall academic experience.
10. **Potential for Future Research**: This study opens the door for further research into the role of libraries in the digital age. It provides a strong foundation for future studies on resource utilization trends, the integration of emerging technologies in libraries, and the evolving role of libraries in supporting academic success.
11. **Practical Applications for Librarians and Educators**: The results of the study can be directly applied to the work of librarians and educators. It can help them better understand how to engage students with library resources, manage collections more effectively, and offer services that align with the changing academic environment.

Weak Points

- The study focuses only on private universities in Bengaluru, which may not represent the trends in other regions or public universities.
- The reliance on self-reported data may introduce biases or inaccuracies in understanding usage patterns.
- Limited sample size could affect the generalizability of the findings.

1. **Limited Scope of Study**: The study focuses on a limited number of private universities in Bengaluru, which may not fully represent the diverse range of institutions across the country. As a result, the findings may not be generalized to other regions or types of universities, such as government-funded or rural institutions.

2. **Potential Bias in User Responses**: User responses from students, faculty, and researchers might be influenced by personal preferences, technological familiarity, or biases in their previous experiences with library resources. This could lead to skewed data, making it harder to draw universally applicable conclusions.
3. **Lack of Longitudinal Data**: The study may not account for changes over time in resource utilization patterns, especially in a fast-evolving educational landscape. A longitudinal approach could have provided a clearer picture of how resource usage evolves as new technologies, digital tools, and educational methods emerge.
4. **Focus on Only Print and Electronic Resources**: The study limits itself to print and electronic resources without considering other emerging forms of academic resources such as audiovisual materials, online learning platforms, and open educational resources (OER). The exclusion of these resources may provide an incomplete picture of the diverse ways students and faculty access information.
5. **Limited Data on Resource Effectiveness**: While the study examines resource utilization, it may not thoroughly assess the effectiveness of these resources in supporting student learning and academic success. It could benefit from measuring the actual impact of print and electronic resources on academic performance and learning outcomes.
6. **Insufficient Exploration of Library Management Challenges**: While the study examines user preferences and behavior, it does not deeply explore the internal challenges faced by libraries in managing these resources, such as budget constraints, staffing issues, and the difficulties of maintaining both print and digital collections simultaneously.
7. **Potential Technological Accessibility Issues**: The study assumes that access to electronic resources is consistent across all users. However, there may be variations in access due to factors such as internet connectivity, digital literacy, or the availability of devices, especially in resource-constrained environments. These variations could affect how users utilize electronic resources.
8. **Absence of User Experience Feedback on Library Services**: While the study focuses on usage patterns, it does not delve deeply into user satisfaction with library services and infrastructure. Understanding how students, faculty, and researchers feel about the usability, accessibility, and support provided by libraries would provide additional insights into improving service quality.
9. **Data Collection Constraints**: The data collection methodology might be limited in scope, such as relying on surveys or interviews with a small sample size. A larger, more diverse sample, as well as mixed methods (qualitative and quantitative), might have provided a more comprehensive understanding of resource utilization.
10. **No Comparative Analysis Between Print and Electronic Resources**: The study examines both print and electronic resources but does not necessarily compare their relative effectiveness or importance in supporting academic success. A direct comparison could have provided deeper insights into how the two forms of resources complement or substitute each other in modern educational settings.
11. **Exclusion of Faculty and Staff Perspectives**: While the study focuses primarily on students, faculty and staff perspectives on resource utilization and their role in shaping library services are not adequately explored. Including their viewpoints could have provided a more complete understanding of how print and electronic resources serve the academic community as a whole.
12. **Limited Focus on Technological Integration in Libraries**: The study does not explore the technological advancements in library services, such as integrated library systems (ILS), library automation, or the use of artificial intelligence and data analytics in improving resource utilization. Including these aspects would have strengthened the understanding of how technology influences library resource management.
13. **Challenges in Data Analysis**: Analyzing data from various user groups with potentially differing levels of access to and comfort with technology may pose challenges. Different levels of digital literacy and technology usage could skew results, making it difficult to draw clear conclusions from the data collected.
14. **Lack of Cultural Context**: The study does not consider the cultural context or socioeconomic factors that may affect the way students and faculty interact with library resources. Factors such as language barriers, cultural perceptions of digital

technology, and regional differences in educational practices could influence resource usage patterns but may be overlooked in this study.

Current Trends

- There is a growing preference for electronic resources due to easy access, especially during the COVID-19 pandemic, which pushed many educational institutions towards online learning and digital resources.
- Print resources are still valued, particularly for reference and course-related materials.
- Libraries are increasingly integrating print and electronic resources into hybrid systems to cater to diverse user needs.

1. **Increasing Dependence on Electronic Resources**: There is a notable trend toward the growing use of electronic resources over traditional print resources. This shift is primarily due to the convenience and accessibility of digital resources, which can be accessed from anywhere, at any time. E-books, journals, online databases, and research articles are becoming the preferred mediums for academic research and learning.
2. **Integration of Digital Libraries and Learning Management Systems (LMS)**: Many private universities are integrating their library services with digital learning management systems (LMS) like Moodle, Blackboard, and Canvas. This integration allows students and faculty to access resources directly within the LMS, improving the overall user experience and making it easier for students to access materials relevant to their coursework.
3. **Rise of Open Access Resources**: The adoption of open access journals, repositories, and databases is increasing. Open access resources allow students, researchers, and educators to freely access and share research materials. This trend is especially prominent in higher education settings where access to subscription-based databases can be limited due to financial constraints.
4. **Focus on Mobile Accessibility**: With the increasing use of smartphones and tablets, universities are focusing on making their library resources more mobile-friendly. Many academic libraries are developing mobile apps and websites that allow users to access electronic books, journals, and other digital resources seamlessly on their mobile devices.
5. **Use of Artificial Intelligence (AI) and Machine Learning in Resource Discovery**: AI and machine learning technologies are increasingly being employed to improve resource discovery and management in academic libraries. These technologies help in personalized recommendations for users based on their previous searches and preferences, making it easier for students to find relevant resources.
6. **Digital Curation and Preservation**: The growing emphasis on preserving digital materials is a key trend. As libraries shift towards digital formats, there is an increasing focus on ensuring the long-term accessibility of digital resources. This includes digitization of physical collections, data backup, and implementation of digital preservation practices to protect against data loss and obsolescence.
7. **Rise of Multimedia Learning Materials**: Universities are increasingly adopting multimedia resources, including videos, podcasts, and webinars, in addition to traditional text-based materials. These multimedia resources cater to diverse learning styles and provide students with more engaging ways to interact with content, especially in online and blended learning environments.
8. **User-Centred Library Services**: There is a growing trend in focusing on user-centred library services, where libraries are tailoring their services based on the needs and preferences of their users. Feedback loops, surveys, and personalized service offerings have become an integral part of library strategies to enhance user engagement and satisfaction.
9. **Cloud-Based Library Management Systems**: The adoption of cloud-based library management systems (LMS) has become a prominent trend. These systems facilitate remote access to library resources, better data management, and enhanced collaboration. Cloud technology also offers scalability, cost efficiency, and easier integration with other university systems.
10. **Shift Towards Hybrid Resources**: Hybrid resources, which combine both print and electronic formats, are becoming increasingly popular in academic libraries. While print resources remain essential, the growing reliance on electronic resources allows for enhanced accessibility and searchability, complementing traditional materials.

11. **Increased Demand for Multimedia Resources**: Alongside traditional academic texts, multimedia resources such as interactive e-books, instructional videos, and other visual content are becoming more integral to the learning experience. The use of these resources helps engage students and fosters a more dynamic learning environment.
12. **Collaborative Tools and Resource Sharing**: There is an increased emphasis on collaborative tools, which allow students, faculty, and researchers to share resources and ideas more effectively. Libraries are incorporating tools for virtual collaboration and resource sharing, facilitating group work, and enabling users to discuss research findings or resources in real time.
13. **Focus on Digital Literacy**: As digital resources become more predominant, there is a growing emphasis on promoting digital literacy among students. Universities and libraries are increasingly offering workshops and courses to help students develop skills in effectively using digital libraries, conducting research online, and evaluating the credibility of digital sources.
14. **Data Analytics for Resource Management**: Libraries are utilizing data analytics tools to assess the usage patterns of resources, helping them optimize the management of print and electronic collections. This data-driven approach allows for more informed decisions regarding which resources to purchase, retain, or discard based on user demand and academic trends.
15. **Sustainability in Resource Management**: There is an increasing awareness of the environmental impact of traditional print materials. As a result, universities are adopting sustainable practices, such as reducing paper use, emphasizing digital resource sharing, and implementing eco-friendly policies in the management of library resources.
16. **Increased Focus on User Privacy and Data Protection**: With the rise in digital resource usage, ensuring the privacy and protection of users' data has become a major concern. Libraries are increasingly implementing robust cybersecurity measures and complying with data protection laws to safeguard user information while utilizing digital resources.
17. **Interactive E-Learning Platforms**: Academic libraries are incorporating interactive learning platforms that combine digital resources with interactive elements such as quizzes, simulations, and gamified learning experiences. This allows students to engage with educational materials in new and innovative ways.
18. **Evolving Role of Librarians**: The role of librarians is evolving with the growing reliance on digital tools. Librarians are becoming more involved in curating, managing, and guiding users in navigating digital resources, while also supporting research, providing information literacy, and offering technological expertise.

History

The transition from print to digital resources in university libraries began in the early 2000s, with significant investments in digital infrastructure. Initially, there was resistance due to unfamiliarity with digital tools and preferences for traditional print materials. However, with increased internet penetration and the rise of online learning, electronic resources became more widely used. Today, academic libraries in India are working towards striking a balance between print and digital resources to meet diverse user needs.**Huge History of Utilization of Print and Electronic Resources in Higher Education Libraries:**

1. **The Early Days of Print Resources in Libraries:** The history of libraries is deeply rooted in the use of print resources, which have been central to the educational system for centuries. The earliest libraries, dating back to ancient civilizations such as Mesopotamia, Egypt, Greece, and Rome, were primarily built around collections of scrolls, manuscripts, and early printed works. These libraries served as repositories of knowledge, where scholars, students, and intellectuals would come to study and research. Print resources, especially books, journals, and periodicals, have traditionally been the backbone of libraries in the higher education sector.

During the 18th and 19th centuries, the rise of print technology, particularly the invention of the printing press by Johannes Gutenberg in the 15th century, revolutionized the accessibility of written materials. Libraries in universities around the world started to expand their collections, making print resources more widely available to faculty and students.

2. **Development of University Libraries in the 19th and Early 20th Century:** In the 19th century, universities across Europe and the United States established formal library systems to support the growing academic demand for printed texts. As higher education expanded, so did the need for comprehensive library collections. During this period, many academic libraries began to acquire vast collections of print resources, focusing on building strong

collections in fields like science, humanities, law, and medicine.

In India, the early 20th century saw the establishment of many university libraries, which focused largely on providing students and faculty with printed books and journals. These libraries were designed to serve the growing intellectual community of India's universities.

3. **The Advent of Digital Resources and Computerization (Late 20th Century):** The late 20th century marked a significant shift in the landscape of academic libraries with the introduction of digital resources and the advent of computerization. In the 1980s and 1990s, the rise of personal computers and the internet revolutionized the way libraries managed and provided access to resources. This period saw the first attempts to digitize academic journals, books, and research papers.

In the early stages of this digital revolution, libraries began adopting computer-based cataloguing systems to manage their print collections more efficiently. Additionally, academic libraries started to subscribe to online databases and digital collections, providing students and faculty with direct access to a wealth of information. The shift towards electronic journals, e-books, and databases became more pronounced in the late 1990s and early 2000s, as the internet gained widespread use.

4. **The Rise of Electronic Resources in the 21st Century:** The 21st century saw the explosive growth of electronic resources in academic libraries. With the advent of broadband internet, high-speed networks, and the increasing availability of online resources, electronic resources became central to the library's role in higher education. Libraries began to invest heavily in digital infrastructure, and the acquisition of print resources began to decrease as the focus shifted to e-books, online journals, and databases. The introduction of platforms such as JSTOR, SpringerLink, and ScienceDirect provided libraries with vast amounts of research content available at the click of a button.

In India, academic libraries began implementing digital resource management systems and transitioning to digital libraries. The National Digital Library of India (NDLI) was launched as a key initiative to facilitate digital access to academic resources for students and researchers across the country.

5. **Mobile Access and Cloud-Based Library Systems (2010s-Present):** In recent years, mobile technology and cloud computing have further transformed the way users access print and electronic resources in academic libraries. With the widespread use of smartphones, tablets, and laptops, academic libraries have increasingly focused on making resources accessible from mobile devices. Mobile apps and websites for library services are now commonplace in universities, allowing users to access digital resources, search catalogs, and request materials anytime, anywhere.

Cloud computing has enabled libraries to store large volumes of electronic resources and offer greater scalability, flexibility, and efficiency in resource management. Cloud-based library management systems have become standard in many higher education institutions, helping libraries streamline operations and provide better services to users.

6. **Integration of Print and Electronic Resources (Present and Future):** As technology continues to evolve, there is a growing trend toward the integration of print and electronic resources in academic libraries. While digital resources continue to dominate, there is still a strong demand for print resources, especially in fields like humanities, law, and social sciences. Many libraries are adopting hybrid models where print and digital collections coexist, with students and faculty being able to access both formats seamlessly.

Libraries are also focusing on improving the discoverability of their collections, whether in print or electronic form. This includes better cataloging systems, digital archives, and integrated library systems (ILS) that allow users to search both print and digital materials from a single platform.

The COVID-19 pandemic accelerated the move toward digital and hybrid learning environments, with more libraries offering remote access to resources. Libraries began providing more support for online learning, which increased the demand for electronic resources even further.

In addition, the increasing popularity of open-access publications has further transformed the way academic libraries interact with publishers and users. Many academic libraries are embracing open-access models that provide free, unrestricted access to scholarly publications, thus helping bridge the knowledge gap and improve access to research.

7. **Future Directions of Resource Utilization in Libraries:** Looking ahead, the utilization of print and electronic resources in higher education libraries is expected to continue evolving. Key trends such as AI-assisted search engines, data-driven resource management, and the increasing use of multimedia resources will shape the future of libraries. The demand for personalized learning experiences and increased collaboration across institutions will drive innovation in library services. Additionally, as sustainability becomes more important, libraries may increasingly focus on reducing their carbon footprints, including digitizing their collections

and promoting more sustainable resource-sharing practices.

The history of the utilization of print and electronic resources in academic libraries has been marked by significant technological advancements, shifting user needs, and the evolving role of libraries in higher education. The integration of digital technologies has reshaped library services, making information more accessible, convenient, and user-centric. As libraries continue to embrace new technologies, their role in facilitating learning and research in higher education will only continue to grow.

Discussion

The findings of this study will shed light on the patterns of usage of print and electronic resources and the factors influencing these patterns. It will also provide a platform for understanding the challenges faced by library users in accessing these resources. For instance, the ease of access to electronic resources might increase their usage, but issues like internet connectivity or lack of digital literacy might hinder their full utilization. Similarly, print resources, though less accessible in a digital era, may still hold value for specific research or academic activities.

Results

- It is expected that electronic resources will have higher usage due to their convenience and accessibility.
- Users may still prefer print resources for particular subjects or types of materials (e.g., reference books or journals).
- Faculty members may show higher usage of electronic resources than students, reflecting their professional and research needs.

Conclusion

In conclusion, the study will highlight the dual role of print and electronic resources in academic settings and the necessity for academic libraries to adapt to changing user preferences. By understanding usage patterns and challenges, libraries can optimize resource availability, improve access, and enhance user satisfaction.

Suggestions and Recommendations

- Libraries should invest in both print and electronic resources to ensure comprehensive access to academic materials.
- Universities should conduct workshops to enhance digital literacy and promote effective usage of electronic resources.
- Regular feedback mechanisms should be implemented to gauge user satisfaction and make necessary improvements.

Future Scope

Future research can explore the usage patterns of resources in different regions or compare usage between private and public universities. Additionally, the impact of digital libraries and e-learning platforms on the utilization of resources can be studied.

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A Case Study On Application Of Artificial Intelligence In Academic Library Automation In Higher Education System Of India And Abroad

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Abstract

The integration of Artificial Intelligence (AI) in academic library automation is revolutionizing the higher education system by enhancing operational efficiency, improving resource accessibility, and personalizing user experiences. This case study explores the application of AI technologies in academic libraries in India and abroad, emphasizing the transformative potential of AI-driven systems. It examines challenges, opportunities, and the impact of AI on library services, focusing on cataloging, digital reference services, collection development, and user engagement. The study evaluates comparative practices, explores AI adoption levels, and highlights future trends to shape academic libraries in the digital age.

Keywords: Artificial Intelligence, Academic Library Automation, Higher Education, India, Global Practices, Library Services, Digital Transformation, AI Adoption, User Experience, Library Management.

Introduction

The advent of Artificial Intelligence (AI) is transforming academic libraries into dynamic hubs of learning and research. AI-based tools streamline processes such as cataloging, reference management, and user analytics, enabling libraries to meet the evolving needs of students and researchers. In India, the shift towards digital and automated solutions has been catalyzed by initiatives like the National Digital Library of India. This study investigates the extent of AI adoption in academic libraries, comparing practices in India and abroad to provide a comprehensive understanding of its impact on higher education. Libraries have always served as the cornerstone of knowledge dissemination and intellectual development, evolving in response to the dynamic needs of society. With the advent of the digital age, the integration of Artificial Intelligence (AI) has ushered in a new era of library services, transforming traditional academic libraries into technologically advanced hubs of information and learning. This transformation is particularly significant in the context of higher education, where libraries play a critical role in facilitating research, innovation, and lifelong learning.

The application of AI in library automation encompasses a wide range of functionalities, including intelligent cataloging, personalized user experiences, advanced search capabilities, and predictive analytics. AI technologies, such as machine learning, natural language processing, and robotics, are being harnessed to automate routine tasks, optimize resource management, and enhance the accessibility of library collections. These innovations have revolutionized the way libraries interact with users, shifting from passive repositories of information to active providers of tailored services and knowledge solutions.

In India, the integration of AI in academic libraries is gradually gaining traction, fueled by government initiatives like the National Digital Library of India (NDLI) and the Digital India campaign. Despite challenges such as limited funding, infrastructure gaps, and skill shortages, Indian libraries are exploring the potential of AI to address the diverse needs of students, researchers, and educators. Globally, academic libraries in developed countries have set benchmarks in AI adoption, showcasing successful implementations that serve as models for libraries in developing nations.

The role of AI in academic libraries extends beyond automation; it encompasses the creation of intelligent systems that can understand and predict user behavior, facilitate interdisciplinary research, and support data-driven decision-making. For instance, AI-powered chatbots are increasingly being used to provide 24/7 reference services, answering user queries and guiding them through complex databases. Similarly, AI-driven analytics tools help librarians monitor usage patterns, identify trends, and optimize resource allocation.

However, the adoption of AI in academic libraries is not without its challenges. Issues such as data privacy, ethical concerns, and the digital divide pose significant barriers to widespread implementation. Moreover, the lack of standardized frameworks for AI integration in libraries highlights the need for collaborative efforts and policy interventions.

This case study aims to explore the multifaceted impact of AI on academic libraries in the higher education sector, with a focus on India and its global counterparts. By examining current practices, emerging trends, and future possibilities, the study seeks to provide actionable insights into the transformative potential of AI in library automation. It also addresses the critical challenges and opportunities associated with AI adoption, offering recommendations for effective implementation and sustained growth.

In the rapidly evolving landscape of higher education, the integration of AI in academic libraries is not merely an option but a necessity. As institutions strive to meet the demands of a knowledge-driven society, the adoption of AI technologies will be instrumental in shaping the future of academic libraries, ensuring their relevance and effectiveness in the digital age.

Definitions

1. **Artificial Intelligence (AI):** The simulation of human intelligence in machines programmed to perform tasks such as learning, reasoning, and problem-solving.
2. **Library Automation:** The use of automated systems and software to manage library operations and services.
3. **Higher Education System:** Institutions and practices focused on post-secondary education, including colleges and universities.

Need

The need for AI in academic libraries arises from growing demands for:

- Enhanced efficiency in library operations.
- Personalized user experiences.
- Improved resource management and access.
- Supporting research in an increasingly data-driven academic environment.

Aims

1. To analyze the role of AI in academic library automation.
2. To identify challenges and opportunities in implementing AI-driven systems in India and abroad.

Objectives

1. Evaluate the current state of AI adoption in academic libraries.
2. Compare AI practices between Indian and international academic libraries.
3. Assess the impact of AI on user satisfaction and library services.

Hypothesis

The integration of Artificial Intelligence significantly enhances the efficiency, accessibility, and user satisfaction of academic libraries in the higher education system.

Research Methodology

- **Research Design:** Comparative case study.
- **Data Collection:** Literature reviews, surveys, and interviews with library professionals.
- **Analysis:** Quantitative and qualitative analysis using statistical tools and thematic coding.

Strong Points of AI Application in Academic Library Automation

The integration of Artificial Intelligence (AI) into academic library automation introduces numerous strengths that significantly enhance the efficiency, accessibility, and adaptability of library services. Below are the detailed strong points:

1. Enhanced Resource Discovery

- AI-powered tools enable intelligent search mechanisms that go beyond keyword matching. They facilitate semantic searches, understanding user intent and providing highly relevant results.
- Recommendation algorithms akin to those used by e-commerce platforms help users discover related resources, increasing engagement with library collections.

2. Personalized User Experience

- AI can analyze user preferences, reading habits, and past interactions to deliver tailored recommendations and alerts about new arrivals or updates in specific fields of interest.
- Adaptive learning systems powered by AI help students and researchers access materials suited to their academic level and focus areas.

3. Automation of Routine Tasks

- Tasks such as cataloging, indexing, and classification are streamlined through AI-driven systems, reducing human error and saving time for librarians to focus on more critical functions.
- Circulation services, including check-ins, check-outs, and overdue reminders, are efficiently managed by AI-powered systems, ensuring smoother operations.

4. Round-the-Clock Assistance

- AI chatbots provide 24/7 support, answering user queries, assisting in locating resources, and guiding them through library systems.
- These chatbots reduce the workload on library staff and enhance user satisfaction by providing instant help.

5. Advanced Data Analytics

- AI systems gather and analyze large volumes of data on user behavior, resource utilization, and traffic patterns, providing actionable insights for library management.
- Predictive analytics help libraries anticipate user needs, optimize acquisitions, and plan space and resource allocation effectively.

6. Improved Accessibility

- AI aids in making libraries more inclusive by providing accessibility tools such as text-to-speech conversion, translation services, and materials for differently-abled users.

- Voice-activated systems and multi-language support cater to diverse user groups, breaking barriers to information access.

7. Efficient Resource Management

- Inventory management and resource allocation are streamlined through AI-based systems, reducing waste and ensuring that resources are available when needed.
- Automated workflows ensure real-time updates on the status of books, journals, and digital resources.

8. Support for Research and Innovation

- AI-driven platforms assist researchers in identifying trends, citations, and relevant publications, significantly reducing the time required for literature reviews.
- Tools like plagiarism detection software and citation managers enhance academic integrity and efficiency.

9. Cost Efficiency

- While initial implementation costs are high, AI systems lead to long-term savings by automating tasks, reducing the need for manual intervention, and optimizing resource allocation.

10. Scalability and Adaptability

- AI systems are scalable, capable of handling increasing user loads and expanding collections without significant additional costs.
- These systems can adapt to changing user needs and technological advancements, ensuring libraries remain relevant.

11. Global Benchmarks and Collaboration

- AI enables libraries to adopt global best practices and collaborate with international institutions, fostering knowledge sharing and innovation.
- Digital interconnectivity facilitated by AI expands the reach of academic libraries, allowing access to global databases and resources.

12. Enhancement of Digital Libraries

- AI accelerates the digitization process, preserving rare and fragile documents while making them accessible online.
- It also enables efficient metadata creation, improving searchability and usability of digital archives.

13. Predictive Maintenance of Library Infrastructure

- AI-powered IoT (Internet of Things) systems can predict equipment failures and monitor environmental conditions, ensuring optimal maintenance of library infrastructure.

Weak Points of AI Application in Academic Library Automation

Despite the numerous advantages, the application of Artificial Intelligence (AI) in academic library automation is not without its challenges and limitations. Below is an in-depth analysis of the weak points:

1. High Initial Costs

- Implementing AI systems in libraries involves significant investment in software, hardware, and infrastructure.
- For many academic institutions, especially in developing countries, these costs can be prohibitive.

2. Skill Gaps Among Library Staff

- Library professionals often lack the technical expertise required to operate, maintain, and optimize AI systems.
- Training staff to use these technologies effectively requires time, effort, and financial resources, adding to the overall cost.

3. Data Privacy and Security Concerns

- AI systems collect and analyze large volumes of user data, raising concerns about privacy and the risk of data breaches.
- Ensuring compliance with data protection laws and regulations, such as GDPR or local equivalents, is a significant challenge.

4. Dependence on Technology Vendors

- Libraries often rely on third-party vendors for AI tools and systems, leading to dependency and potential issues with long-term sustainability and cost escalation.
- Vendor lock-in may also restrict customization and adaptation to specific institutional needs.

5. Lack of Interoperability

- Many AI-based library systems are not interoperable, meaning they cannot seamlessly integrate with existing library management systems or other institutional technologies.
- This lack of standardization creates inefficiencies and hinders collaborative efforts among libraries.

6. Ethical Concerns and Bias in AI Systems

- AI algorithms can inherit biases from the data they are trained on, leading to skewed or discriminatory outcomes.
- For instance, search algorithms may prioritize certain publishers or perspectives, inadvertently limiting access to diverse viewpoints.

7. Maintenance and Upgrades

- AI systems require regular maintenance, updates, and troubleshooting, which can be resource-intensive.
- Rapid technological advancements make older systems obsolete quickly, necessitating frequent upgrades.

8. Limited Accessibility in Remote and Underdeveloped Areas

- Institutions in rural or underdeveloped regions may lack the internet bandwidth and technological infrastructure needed to implement AI systems effectively.

- This digital divide exacerbates inequalities in access to advanced library services.

9. Over-Reliance on Technology

- Excessive dependence on AI systems can lead to a reduction in human interaction, which is still a critical aspect of library services.
- Users seeking personalized assistance may find automated systems impersonal and less effective.

10. Loss of Traditional Librarianship Skills

- With the increasing automation of tasks such as cataloging and indexing, there is a risk of losing traditional library skills and knowledge.
- This shift could undermine the role of librarians as information curators and educators.

11. Difficulty in Handling Complex or Specialized Queries

- AI chatbots and search systems often struggle to interpret and address highly complex or interdisciplinary research queries.
- These systems may not match the expertise and intuition of experienced library professionals.

12. Resistance to Change

- Both staff and users may resist the adoption of AI systems due to fear of job displacement, lack of familiarity, or distrust of technology.
- Overcoming this resistance requires effective change management strategies.

13. Inequitable Access to AI Resources

- Smaller institutions and libraries with limited budgets may be unable to afford advanced AI systems, leading to unequal access to modern library services.
- This disparity can widen the gap between well-funded and under-resourced institutions.

14. Potential for System Failures

- AI systems are not immune to errors or technical glitches, which can disrupt library operations and user experiences.
- Downtime caused by system failures may affect user trust and satisfaction.

15. Language and Cultural Barriers

- Many AI systems are designed for English-speaking users and may not effectively serve non-English speakers or those from diverse cultural backgrounds.
- Limited multilingual capabilities hinder inclusivity and accessibility.

16. Uncertain Return on Investment (ROI)

- Measuring the success and ROI of AI systems in libraries is challenging due to the qualitative nature of many benefits, such as improved user satisfaction or enhanced learning outcomes.
- Decision-makers may struggle to justify the high costs without clear, quantifiable metrics.

17. Ethical Concerns in Data Usage

- The use of user data to train AI models raises questions about consent and ethical practices.
- Libraries must balance the need for data to improve services with the responsibility to protect user rights.

Current Trends in Artificial Intelligence (AI) Applications in Academic Library Automation

The integration of Artificial Intelligence (AI) into academic library systems is revolutionizing how knowledge is managed, accessed, and disseminated. Below is an exhaustive overview of the current trends shaping the landscape:

1. AI-Driven Cataloging and Metadata Creation

- Libraries are employing AI for automated cataloging and metadata generation, ensuring faster and more accurate indexing of resources.
- Machine learning algorithms enhance the categorization of multimedia and non-text resources, making them easier to search and retrieve.

2. Smart Search Engines

- AI-powered search tools leverage natural language processing (NLP) to understand user queries more intuitively.
- Predictive and contextual search features anticipate user needs, providing more relevant results.

3. Chatbots and Virtual Assistants

- AI chatbots like Siri and Alexa are now being customized for academic libraries, offering real-time assistance to users.
- These bots handle routine queries, such as locating materials or managing due dates, reducing staff workload.

4. AI-Powered Recommendation Systems

- Personalized recommendations based on user behavior and preferences are becoming standard features in library systems.
- Collaborative filtering techniques analyze user histories to suggest relevant books, journals, or databases.

5. Automated Content Summarization

- AI tools summarize lengthy texts, research papers, or books, helping users grasp key concepts quickly.
- This trend is particularly beneficial for academic researchers working under tight deadlines.

6. Voice Recognition and Accessibility Enhancements

- Libraries are incorporating AI-driven voice recognition systems to cater to visually impaired or differently-abled users.
- Multilingual voice assistants and text-to-speech capabilities promote inclusivity.

7. Predictive Analytics for Collection Management

- Predictive models analyze user borrowing patterns to inform acquisition and weeding decisions.
- Libraries use these insights to maintain a balanced and user-centric collection.

8. AI-Enhanced Digital Libraries

- Many academic libraries are transitioning to digital platforms powered by AI, offering seamless access to e-resources, research databases, and digital archives.
- Advanced OCR (Optical Character Recognition) technology digitizes and indexes legacy collections for broader accessibility.

9. Automated Citation and Plagiarism Detection Tools

- AI tools like Turnitin and Grammarly provide comprehensive plagiarism checks and automate citation formatting.
- These tools support academic integrity while saving time for researchers and students.

10. Knowledge Graphs and Semantic Search

- AI enables the creation of knowledge graphs that connect related topics, authors, and works.
- Semantic search engines allow users to explore content based on meaning rather than keyword matching.

11. Digital Preservation and Restoration

- AI is aiding in the preservation of fragile historical documents by analyzing damage and suggesting restoration techniques.
- Automated archiving solutions ensure long-term accessibility and security of digital collections.

12. Adaptive Learning Platforms

- AI-driven learning platforms integrated into libraries offer tailored educational resources to students based on their learning styles and progress.
- This trend bridges the gap between libraries and pedagogical initiatives.

13. Cloud Integration for Resource Sharing

- Cloud-based AI systems enable libraries to collaborate, share resources, and provide interlibrary loans with minimal manual intervention.
- Shared repositories, such as WorldCat, are enhanced by AI for global access.

14. Blockchain and AI in Library Security

- AI combined with blockchain ensures secure transactions, protects intellectual property rights, and enhances user data privacy.
- Libraries are using these technologies to safeguard their digital assets against cyber threats.

15. AI in Scholarly Publishing

- AI tools are streamlining the peer review process, identifying potential reviewers, and detecting research trends in academic publishing.
- These advancements accelerate the dissemination of scholarly work.

16. Library Workforce Augmentation

- Rather than replacing library staff, AI tools are being used to augment their capabilities, allowing them to focus on high-value tasks like research consultations and user education.

17. Integration of IoT and AI

- Libraries are deploying Internet of Things (IoT) devices managed by AI to monitor and optimize physical spaces, such as energy-efficient lighting or real-time tracking of book availability.

18. Data-Driven Decision Making

- AI analytics help libraries track user engagement, resource utilization, and program effectiveness.
- Data insights inform strategic planning and budgeting decisions.

19. AI for Research Discovery and Analysis

- Libraries are adopting AI tools like Scite and Semantic Scholar to assist researchers in finding relevant studies, identifying citations, and analyzing trends in their fields.

20. Gamification of Library Services

- AI-based gamification strategies are being used to engage users, promote library services, and encourage learning through interactive challenges.

21. Green and Sustainable AI Solutions

- AI is aiding libraries in adopting sustainable practices, such as optimizing energy usage, recycling materials, and promoting e-resources to reduce paper consumption.

22. Focus on Ethical AI and Inclusivity

- Libraries are prioritizing ethical AI practices by ensuring data transparency, combating algorithmic biases, and promoting digital equity.
- Inclusivity initiatives focus on serving diverse user groups effectively through culturally and linguistically adaptive systems.

23. AI-Enhanced Library Events and Programs

- AI tools are being used to personalize event recommendations, manage attendance, and evaluate the success of library programs.

24. Collaboration with Tech Startups

- Libraries are increasingly collaborating with technology startups to explore innovative AI solutions tailored to academic environments.

25. Focus on User-Centric AI Design

- Libraries are involving users in the design and implementation of AI tools, ensuring that these systems align with their needs and preferences.

History

Library automation began with early computerization efforts in the 1970s, focusing on cataloging and circulation. The introduction of digital libraries in the 1990s paved the way for AI-driven systems, which gained prominence in the 21st century with advancements in machine learning and data analytics. The integration of Artificial Intelligence (AI) in academic library automation has been a progressive journey marked by transformative milestones. Tracing its history reveals how technological advancements and changing user demands have shaped the evolution of libraries into intelligent knowledge hubs.

1. Pre-AI Era (1940s–1960s): Foundations of Automation

- **Advent of Automation Concepts:** The mid-20th century saw the initial application of computational tools in library operations. Early automation efforts focused on replacing manual cataloging and indexing processes with basic computing.
- **Punch Card Systems:** Libraries adopted punch card systems for book borrowing and inventory management, laying the groundwork for mechanized workflows.

2. Early Automation (1970s–1980s): Computerized Systems

- **Integrated Library Systems (ILS):** The introduction of ILS revolutionized library management by consolidating acquisitions, cataloging, circulation, and OPAC (Online Public Access Catalog).
- **Emergence of MARC Standards:** The Machine-Readable Cataloging (MARC) format standardized bibliographic records, enabling easier data exchange between libraries.
- **Database Integration:** Libraries began offering access to digital databases, replacing physical card catalogs with searchable computer systems.

3. Digital Transformation Era (1990s–2000s): Internet and Digital Libraries

- **Adoption of the Internet:** The widespread use of the internet transformed libraries, enabling global resource sharing, access to e-journals, and real-time information retrieval.
- **Digital Libraries:** Initiatives like Project Gutenberg and Google Books digitized millions of books, making them available online. Academic libraries embraced these platforms to complement physical collections.
- **Search Engines and Indexing Tools:** Early search engines and Boolean query systems allowed users to navigate vast digital repositories more efficiently.

4. Emergence of AI in Libraries (2000s–2010s): The Beginning of Intelligent Systems

- **AI-Enriched OPACs:** Libraries began incorporating AI-driven search functionalities, offering keyword-based and semantic search options.
- **Personalized Recommendations:** Recommendation systems inspired by e-commerce platforms were introduced to suggest books and articles based on user preferences.
- **Chatbots and Virtual Assistants:** Pioneering libraries experimented with basic AI chatbots to answer routine queries and guide users through library services.

5. The Rise of Advanced AI (2010s–Present): Transformational Technology

- **Natural Language Processing (NLP):** AI systems adopted NLP capabilities, enabling conversational interfaces and intuitive user interactions.
- **Machine Learning Algorithms:** These algorithms enhanced cataloging, metadata creation, and resource discovery by identifying patterns in vast datasets.
- **Digital Preservation:** AI was deployed for the digitization and restoration of rare manuscripts, ensuring their long-term accessibility.
- **Smart Library Systems:** IoT and AI integration allowed for real-time monitoring of library spaces, energy efficiency, and resource utilization.

6. Global Milestones in AI-Powered Libraries

- **Europe and North America:** Institutions like the British Library and the Library of Congress led the adoption of AI for advanced cataloging and digital archiving.
- **Asia:** Countries like India and China embraced AI to address the unique challenges of diverse languages and large user bases.
- **Africa:** AI applications supported initiatives for affordable and inclusive access to educational resources in underprivileged regions.

7. Contemporary Developments: A Decade of Disruption (2020s)

- **COVID-19 and Remote Access:** The pandemic accelerated the adoption of AI to support remote learning, virtual library tours, and automated e-resource delivery systems.
- **AI-Driven Research Tools:** Modern libraries incorporated AI tools like citation analyzers, plagiarism checkers, and predictive analytics for academic research.

- **Ethical AI Implementation:**
  Libraries began focusing on ethical concerns, such as data privacy, algorithmic bias, and digital equity.

8. Milestones in Indian Library Automation

- **National Library of India:**
  The National Library initiated digital projects and metadata enhancements powered by AI.
- **Academic Institutions:**
  Universities like IITs and IIMs have integrated AI systems for personalized learning, resource management, and research assistance.
- **Government Initiatives:**
  Schemes such as the National Digital Library of India (NDLI) exemplify the country's commitment to accessible AI-powered library systems.

  The history of AI in academic library automation reflects a gradual yet transformative journey. From basic computerized systems to intelligent platforms capable of anticipating user needs, the evolution underscores the library's enduring role as a cornerstone of knowledge dissemination. As AI technology continues to advance, libraries are poised to redefine their services, bridging the gap between traditional and futuristic modes of learning.

Discussion

The integration of AI in academic libraries represents a paradigm shift. While challenges such as infrastructure and training persist, the potential for transformative change outweighs these hurdles. Comparative analysis shows that libraries in developed countries are leading in AI adoption, offering a blueprint for implementation in India.

Results

The findings indicate that AI significantly improves library efficiency, user engagement, and resource management. Libraries that adopt AI report higher user satisfaction and operational efficiency compared to traditional systems.

Conclusion

AI is a game-changer for academic libraries, bridging gaps in accessibility, efficiency, and personalization. The successful adoption of AI requires addressing challenges such as infrastructure, training, and policy alignment. The integration of Artificial Intelligence (AI) in academic library automation marks a significant leap in redefining how libraries function in the digital age. Academic libraries, traditionally viewed as reservoirs of knowledge, are now transforming into dynamic, interactive, and adaptive systems, empowering users with personalized and seamless access to information.

AI's role extends beyond automating routine tasks; it fundamentally enhances the efficiency, accessibility, and inclusiveness of library services. By employing machine learning, natural language processing, and predictive analytics, libraries are evolving into intelligent systems capable of understanding user behavior, recommending resources, and supporting complex research needs. The introduction of AI chatbots, virtual assistants, and smart search engines has revolutionized how users interact with library systems, ensuring quicker and more intuitive access to resources.

Globally, AI-driven library systems have bridged geographical and linguistic barriers, enabling equal access to knowledge for diverse populations. In countries like India, where academic libraries serve millions of users from multilingual and multicultural backgrounds, AI has been pivotal in overcoming challenges related to scalability, resource availability, and language diversity. Initiatives such as the National Digital Library of India (NDLI) and the adoption of AI-powered tools in premier institutions highlight the growing acceptance of AI technologies in shaping the future of libraries.

However, this transformation is not without its challenges. Issues such as data privacy, algorithmic bias, technological infrastructure, and the need for digital literacy among library staff and users must be addressed. The ethical implementation of AI and its alignment with the mission of libraries—ensuring equitable access to knowledge—remain crucial. Libraries must also balance their historical legacy with modern advancements, preserving traditional resources while embracing innovation.

As we look to the future, the potential of AI in academic library automation is vast. Emerging technologies such as deep learning, blockchain, and augmented reality offer exciting opportunities to further enhance library systems. The fusion of AI with other cutting-edge technologies could lead to the creation of hyper-personalized learning environments, immersive educational experiences, and unprecedented levels of resource accessibility.

AI is not merely a tool for academic libraries—it is a transformative force that redefines their role in higher education and society. By embracing this technology responsibly, libraries can position themselves as leaders in the digital knowledge economy, fostering a culture of innovation, inclusivity, and lifelong learning. The journey of AI in libraries is still unfolding, and its ultimate impact will depend on how effectively it is harnessed to meet the diverse and evolving needs of users worldwide.

Suggestions and Recommendations

1. Increase investment in AI infrastructure and training programs.
2. Develop national policies for AI adoption in academic libraries.

3. Promote collaborative initiatives between Indian and international libraries.
4. Enhance awareness and training on AI applications for library staff.

Future Scope

The study highlights potential areas for future research:

1. Advanced AI applications in digital preservation and archiving.
2. Ethical implications of AI in libraries.
3. Development of region-specific AI tools for diverse user needs.

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Analysis of Awareness, Acceptability and Feasibility of Automatic Hot Food Vending Machines with special reference to Pune Consumers

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Abstract

This study explores the awareness, acceptability, and feasibility of automatic hot food dispensing machines, commonly known as vending machines, with special reference to consumers in Pune, India. The increasing demand for convenience, hygienic food options, and advanced technologies in urban areas has made vending machines a viable alternative. Through surveys and focus group discussions, the study evaluates consumer awareness, the influence of demographic factors, and feasibility concerning costs, maintenance, and operational challenges. Key findings reveal a growing trend of acceptance, with younger consumers showing the highest interest. The study highlights the potential for vending machines to reshape the urban food landscape while addressing concerns about affordability, product variety, and operational reliability.

Keywords: Vending Machines, Automatic Hot Food, Consumer Awareness, Acceptability, Feasibility, Pune, Urban Food Landscape, Technology, Convenience, Hygiene.

Introduction

The global food industry has witnessed a surge in technological advancements aimed at meeting the growing demand for convenience and quality. Automatic hot food vending machines represent a revolutionary step in food service, offering quick, hygienic, and automated food delivery solutions. In India, urbanization and changing consumer lifestyles have driven interest in these machines, particularly in cities like Pune. This study delves into the awareness, acceptability, and feasibility of vending machines, examining consumer attitudes and industry challenges. The research investigates factors influencing adoption and identifies potential barriers to successful implementation in Pune's urban food ecosystem. The growing complexities of urban life and the pressing need for convenience have transformed consumer behavior in the modern world. Automatic vending machines, particularly those designed for hot food, have emerged as a revolutionary solution in urban food services. With their roots dating back to the late 19th century, vending machines have evolved from simplistic snack dispensers to sophisticated, AI-driven, and highly efficient systems capable of delivering fresh, hot meals at the push of a button. Globally, the adoption of such machines has been spurred by advancements in technology, shifting consumer expectations, and a greater emphasis on hygiene and operational efficiency.

In India, the rapid pace of urbanization, a growing middle-class population, and the proliferation of technology have created fertile ground for the introduction of automated food solutions. Cities like Pune, with their blend of traditional and modern lifestyles, serve as ideal testing grounds for understanding the feasibility and acceptability of such innovations. Pune's status as a cultural and educational hub further amplifies its relevance as a microcosm for studying the interaction between consumer needs, technological advancements, and food delivery mechanisms.

The introduction of vending machines in India, particularly those offering hot food, aligns with the broader trends of automation and digitalization across industries. As work-life dynamics shift, particularly in urban centers, consumers increasingly prioritize speed, hygiene, and accessibility in their food choices. Vending machines provide an answer to these needs, offering 24/7 service with minimal human intervention. This capability is especially significant in a post-pandemic world where contactless services are not just a preference but a necessity.

However, the Indian market presents unique challenges that warrant careful analysis. Cultural preferences for freshly cooked meals, apprehensions about machine reliability, and concerns regarding

affordability are significant barriers to the widespread acceptance of vending machines. Additionally, the high initial investment required for setting up and maintaining these machines poses challenges for operators and businesses. Despite these hurdles, the potential for vending machines to revolutionize food delivery systems in urban India remains immense.

This study is rooted in the exploration of awareness, acceptability, and feasibility of hot food vending machines among Pune consumers. It seeks to bridge the gap between consumer expectations and technological capabilities, offering insights into the operational, economic, and social factors influencing the adoption of such machines. By understanding the interplay between these elements, this research aims to provide actionable recommendations for stakeholders, including manufacturers, policymakers, and urban planners.

The scope of this research extends beyond the technical and operational aspects of vending machines. It delves into consumer psychology, assessing the motivations, reservations, and preferences of individuals across demographic segments. It also considers the broader implications of introducing such technology in a culturally diverse and economically stratified market like India.

Through this comprehensive analysis, the study not only highlights the challenges but also uncovers the opportunities presented by this innovative technology. The research underscores the importance of adaptability, consumer education, and strategic implementation to ensure that vending machines can successfully integrate into the Indian urban food ecosystem, contributing to a more convenient and efficient future.

Definitions

1. **Vending Machine**: A self-service machine that dispenses food, beverages, or other items to consumers after payment.
2. **Awareness**: The extent to which consumers recognize and understand the concept and utility of vending machines.
3. **Acceptability**: The degree to which consumers are willing to use vending machines for food purchases.
4. **Feasibility**: Practical aspects of implementing and maintaining vending machines, including cost, technical challenges, and consumer satisfaction.

Need

The demand for hygienic, time-saving food options has increased significantly in urban areas. Vending machines provide a solution to modern consumer needs by offering 24/7 availability, minimal human intervention, and operational efficiency. Understanding their potential in Pune helps address urban food delivery challenges and promotes innovative business models.

Aims

- To study consumer awareness of hot food vending machines.
- To evaluate the acceptability of vending machines among Pune consumers.
- To assess the feasibility of implementing vending machines from an operational and financial perspective.

Objectives

1. To analyze demographic factors influencing awareness and acceptability.
2. To explore consumer preferences regarding food variety and quality in vending machines.
3. To assess the cost-effectiveness and technological reliability of vending machines.
4. To identify barriers and suggest strategies for successful implementation.

Hypothesis

- **H1**: Awareness of vending machines positively correlates with their acceptability among Pune consumers.
- **H2**: Feasibility factors, including cost and reliability, significantly impact consumer adoption rates.

Research Methodology

1. **Study Design**: Quantitative and qualitative methods through surveys and focus group discussions.
2. **Sampling**: Random sampling of 150 Pune residents, stratified by age, gender, and occupation.
3. **Data Collection**: Structured questionnaires and semi-structured interviews.
4. **Analysis**: Statistical tools (SPSS) and thematic analysis for qualitative data.

Strong Points

- Promotes convenience and hygiene.
- Operates 24/7, addressing urban time constraints.
- Reduces dependency on human labor.
- Technological advancements ensure quality and consistency.

The adoption and implementation of Automatic Hot Food Vending Machines (AHFVMs) in the Indian context, specifically in Pune, offer several advantages that highlight the potential and feasibility of this technology. These strong points encompass technological, social, and operational aspects, demonstrating the robustness of this innovative food delivery system:

1. Convenience and Accessibility

- AHFVMs provide unparalleled convenience by offering round-the-clock service, making them ideal for consumers with varying schedules.
- They eliminate the need for human intervention in ordering and serving food, reducing waiting times and queues, especially during peak hours.

- Machines can be strategically installed in high-traffic areas such as office complexes, educational institutions, hospitals, and transit hubs, ensuring food is accessible to a large and diverse population.

2. Hygiene and Safety

- The closed, automated systems of vending machines ensure minimal contact with food, addressing consumer concerns about hygiene and contamination, particularly in a post-pandemic world.
- Stringent cleaning protocols and quality checks can be maintained, enhancing consumer trust in food safety.

3. Customization and Variety

- Advanced vending machines can cater to diverse consumer preferences, offering multiple menu options, including vegetarian, vegan, and gluten-free meals.
- Machines equipped with digital interfaces allow for customization of food items, such as spice levels, portion sizes, and add-ons, enhancing consumer satisfaction.

4. Technological Integration

- AI-powered vending machines can adapt to consumer trends, track preferences, and manage inventory efficiently, ensuring minimal wastage.
- Integration with payment platforms, including UPI, credit/debit cards, and digital wallets, facilitates seamless transactions.
- Smart features such as remote monitoring and troubleshooting reduce downtime and operational inefficiencies.

5. Economic Opportunities

- Vending machines create new revenue streams for businesses, particularly in the hospitality and food service industries.
- The scalability of vending machine operations allows small and medium enterprises to enter the market with relatively low investment compared to traditional restaurant setups.
- AHFVMs contribute to the gig economy by generating jobs for maintenance, logistics, and supply chain management.

6. Urban Adaptability

- In rapidly urbanizing cities like Pune, where space is at a premium, AHFVMs require minimal physical footprint compared to traditional eateries.
- They can operate effectively in crowded or compact environments, making them suitable for metro stations, malls, and even residential complexes.

7. Consumer Appeal and Modernization

- Vending machines align with the increasing consumer demand for innovative, tech-driven solutions, particularly among younger demographics.
- The use of touchscreens, digital menus, and interactive interfaces adds an element of novelty and excitement to the food-buying experience.

8. Environmental Considerations

- Machines designed with energy-efficient technologies and sustainable packaging options contribute to eco-friendly practices.
- Inventory management systems reduce food wastage, aligning with global sustainability goals.

9. Scalability and Innovation

- The modular nature of vending machines allows for easy upgrades and adaptations to market trends, such as adding healthier meal options or integrating AI-driven meal suggestions.
- Machines can be expanded to include additional services like snacks, beverages, and desserts, providing a one-stop food solution.

10. Market Potential and Consumer Demand

- The increasing demand for fast, affordable, and hygienic food in urban areas supports the adoption of AHFVMs.
- The machines cater to diverse consumer segments, from working professionals to students and travelers, ensuring broad market appeal.

By leveraging these strong points, AHFVMs have the potential to transform the food service industry in urban India, addressing critical challenges while enhancing consumer satisfaction and operational efficiency.

Weak Points

- High initial investment and maintenance costs.
- Limited food variety compared to traditional outlets.
- Technical glitches and machine malfunctions.
- Consumer hesitation due to unfamiliarity.

While Automatic Hot Food Vending Machines (AHFVMs) offer significant benefits, their adoption and operation come with notable challenges and limitations. These weak points highlight areas where the technology and its implementation face obstacles, particularly in the context of Pune and similar urban settings in India:

1. High Initial Investment Costs

- The setup of AHFVMs, including the purchase, installation, and integration of advanced technology, involves substantial capital investment.
- For small businesses and startups, the high cost may act as a deterrent, limiting market penetration.

2. Maintenance and Operational Challenges

- Regular maintenance is essential to ensure machine efficiency and hygiene, leading to additional recurring expenses.

- Technical issues, such as malfunctions or software glitches, can disrupt operations and impact customer satisfaction.
- Ensuring the availability of spare parts and skilled technicians can be a logistical challenge.

3. Limited Menu and Customization Constraints

- Despite technological advancements, the menu options are limited compared to traditional food outlets.
- Customization features, such as adjusting portion sizes or spice levels, may not cater to all consumer preferences, potentially alienating certain segments.

4. Consumer Skepticism and Cultural Resistance

- AHFVMs may face resistance from consumers accustomed to traditional dining experiences involving human interaction and freshly prepared food.
- Cultural preferences for home-cooked meals or street food might impact the acceptance of vending machine meals.

5. Dependence on Technology

- Machines are heavily reliant on uninterrupted power and internet connectivity, making them vulnerable to technical disruptions in areas with inconsistent infrastructure.
- Cybersecurity threats, including potential hacking of payment systems or data breaches, pose significant risks.

6. Hygiene and Food Safety Concerns

- Despite automated systems, consumer concerns about stale food, improper storage temperatures, or contamination during restocking persist.
- Ensuring consistent adherence to hygiene standards across multiple machines can be challenging.

7. Limited Accessibility in Non-Urban Areas

- While AHFVMs thrive in urban settings, they are less feasible in rural or semi-urban areas with lower consumer density and less developed infrastructure.
- The lack of demand and operational viability in non-urban regions may restrict the technology's reach and impact.

8. Environmental Impact

- The reliance on single-use or disposable packaging materials contributes to environmental concerns, especially if recycling facilities are inadequate.
- Energy consumption of vending machines, particularly those requiring heating or refrigeration, can strain electricity resources.

9. Competitive Market Pressures

- Traditional eateries, food delivery platforms, and street vendors provide stiff competition due to their diverse offerings, affordability, and human interaction.
- Consumers may perceive vending machine meals as less authentic or appealing compared to freshly prepared alternatives.

10. Consumer Trust and Adoption

- Establishing trust in the quality and safety of food dispensed by machines requires significant marketing and awareness efforts.
- New users may hesitate to adopt the technology, especially older demographics unfamiliar with digital interfaces.

11. Regulatory and Compliance Issues

- Navigating food safety regulations, licensing, and other bureaucratic hurdles can delay deployment and operation.
- Ensuring compliance with health standards and machine inspections adds to the administrative burden.

12. Limited Customization for Local Preferences

- Machines may struggle to accommodate hyper-local tastes and dietary habits, especially in a diverse market like Pune.
- Offering regional specialties in an automated format poses significant logistical and technological challenges.

13. Economic Constraints for Consumers

- The relatively higher price of vending machine food compared to local alternatives might deter cost-conscious consumers.
- Limited adoption by lower-income groups could reduce the overall market size.

14. Energy Dependence and Sustainability Issues

- Machines require constant energy supply, which can be challenging during power outages or in areas with limited energy resources.
- The environmental impact of large-scale deployments, including carbon footprints, requires careful consideration.

15. Scaling and Supply Chain Issues

- Maintaining consistent quality across a large network of machines requires an efficient and reliable supply chain, which may be challenging in diverse geographical locations.
- Restocking machines with fresh ingredients while minimizing waste is a logistical hurdle.

Despite these weaknesses, AHFVMs present an opportunity for innovation in the food service industry. Addressing these challenges through strategic planning, technological upgrades, and consumer engagement can significantly enhance their feasibility and appeal.

Current Trends

1. Rising use of AI and IoT in vending machines for personalized services.
2. Introduction of cashless and contactless payment methods.

3. Increasing popularity of health-focused food options in vending machines.
4. Expansion of vending machines into non-traditional locations, including offices and public transport hubs.

The landscape of Automatic Hot Food Vending Machines (AHFVMs) is evolving rapidly, shaped by technological advancements, changing consumer behaviors, and innovative business models. Below are the significant trends defining the growth and future of AHFVMs, with a focus on the context of Pune and similar urban markets in India:

1. Technological Integration

- **AI-Powered Personalization**: Vending machines are increasingly adopting artificial intelligence to offer personalized menu recommendations based on user preferences and purchasing history.
- **IoT Connectivity**: Internet of Things (IoT) technology is enabling real-time monitoring of machine performance, inventory levels, and food freshness, ensuring operational efficiency.
- **Contactless Transactions**: The rise of digital payment systems, including UPI, QR codes, and mobile wallets, has made transactions seamless and secure, particularly relevant in post-pandemic times.
- **Touchless Interfaces**: To enhance hygiene, machines now feature touchless interfaces that allow users to interact via voice commands or mobile apps.

2. Focus on Health and Wellness

- **Health-Conscious Offerings**: Machines are increasingly featuring healthy options such as low-calorie meals, gluten-free items, and organic snacks to cater to the health-conscious consumer segment.
- **Nutritional Transparency**: Clear labeling of nutritional information, including calories, protein, and sugar content, is becoming a standard feature.

3. Expansion of Product Variety

- **Multi-Cuisine Options**: AHFVMs are expanding their menus to include diverse cuisines such as Indian, Chinese, Italian, and fast food, appealing to varied consumer tastes.
- **Customizable Meals**: Machines offering meal customization, such as spice levels or ingredient choices, are gaining popularity.
- **Seasonal and Festive Specials**: Catering to regional and cultural preferences, vending machines now feature seasonal and festive-specific menus.

4. Sustainable Practices

- **Eco-Friendly Packaging**: There is a growing shift toward biodegradable or reusable packaging materials to address environmental concerns.
- **Energy-Efficient Machines**: Manufacturers are focusing on energy-efficient designs to reduce electricity consumption and carbon footprints.

5. Integration with Food Delivery Platforms

- **Hybrid Models**: Machines are being integrated with food delivery platforms, allowing customers to order through apps and pick up meals from nearby vending machines.
- **Geo-Tagging for Availability**: Consumers can now locate the nearest vending machine and check menu availability in real-time through mobile apps.

6. Enhanced Hygiene Standards

- **Automated Cleaning Systems**: Machines with self-cleaning mechanisms and antimicrobial surfaces are addressing hygiene concerns effectively.
- **Sealed Compartments**: Food is stored and dispensed in tamper-proof and sealed compartments to ensure safety and freshness.

7. Strategic Placement and Accessibility

- **High-Traffic Areas**: Machines are being deployed in high-footfall locations such as malls, corporate offices, hospitals, and metro stations for maximum visibility and convenience.
- **Rural Expansion**: Efforts are underway to introduce vending machines in semi-urban and rural areas, with modifications to suit local preferences and cost structures.

8. Data-Driven Insights

- **Consumer Analytics**: Machines equipped with data collection capabilities are providing valuable insights into consumer preferences, enabling better inventory and menu management.
- **Dynamic Pricing Models**: Based on demand and location, machines now feature dynamic pricing strategies to maximize revenue.

9. Integration of Robotics

- **Robotic Chefs**: Some vending machines now include robotic arms and cooking mechanisms to prepare food on demand, enhancing the freshness and experience.
- **Automated Restocking**: Robotic solutions are being introduced to streamline the process of restocking ingredients and meals.

10. Customization for Local Markets

- **Regional Cuisines**: Machines in Pune and other Indian cities are increasingly featuring local delicacies such as poha, idli, vada pav, and biryani.
- **Language Support**: Interfaces offering multilingual support cater to India's diverse population, enhancing usability.

11. Consumer Engagement Strategies

- **Gamification**: Loyalty programs and gamified experiences, such as discounts for repeat

purchases, are being used to increase consumer engagement.

- **Interactive Displays**: Machines with high-definition displays for advertisements, recipes, or interactive content are capturing consumer attention.

12. Focus on Affordability

- **Budget-Friendly Meals**: Vendors are introducing affordable meal options to attract price-sensitive customers in cities like Pune.
- **Subscription Models**: Monthly or weekly subscription plans offer cost-effective solutions for frequent users.

13. Collaboration with Local Brands

- **Partnerships with Cloud Kitchens**: Collaborations with cloud kitchens are enabling the preparation and delivery of fresh meals to vending machines.
- **Support for Small Vendors**: Machines are also showcasing products from local and small-scale food manufacturers.

14. Increasing Popularity of Fresh and Hot Foods

- **Real-Time Preparation**: Machines capable of cooking and serving meals in under 3 minutes are redefining convenience.
- **Fresh Ingredients**: The inclusion of fresh vegetables, meats, and spices enhances food quality and consumer trust.

15. Adaptations to Pandemic-Era Needs

- **24/7 Availability**: Vending machines offer round-the-clock food access, addressing the needs of healthcare workers and shift employees.
- **Social Distancing Measures**: Automated services reduce human contact, aligning with pandemic-era safety protocols.

16. Integration with Emerging Technologies

- **Blockchain for Transparency**: Blockchain technology is being explored to provide end-to-end traceability of ingredients and food safety measures.
- **AI Chatbots**: Some machines now offer AI-based chatbots for customer support and troubleshooting. The evolution of Automatic Hot Food Vending Machines is being driven by a mix of technological advancements, consumer demands, and market opportunities. These trends, particularly when tailored to local contexts like Pune, signify a promising future for automated food services. However, addressing challenges such as affordability, cultural acceptance, and sustainability will be critical for their long-term success.

History

Vending machines have evolved from basic snack dispensers in the 19th century to advanced, fully automated systems. The concept entered India in the early 2000s, initially limited to urban corporate spaces. Over time, improvements in technology and consumer demand have expanded their reach to various public and private locations. The evolution of Automatic Hot Food Vending Machines (AHFVMs) represents a fascinating journey through time, reflecting advancements in technology, changing consumer needs, and innovations in food services. The history of AHFVMs can be categorized into key milestones and eras, showcasing how they evolved into modern, sophisticated machines.

1. Ancient and Early Predecessors

- **Vending in Antiquity**: The concept of vending dates back to ancient Greece. A mathematician and engineer, Hero of Alexandria, designed a coin-operated machine in the 1st century AD that dispensed holy water in temples. While not food-related, this concept laid the groundwork for vending automation.

2. Early Developments (17th to 19th Century)

- **European Origins**: In the 17th century, simple mechanical vending machines appeared in taverns and inns, dispensing small snacks and drinks.
- **First Commercial Vending Machine (1880s)**: In England, coin-operated machines dispensing postcards and small goods became common. These machines were not food-specific but marked the first steps toward automated retail solutions.

3. Evolution into Food and Beverage Vending (20th Century)

- **The Birth of Food Vending (1920s-1930s)**: The early 20th century saw vending machines dispensing packaged snacks like chips, cookies, and canned drinks in the United States.
- **Hot Beverage Machines**: By the 1930s, machines dispensing hot coffee and tea began to appear in office buildings, marking a shift toward providing fresh and hot consumables.
- **World War II and Post-War Era**: The 1940s and 1950s saw significant innovation driven by the need for convenience during wartime and the post-war economic boom. Machines dispensing pre-cooked meals and beverages gained popularity in public spaces.

4. The Rise of Automated Hot Food Machines (1960s-1980s)

- **Introduction of Hot Food Vending**: The 1960s saw the development of machines capable of heating pre-cooked meals, such as soups, pizzas, and sandwiches, using basic heating elements.
- **Microwave Technology**: The integration of microwave ovens in the 1970s revolutionized vending machines, allowing for the quick heating of frozen and chilled meals.

- **Cultural Popularity**: In Japan, vending machines became a cultural phenomenon, offering a variety of hot and fresh foods, including ramen, rice dishes, and hot beverages.

5. Technological Advancements and Diversification (1990s-2000s)

- **Digital Interfaces**: The 1990s introduced digital displays and automated controls, enabling more precise food selection and preparation.
- **Global Expansion**: Vending machines offering hot meals expanded globally, with significant penetration in urban centers and workplaces.
- **Focus on Freshness**: Machines began incorporating refrigeration systems to maintain food quality before heating.
- **Diverse Menus**: Food vending diversified to include a broader range of cuisines, including ethnic and dietary-specific options.

6. Modern Era of AHFVMs (2010s-Present)

- **Smart Vending Machines**: The integration of IoT, AI, and machine learning transformed vending machines into smart devices capable of personalizing user experiences and ensuring operational efficiency.
- **Touchless Technology**: The COVID-19 pandemic accelerated the adoption of touchless payment systems and interfaces for enhanced hygiene.
- **On-Demand Fresh Food**: Advanced machines now prepare fresh meals from scratch using robotic arms and automated cooking systems.
- **Sustainability Focus**: Eco-friendly packaging, energy-efficient designs, and waste reduction initiatives became a priority for modern vending solutions.

7. Regional Developments in India

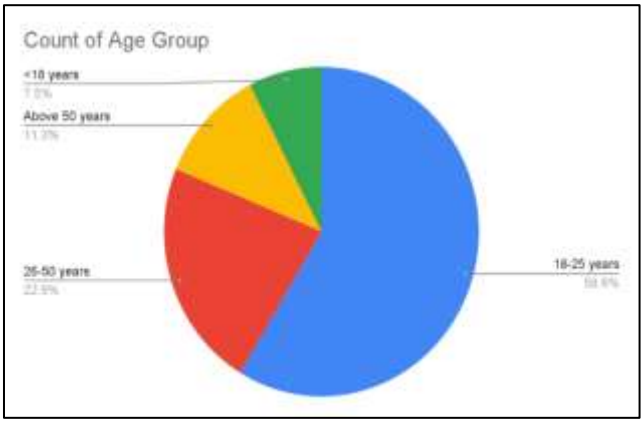
- **Initial Adoption**: The Indian market began embracing vending machines in the late 20th century, initially focusing on snacks and beverages in urban areas.
- **Introduction of Hot Food Machines**: Over the last two decades, the demand for quick and affordable meals has led to the adoption of AHFVMs in metro cities like Pune, catering to students, office workers, and commuters.
- **Local Adaptation**: Machines have been adapted to offer popular Indian dishes such as biryani, samosas, and dosas, alongside international cuisines.
- **Challenges**: High initial costs, maintenance issues, and consumer skepticism have been hurdles in expanding the reach of AHFVMs in rural and semi-urban areas.

8. Integration of Emerging Technologies

- **Blockchain and Transparency**: Recent advancements include using blockchain technology for ingredient tracking and ensuring food safety.
- **AI and Data Analytics**: Machines equipped with AI are analyzing consumer preferences to offer tailored menus and optimize inventory.
- **Robotics in Preparation**: Machines now include robotic mechanisms for on-demand meal preparation, enhancing freshness and taste. The history of Automatic Hot Food Vending Machines reflects the confluence of human ingenuity, technological progress, and evolving consumer expectations. From the rudimentary coin-operated mechanisms of ancient Greece to today's AI-driven smart devices, AHFVMs have become an indispensable part of modern food service. As consumer demands grow and technology continues to evolve, the journey of these machines is far from over, promising exciting innovations in the years to come.

Data Analysis

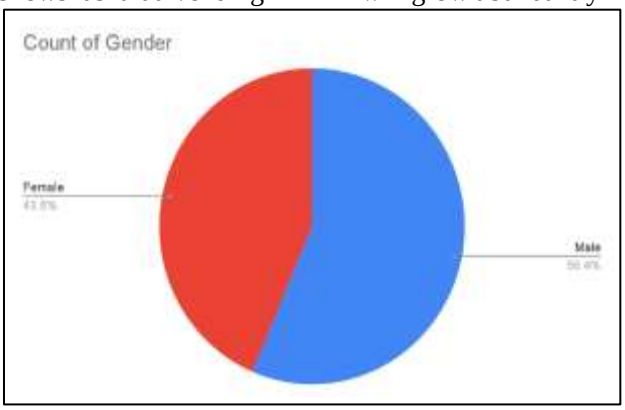
Structured Questionnaire through Google form was shared with the random respondents and 133 consumer responses were collected as Primary data for the given topic. The target sample size for the research study was 150 responses out of which 133 were recorded which is almost 88.6% response rate. The form was shared and circulated on different social media platforms such as Instagram, Facebook, LinkedIn, WhatsApp and various telegram groups. The analysis and interpretation are mentioned below-



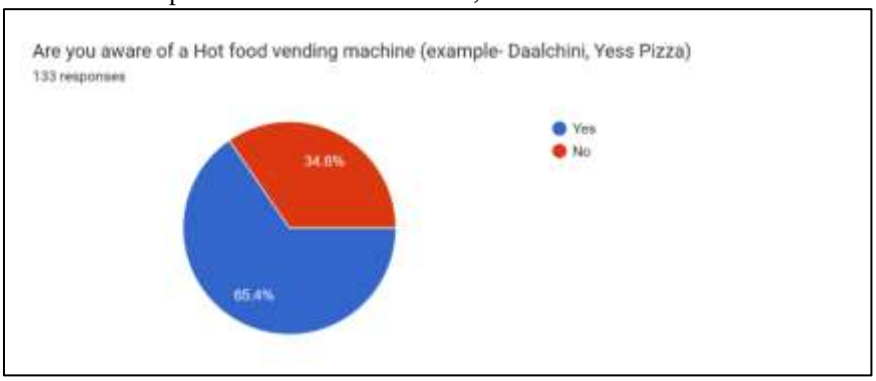
The above pie chart shows the breakdown of the age group who have responded to the survey. Out of 133 responses 58.6% respondents belong to the age group of 18-25. 22.6% responses belong to the working-class people. Combined they comprise more than 80% of the responses which shows that people from age group 18-50 are well acquainted with the concept of vending machines.

7.5% of respondents are children, teenagers and youngsters below 18. This shows us that vending machines are being introduced in schools, colleges and Universities too and hence the millennials are also well versed with the technology of Vending machines and how it works/operates.

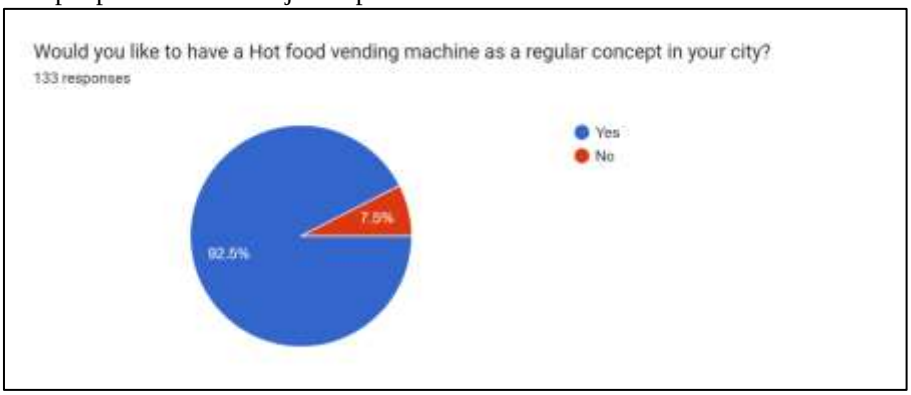
People more than 50 years of age consist of almost 11.3% of the overall respondents, this survey shows that people of all ages in the 21st century are well equipped with not only using the vending machine but also adapting to the upcoming technology which will grow abundantly in the coming years.



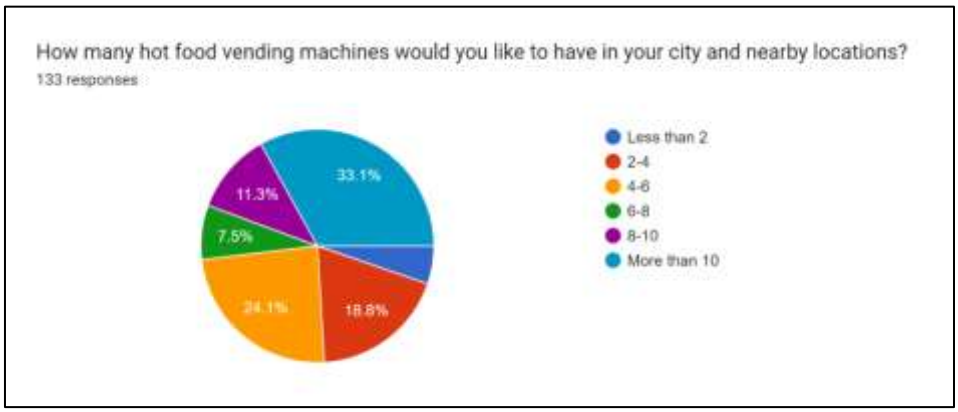
The above pie chart shows that 43.6% responses were received from Women and 56.4% responses were received from Men out of the total 133 responses recorded from Pune,



The Above chart depicts that 65.4% respondents are aware of the concept of hot food vending machines whereas almost 34.6% people have heard about it for the very first time. This question helps in understanding the mindset and awareness of the people about the subject/topic.

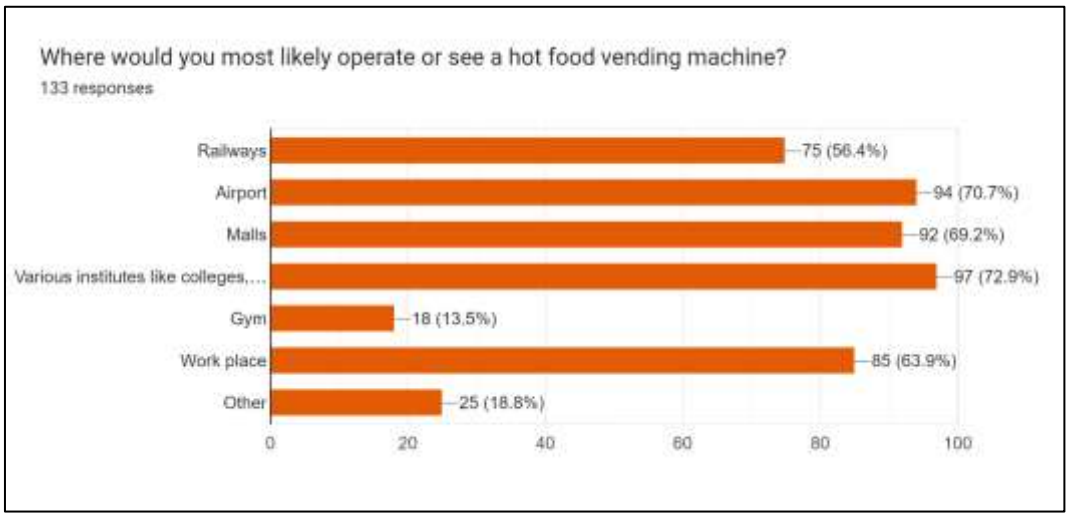


The main aim of asking this question, was to understand, whether the consumers are gonna accept the idea and concept of Hot food vending machines if introduced in their city. Around 92.5% respondents are keen towards the technological advancement in food industry whereas, 7.5% respondents are hesitant with new technological advancements in food and beverage industry mainly pertaining to vending machine business.

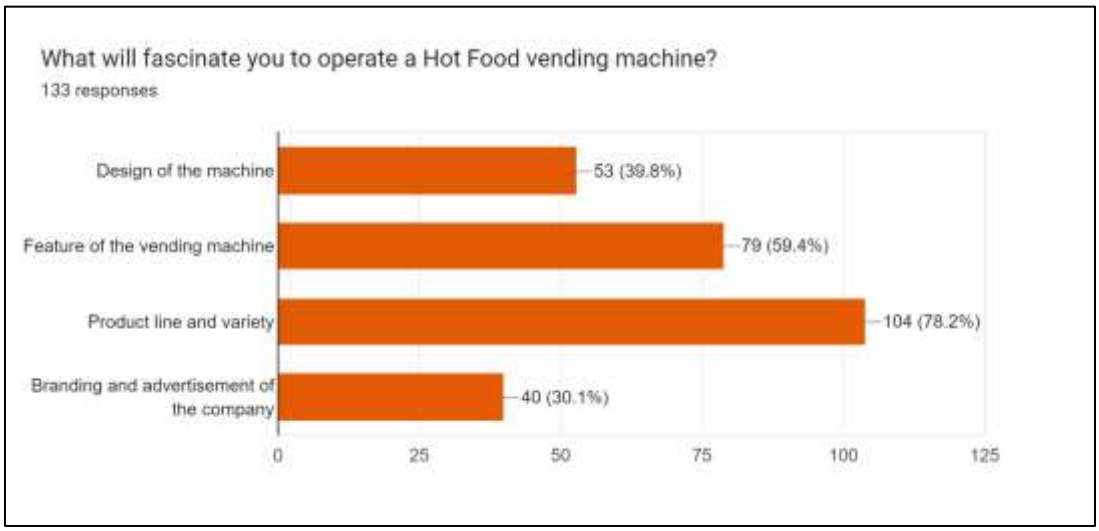


The figure above, shows the number of Automated Retail Kiosks/Vending machine, Respondents would like to see and operate in their respective cities. 33.1% respondents would like to see more than 10 machines in their respective cities whereas 24.1% respondents want 4-6 functional vending machines. 5.2% respondents want less than 2 machine in their cities. 18.8% respondents want 2-4 machines in their city whereas 11.3% respondents want to see at least 8-10 machines installed and operating. The above graph clearly shows a mixed reaction of people to the number of vending machines they want to have in their cities.

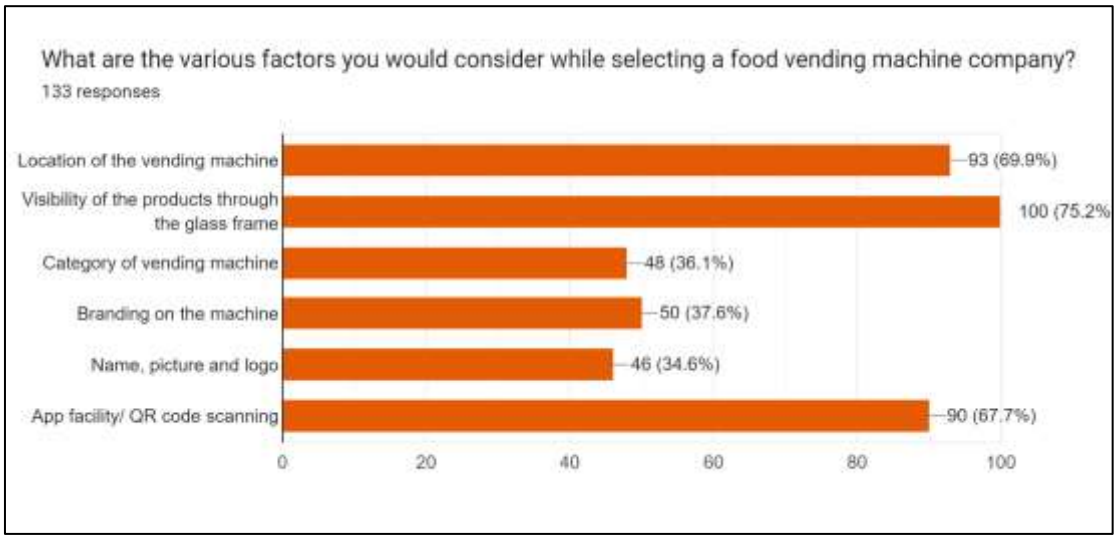
Thus, this clearly states that there is still a long way to go until people accept vending machines into their day-to-day life.



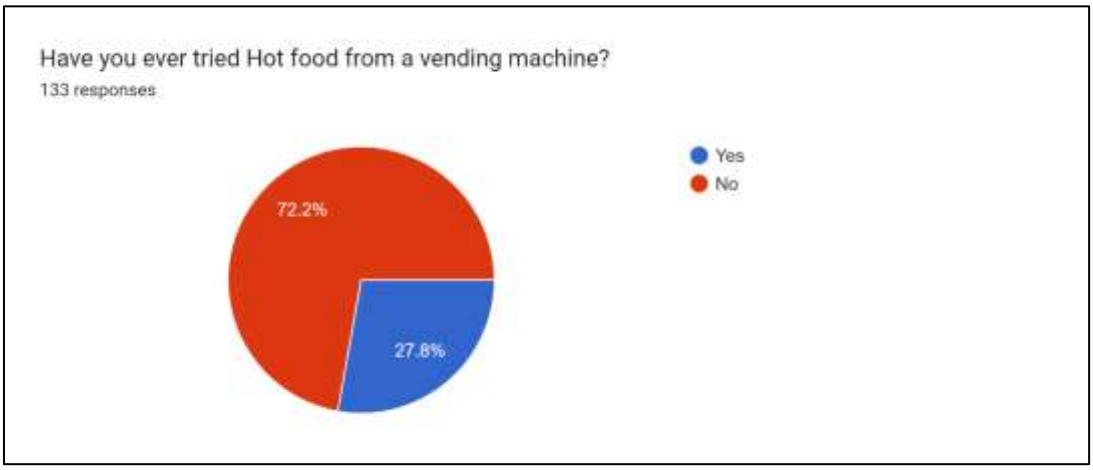
The above graph shows the demand for vending machines in various public places. Out of 133 respondents, 56.4% respondents would like to have Vending machines at the railway station and 71% respondents would like to operate vending machines at the airport. Great demand can also be seen for vending machines at places like malls (69.2%) and various institutes like colleges, schools, universities etc (72.9%). These public places can be a great start for the rise of vending machines and increase in their demand and growth. Employees (63.9%) would also like to have vending machines at their work place for saving time, energy and ease of convenience. 13.5% Respondents would also like to operate Vending machines at Gym for fitness related products and facilities.



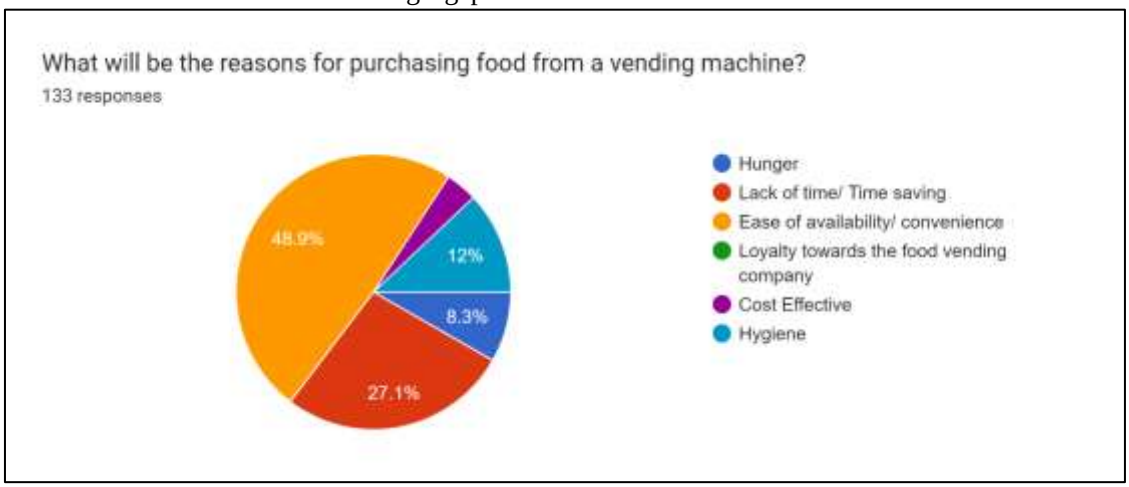
The above graph shows that the product line and variety of products (78.2%) plays a major role in fascinating people to use a vending machine, followed by the factors such as Feature (59.4%) and design of the machine (39.8%). It is to be noted that Branding and advertisement (30.1%) plays a limited role in motivating people to operate a hot food vending machine and thus those costs can be reduced. The main aim of asking this question in survey was to determine various stimuli that motivates the respondents for operating a hot food vending machine when they see one.



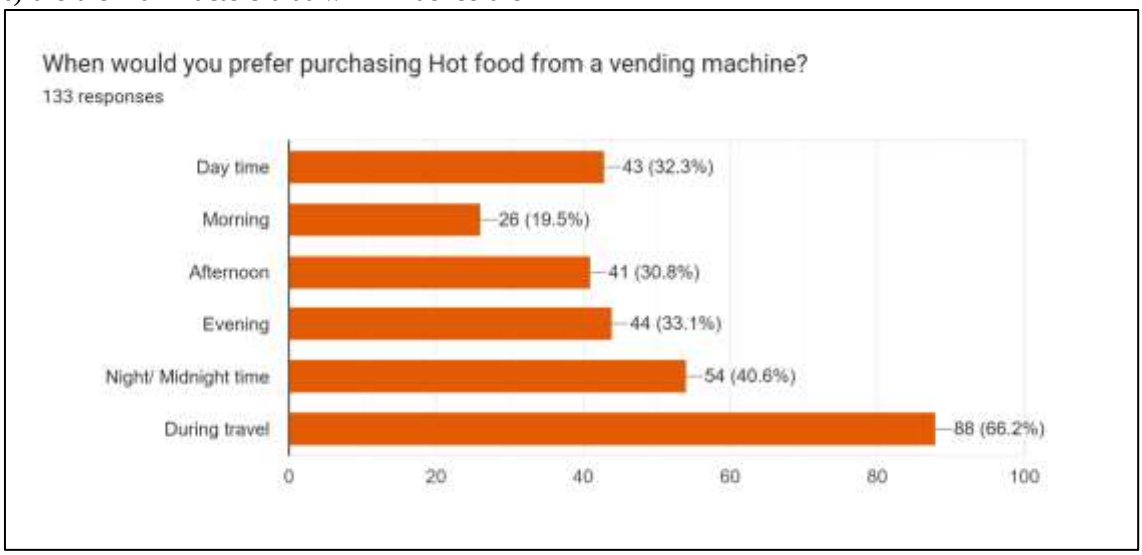
The above bar graph shows the various factors, customers consider while selecting a food vending machine. Visibility of the products (75.2%), location of the vending machine (69.9%) and easy accessibility for payments/ App facility or QR code scanning (67.7%) are the main factors. Branding of the machine (37.6%), Name, picture and logo (34.6%) and category of vending machine (37.6%) play limited role in selection of vending machine by the respondents.



The above pie chart shows that out of 133 respondents, only 27.8% of respondents have tried hot food from vending machine whereas 72.2% respondents have not tried food from a vending machine. The main reason for such a huge gap is because the concept and ideology of hot food vending machine is relatively new to the Indian market. However, it is assumed that Vending machine industry will boom in upcoming Indian market.

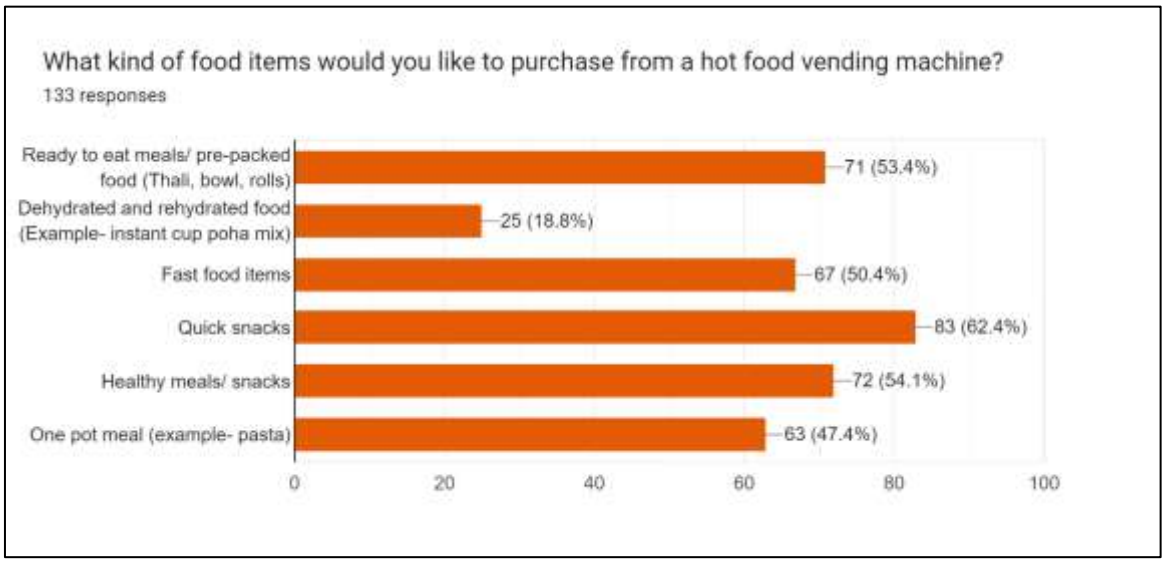


The main purpose of adding this question to the survey was to understand the buying behaviour of the consumers when they are purchasing food from a vending machine. Lack of time/ time saving (27.1%) and ease of availability/ convenience (48.9%) are the main factors that will influence the respondents to purchase food from a vending machine. Hygiene (12%), Hunger (8.3%) and cost effectiveness (3.7%) are the other factors that will motivate the decision of the respondents when purchasing food items from a vending machine.

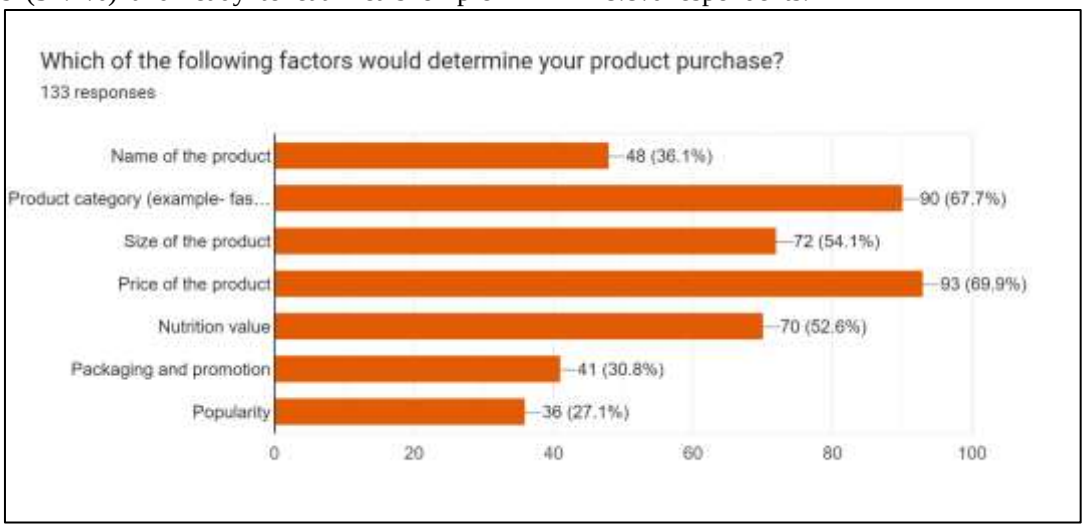


The above graph shows that people/consumers prefer purchasing hot food from vending machine while travelling (66.2%), the main reason being hygiene of the food and availability of food during different times.

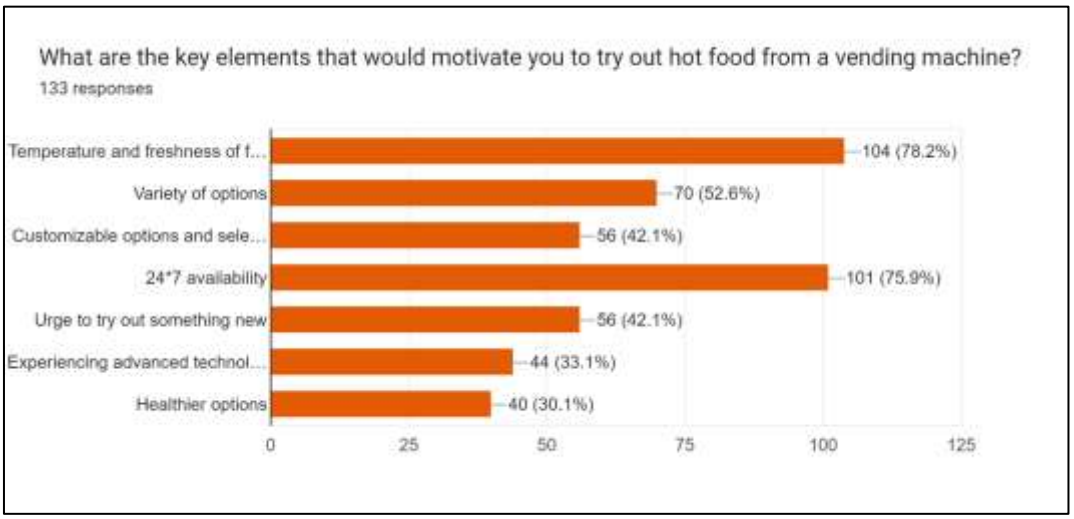
During regular days people prefer purchasing hot food from vending machine, during night/midnight time (40.6% - as major food outlets are closed) followed by Evening (33.1%) and day time (32.3%). Morning (19.5%) and Afternoon (30.8%) time zones, are not much preferred by the respondents for purchasing Hot food from vending machines.



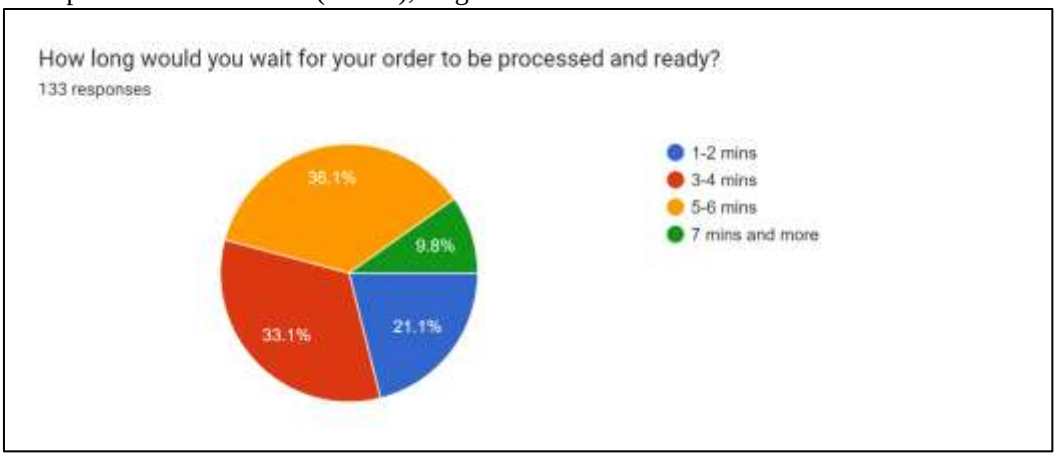
The Bar graph displayed above shows the consumer preferences of food items when purchasing Hot food from a vending machine. 62.4% respondents prefer Quick snacks the most, when purchasing food items from vending machines followed by healthy meals or snacks (54.1%) and ready to eat meals or pre packed food (53.4%). 50.4% respondents prefer fast food items and 47.4% respondents prefer one pot meal/dishes like pasta. Dehydrated food items which are then rehydrated after adding hot liquid like instant poha mix or Maggi is preferred only by 18.8% respondents.



This question was asked to understand the thought process of the consumers when purchasing products from a food vending machine. According to 69.9% respondents- Pricing of the food item is the biggest factor for product purchase from a vending machine, followed by product category (67.7%) and size of product (54.1%). According to 52.6% respondents' Nutritional value plays an equivalent important role in the product purchase. Name of product (36.1%), Packaging/ Promotion (30.8%) and popularity (27.1%) are passive factors that determine product purchase.



According to the above bar graph Temperature and freshness of food items (78.2%) and 24*7 availability (75.9%) are the key elements that would motivate the consumers to try out food from Hot vending machine. Variety of options (52.6%), Customizable options and selections (42.1%), Urge to try out something new (42.1%), Experiencing advanced technology (33.1%) and Healthier options (30.1%) are passive but important elements that would motivate the customers/consumers to try hot food from vending machines.



According to the pie graph shown above 36.1% respondents are ready to wait 5-6 mins for their food to get ready, followed by 33.1% respondents who will wait 3-4 mins. 21.1% consumers expect their food to get ready within 1-2 mins. Only 9.8% of the total respondents are ready to wait more than 7 mins for their food to be ready. Food Processing time should be carefully considered while establishing a vending machine business

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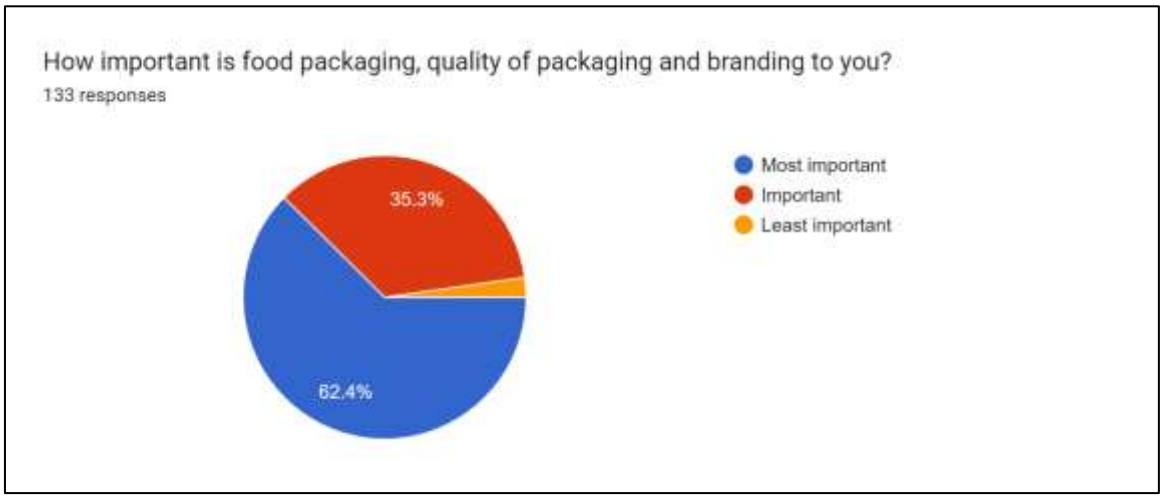
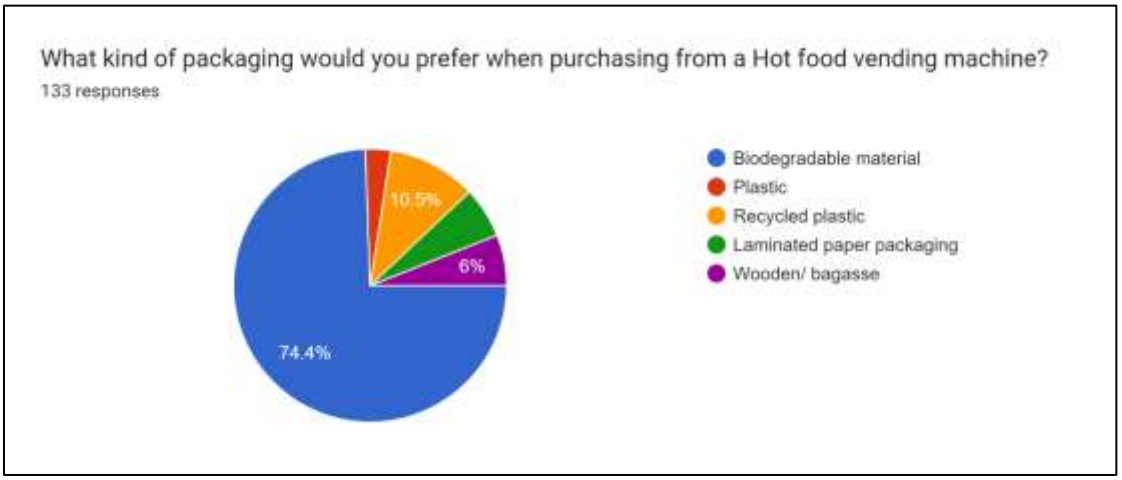
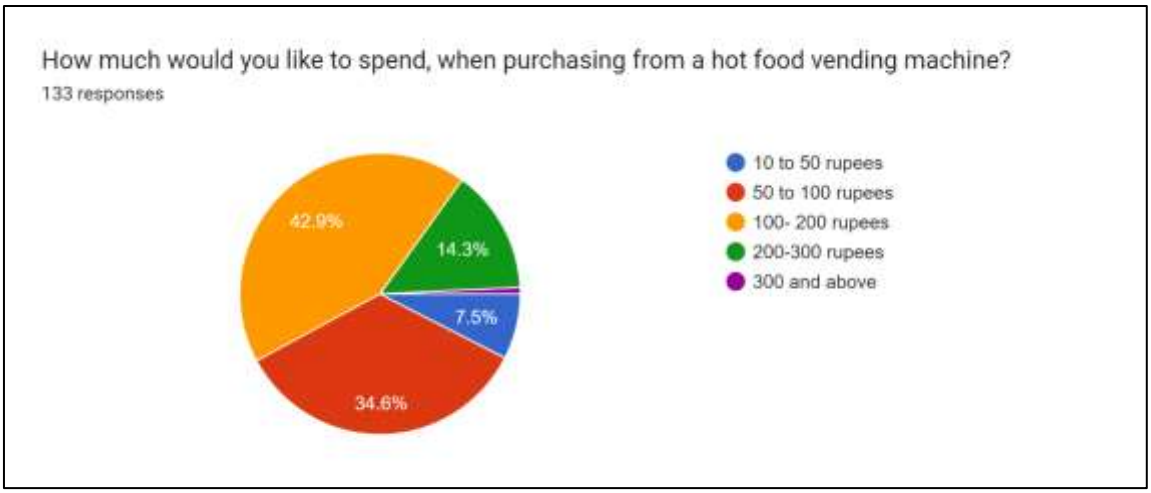


In accordance with the pie chart shown above 62.4% respondents feel that food packaging and quality of packaging is most important. 35.3% respondents believe that it is Important to have proper packaging

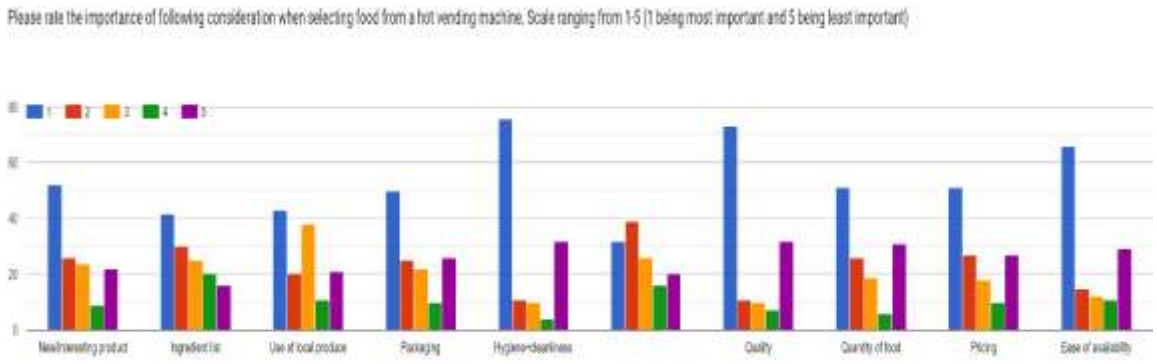
of food materials. Food packaging, quality of packaging and branding is least important as per 2.3% respondents. The objective of adding this question to the survey was to analyse the responses and reaction of the consumers, based on the importance of Branding of product and company, quality of packaging, colour and design of packaging for food items while making the decision of purchasing from a hot vending machine.



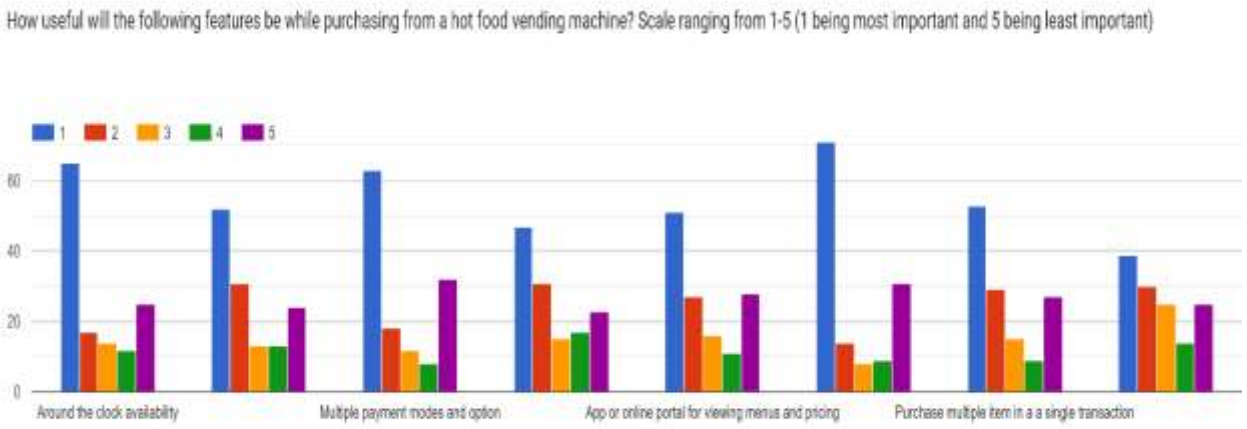
The above pie graph shows that 74.4% consumers/respondents would prefer environment friendly biodegradable packing material followed by recycled plastic (10.5%) packaging and wooden/Bagasse items (6%). Around 6% respondents prefer Laminated paper packaging and 3.1% respondents prefer Plastic Packaging. However due to increased awareness about sustainable packaging consumers are adapting to other forms of eco friendly packaging.



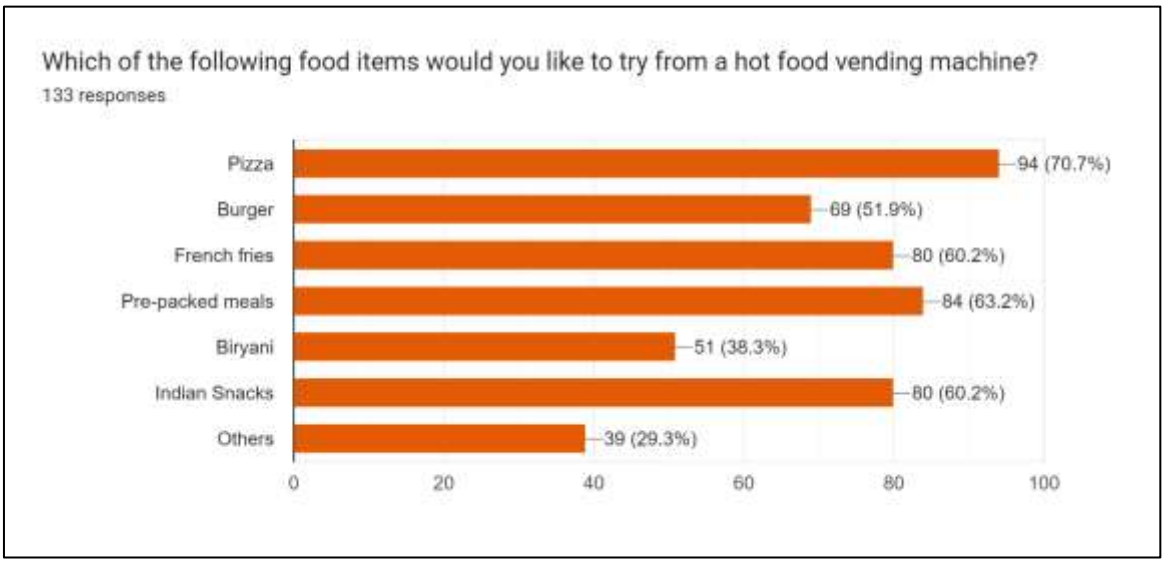
In Accordance with the above pie graph 42.9% respondents (majority of customers) are willing to spend 100-200 Rs while purchasing food from the vending machine, followed by 34.6% consumers willing to spend 50-100 rupees for vended food products. Around 7.5% consumers are willing to spend 10-50 rupees and very few people (14.3% respondents) are willing to spend 200-300 Rs on a food item from vending machine. Only 0.7% consumers are willing to spend above 300 rupees on food products purchased from a vending machine. Hence the pricing should be done accordingly. Various psychological and physiological factors are needed to be considered along with major elements while determining price for food products or food product line.



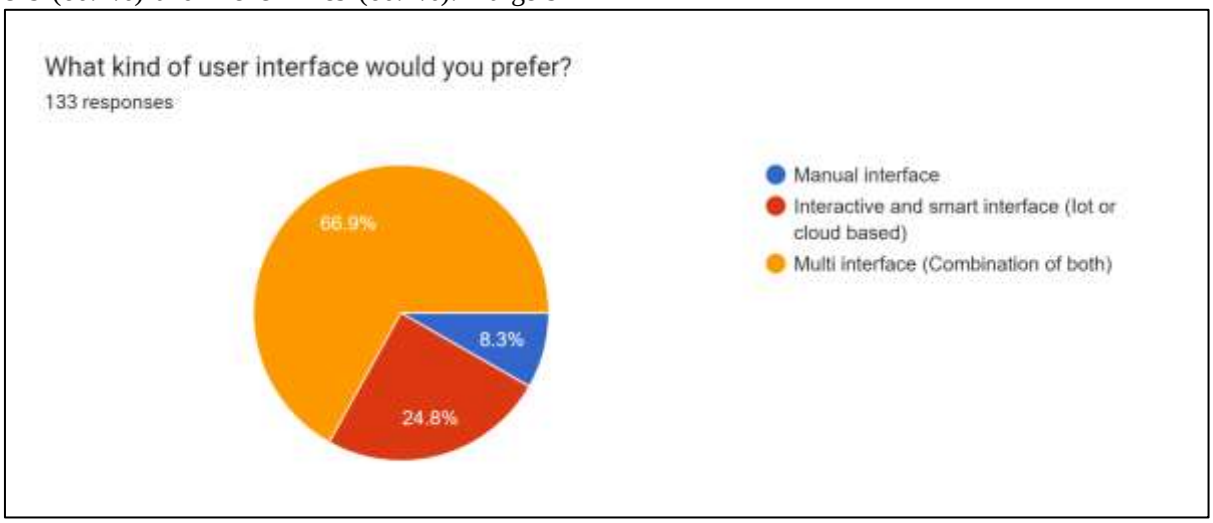
According to bar graphs shown above hygiene and cleanliness is a very important consideration for customers before buying food from a vending machine. Quality of food, ease of availability and pricing of the goods also play a very important role when selecting food from a vending machine. Ingredient list, source of local produce, new products are not very important considerations but they should also be kept in check. Multiple choice answers were recorded for this question. Scale of 1-5 was provided with 1 being most important and 5 being least important. According to the responses recorded all the considerations mentioned above has highest marking of number 1 which depicts that most of the factors/considerations mentioned above are most important. However mixed responses were collected and the viewpoint and opinion of each induvial varies.



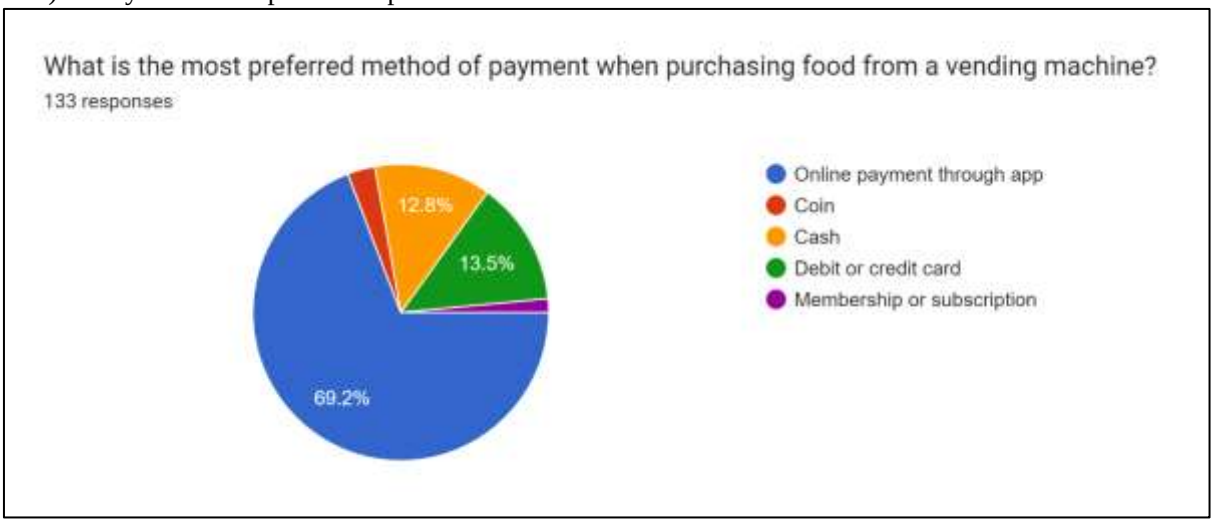
The above graphs show that the feature of App/web portal for viewing menu and pricing are the most important feature customers would like to have, followed by round the clock availability of food items in the vending machine and Purchase of multiple items in a single transaction. Multiple payment modes and options are also an important feature which should be available while using the vending machine. Scale of 1-5 was used for recording multiple choice answers.



The above bar graph shows that customers would like to try pizzas (70.7%) the most from a vending machine. Apart from pizzas customers are also willing to try out pre-packed meals (63.2%), Indian snacks (60.2%) and French fries (60.2%). Burgers (51.9%) and biryanis (38.3%) are less preferred food items in comparison with others. 29.3% respondents are ready to try out innovative and new food products from Hot food vending machine.



In Accordance with the pie chart shown above 66.9% respondents are really comfortable with a multi-interface (combination of both) for a vending machine followed by a cloud-based interface (24.8%). Only 8.3% respondents prefer Manual interface. Manual Interface is not preferred so much in today's technologically growing era as multi interface option is available in the market for ease of operation and functioning.



According to the pie chart displayed above, 69.2% respondents prefer Online payment through app which is the most preferred and easy method of payment followed by debit card and credit card (13.5%) payment and Cash Payment (12.8%) while purchasing food from Vending machine. 1.5% respondents prefer membership or subscription and around 3% respondents prefer coin as a method of payment while purchasing from vending machines

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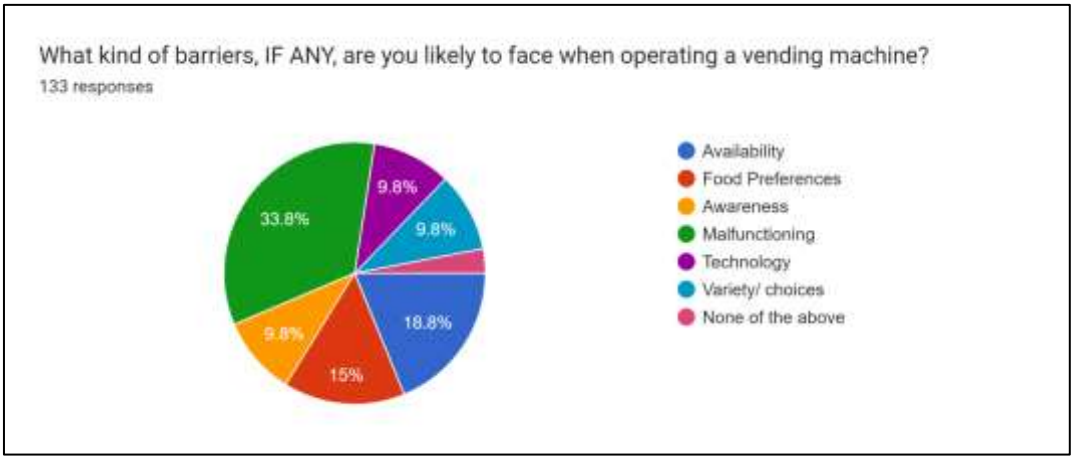
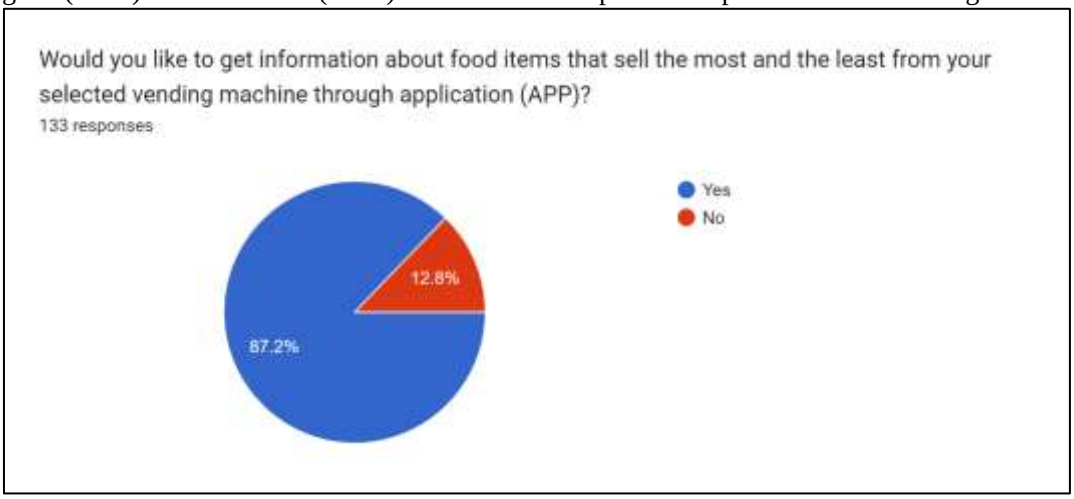
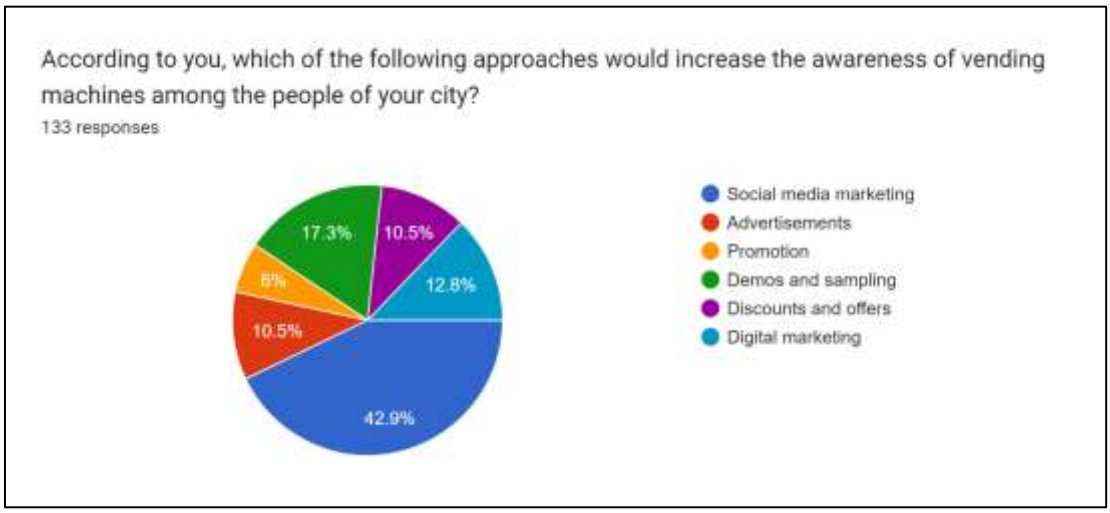


The objective of asking this question to the consumers in the survey was to understand the challenges or hurdles they might face while operating a vending machine. The main barrier customers would face while using the vending machines would be the malfunctioning of the machines (33.8%) itself followed by availability of products (18.8%) and food preferences (15%). Technological (9.8%) and awareness (9.8%) barriers are also major challenges faced by few customers while using a vending machine. Lack of variety of food options (9.8%) is also an important barrier a customer might face while using the vending machine. 3% of respondents have answered to the option of- None of the above as they might be well versed with the technology and functioning of vending machines and feel confident enough to operate and purchase from vending machines.



The above pie chart depicts that out of 133 respondents, almost 87.2% respondents agree to get information about food items that sell most and least from their selected vending machine company through their application. Around 12.8% respondents do not want to receive any information regarding the popular food items as they are sure and well aware about their food choices and preferences.



The purpose of this question was to understand which method of promotion and advertisement will help spread awareness about vending machine among the people of various cities according to the respondents. The above abstract pie chart depicts that digital marketing (12.8%) and social media marketing (42.9%) would lead to a major contribution in increasing awareness of vending machines among the people in various cities. Demos and sampling (17.3%) along with discount and offer (10.5%), advertisements (10.5%) and Promotion (6%) will also play a crucial role in increasing the awareness about the same

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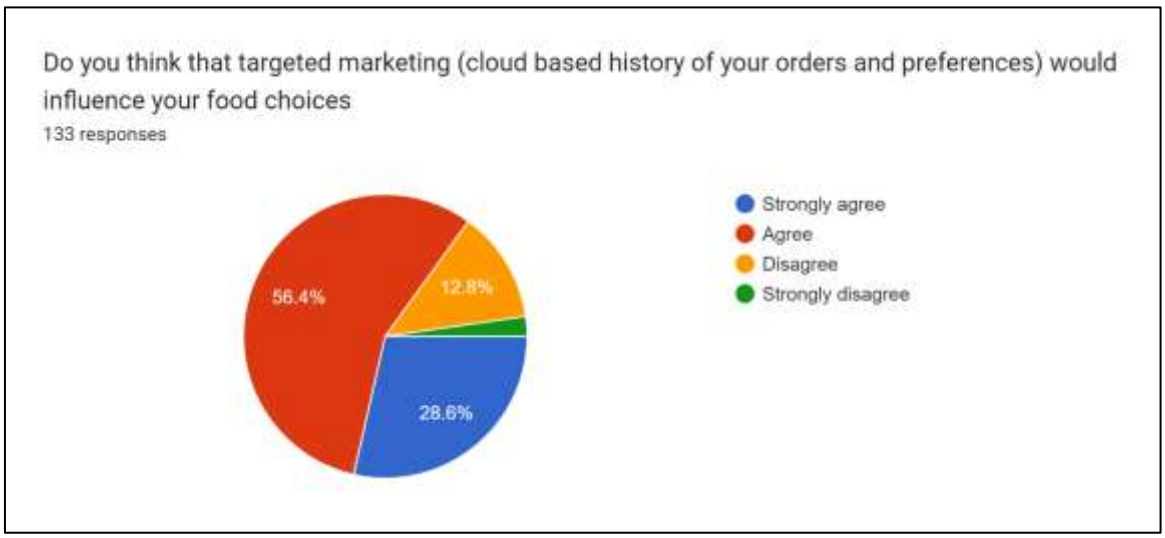
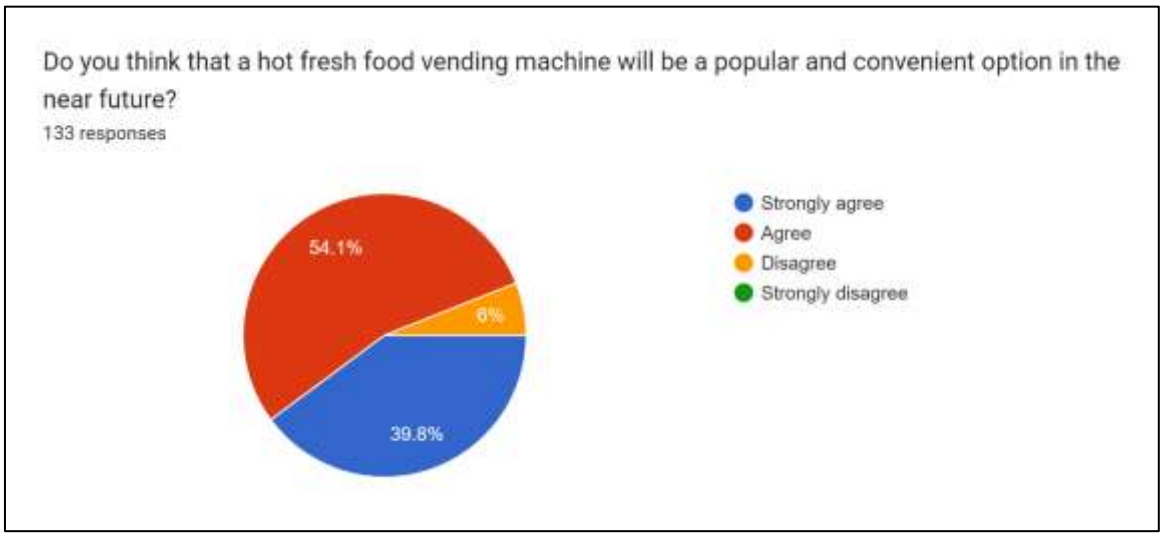


In accordance with the pie chart shown above, 56.4% respondents agree and 28.6% respondents strongly agree that target marketing will influence their food choices and preferences. Various algorithms and tools are used to collect consumer data about previous orders, likes, dislikes, allergies etc. 12.8% respondents disagree and 2.3% respondents strongly disagree that targeted marketing will change or influence their food choices. They believe that targeted marketing will not impact or influence their choices.



This final question was asked to the consumers to understand their viewpoint on the given subject. The above pie chart shows clear future trend. 54.1% respondents agree and 39.8% respondents strongly agree that hot fresh food vending machines will be a popular and convenient option in the coming future. 6% of respondents disagree to the concept of vending machine becoming a convenient and popular option in near future.

Discussion

The findings underscore significant consumer interest in hot food vending machines, particularly among younger, tech-savvy demographics. However, challenges such as cost, limited food options, and operational glitches pose barriers. The role of manufacturers and policymakers in addressing these issues is critical for widespread adoption.

Results

- **Awareness**: 70% of respondents were familiar with vending machines, with 40% aware of hot food options.
- **Acceptability**: 60% expressed willingness to use hot food vending machines.
- **Feasibility**: High costs and technical issues were major concerns.

Conclusion

Hot food vending machines have significant potential to transform urban food services. While consumer interest is evident, addressing feasibility challenges and building trust through quality assurance and affordability is essential for long-term success. The journey of Automatic Hot Food Vending Machines (AHFVMs) represents a remarkable confluence of innovation, convenience, and adaptability, reflecting the ever-changing landscape of consumer preferences and technological advancements. These machines, which started as rudimentary mechanisms dispensing basic goods, have evolved into sophisticated systems capable of delivering fresh, hot, and hygienic meals on demand.

The significance of AHFVMs lies not only in their ability to provide quick and affordable food solutions but also in their impact on modern lifestyles. They have redefined convenience by making fresh meals accessible in diverse settings, from office complexes and educational institutions to hospitals and public transportation hubs. This accessibility has catered to the fast-paced lifestyles of urban consumers, addressing their need for efficiency without compromising on quality.

Moreover, the integration of cutting-edge technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and robotics has elevated the capabilities of these machines. Smart vending solutions now offer personalized menus, seamless touchless transactions, and real-time inventory management, ensuring an enhanced user experience. Sustainability has also emerged as a crucial focus, with manufacturers adopting energy-efficient systems and eco-friendly practices to minimize environmental impact.

However, the widespread adoption of AHFVMs has not been without challenges. In markets like India, cultural preferences, scepticisms regarding machine-prepared meals, and operational barriers such as maintenance and high initial costs have limited their penetration. Despite these obstacles, the potential for growth is immense, particularly in urban centers where consumer demand for quick-service solutions continues to rise. The Indian context provides a unique case study in the localization of vending technology. By incorporating regional Flavors and catering to dietary preferences, AHFVMs in India are gradually bridging the gap between tradition and modernity. Cities like Pune have become hubs for experimentation, showcasing how these machines can adapt to diverse culinary landscapes.

Automatic Hot Food Vending Machines have become a vital component of contemporary food service ecosystems. Their ability to balance speed, convenience, and quality aligns perfectly with the demands of modern consumers. As

technology advances and societal acceptance grows, the role of AHFVMs is poised to expand significantly. They hold the promise of not just transforming how we consume food but also shaping the future of automated services across industries. By addressing challenges and leveraging opportunities, AHFVMs can lead a revolution in the food industry, offering innovative, sustainable, and inclusive solutions for generations to come.

Suggestions and Recommendations

1. Introduce affordable leasing models for businesses.
2. Conduct awareness campaigns to familiarize consumers with vending machine benefits.
3. Develop partnerships with local food vendors for diverse options.
4. Incorporate AI-driven features to enhance user experience and operational efficiency.

Future Scope

- Expansion of vending machines to semi-urban and rural markets.
- Integration of sustainable and eco-friendly practices, such as biodegradable packaging.
- Enhanced customization through AI and machine learning.

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Association Between Knowledge Regarding Anemia And Demographic Variable Among Adolescent Girls In Saikul Sub -Division, Kangpokpi District, Manipur.

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Abstract:
The present aim of the study was to assess the knowledge about prevalence of iron deficiency anemia and find out the association between the level of knowledge with selected demographic variables among adolescent girls (age 15-18 years) from a higher secondary school of Saikul sub-division, Kangpokpi district, Manipur. Using a convenient sampling 100 adolescent girls were selected. Data were collected using self-administered questionnaire on knowledge about iron deficiency anemia and HemoCue (Hb 201) to measure hemoglobin (Hb) level. Anemia, i.e., Hb <12 g/dl was found in 69 % of the study samples. Majority of the adolescent girls had an average to poor level of knowledge. There was a significant association between demographic variable such as monthly family's income, father's and mother's occupation.

Keywords: Anemia, Adolescent Girls, Knowledge

1.Introduction

Anemia has become a significant health problem among adolescent girl and it is becoming more prevalent in developing countries like India. Iron deficiency is the major cause of anemia which is the most common nutritional problem among children and adolescent. According to the World Health Organization (WHO), adolescent age is defined as a period between the ages of 10 and 19[1]. During adolescence period there is major growth spurt, beginning of menstruation, hormonal and other changes in physical body. The body need of iron requirement increase in two -to-three folds during adolescence and there is need of good diet intake for the body if not it led to iron deficiency anemia among the adolescent girls and during this period, they are more vulnerable to anemia. Deficiency of iron in adolescents experience weakness and fatigue, headache, shortness of breath and effect the impair cellular response and immune functions and increase susceptibility to infection.
Nutritional anemia during adolescence has an irreversible negative effect on growth and cognitive, work performance and serious impact throughout the reproductive years of life and beyond [2].

Nutritional anemia is a major public health problem in India and is primarily due to iron deficiency. In India, iron deficiency anemia constitutes more than 10 million cases per year [3]. In India, about 60- 90% of adolescent suffer from anemia [4]. According to global nutrition survey,2016 India ranks 170 out of 180 countries for anemia among women. In latest, NFHS -5 report by ministry of health and family welfare, government of India, the prevalence of anemia as 57% which show an alarming rise in anemia. In Manipur according to NFHS-5 data, the adolescent girls who are anemic is 27.9% and result shown an increase rise of anemic from NFHS-4 (21.1%). So, there was a still an increase rise of anemic cases despite the numerous programmed initiated by the government of India. The prevalence of anemia among women and adolescent girls is alarming. Nowadays, adolescent girls are more worried about their looks and more influence by maintaining their physique a slim, social media influence most of them to eat outside food which are not healthy for their body which can reduce the intake of dietary iron rich food and lack of knowledge about healthy lifestyles can affect their overall health status. Imparting knowledge about anemia, important of dietary intake of iron rich foods and others necessary healthy lifestyles resources can be use to improve health and adopt healthy habits to avoid many health, decrease the risk of anemia and nutritional problems later in life.

2. Materials And Method

A cross-sectional descriptive survey was used to conduct for this study at school of Saikul, subdivision, Kangpokpi district, Manipur. The school going adolescent girls aged 15 to 18 years was selected, using a convenient sampling technique, 100 adolescent girls were selected who are willing to participates and who had no history of major health illness and those who are not under medications. Ethical clearance was obtained from the institution ethics committee. Formal permission was taken from the school authorities to conduct the study. A semi-structured questionnaire was used to collect information about their sociodemographic characteristics, and related question about anemia causes, symptom and prevention. All the girls aged 15 to 18 years who gave their consent for hemoglobin estimation were included and hemoglobin estimation was performed using Hemo Cue (Hb 201). The data collected was analyzed by using descriptive and inferential statistics.

3. Results

3.1. Sociodemographic Characteristics of Study Participants.

From the study of total 100 adolescent girls the data given on Table2, majority of the (56%) girls were in the age group of 17-18 years and 44 % in the age group of 15-16years. All of the girls (100%) were Christian by religion, they belong to Scheduled tribe (ST) category and are all unmarried. Majority (68%) belong to nuclear family. Most of them have a family member (48%) more than six people living in their family. In term of their parents' education, majority of their father (34%) have completed their high school, (28%) of their mother have finished higher secondary education. Majority of their father (72%) and mother (82%) had a other type of occupation. The majority (66%) of the participants parents' monthly income is Rs 1000030000/month.

3.2 Prevalence of Iron Deficiency Anemia Among Adolescent Girls

From the table 1, the hemoglobin level of the study participants is shown, where (42%) of the adolescent girls have a moderate anemia, (14%) mild anemia, (13%) severe anemia and about (13%) have no anemia. Classification base on (WHO),2011

Table 1: Prevalence of Iron Deficiency Anemia Among Adolescent Girls (N=100)

Hemoglobin level (g/dl)	category	frequency	Percentage
< 8g/dl	Severe anemia	13	13%
8-10.9g/dl	Moderate anemia	42	42%
11-11.9g/dl	Mild anemia	14	14%
>12g/dl	No anemia	13	13%

3.3 Knowledge Level Related to Anemia and its Prevalence among Adolescent Girls

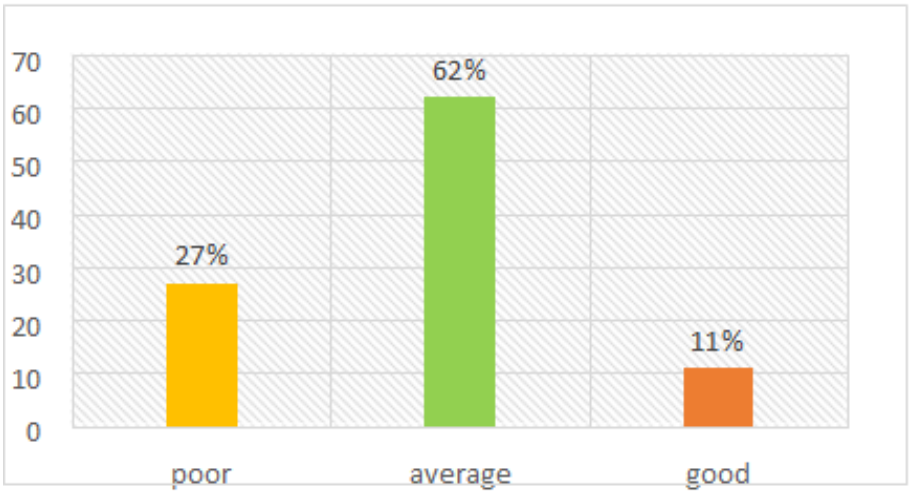

Fig. 1: Level of Knowledge Related to Anemia among Adolescent Girls (N=100)

From figure 1 majority (62%) of the adolescent girls have an average level of knowledge, (27%) of them have a poor while (11%) of the subjects have a good level of knowledge.

3.4 The association between knowledge level and sociodemographic characteristic of the adolescent girls

Table 2: Association of sociodemographic factors and knowledge level in adolescent girls (N=100)

Variables	Categories	Frequency	Percentage	**χ2 value**	P value
Age	15-16	44	44%	.017	.992
	17-18	56	56%		
Religion	Christian	100	100%		
Community	ST	100	100%		
Maritial status	unmarried	100	100%		
Family type	nuclear	68	68%	.171	.918
	joint	32	32%		
Family size (number of member)	4	10	10%	6.585	.159
	5	42	42%		
	>6	48	48%		
Father Education	illiterate	7	7%	14.268	.161
	Primary	14	14%		
	High school	34	34%		
	Higher secondary	17	17%		
	Graduate	24	24%		
	Post graduate	4	4%		
Father Occupation	Govt employee	17	17%	24.361	**.000***
	Business	7	7%		
	Other	76	76%		
Mother education	illiterate	13	13%	10.277	.417
	Primary	16	16%		
	High school	27	27%		
	Higher secondary	28	28%		
	Graduate	11	11%		
	Post graduate	5	5%		
Mother Occupation	Govt employee	8	8%	14.967	**.021***
	Business	9	9%		
	Other	83	83%		
Family Monthly income	10000-30000	66	66%	14.789	**.005***
	40000-60000	23	23%		
	>60000	11	11%		

Significant value p<0.05*

From Table 2: To explore the association between knowledge level and sociodemographic characteristic of the adolescent girls, a series of chi-square test of independence was done. The analysis revealed a significant association between knowledge level and monthly family income, father and mother occupation where the significant level is than the value (P<0.05). however, there was no association between the knowledge level and their age, family type, father and mother education, family size.

4. Discussion

4.1 Prevalence of anemia

In developing countries like India, there is very prevalent of anemia among the adolescent girls they are also vulnerable to nutritional problem related to iron deficiency. So adequate knowledge about the problems can help themselves to promote a good practice which can help them in prevention

of iron deficiency anemia. The aim and purpose of this study was to assess their hemoglobin level and their knowledge level about anemia and to find out the association between the knowledge level and their sociodemographic character.

In the present study, we found out that the prevalence of anemia was about 69%, with (42%) of the adolescent girls have a moderate anemia, (14%) mild anemia, (13%) severe anemia. The result was also similar with Ahwal S. [6] in the study Prevalence of Anemia among Adolescent Girls was 70%. Verma K *et al.* [7] also found that the total prevalence of anemia among adolescent girls was 56.32%, with 51.70% having mild anemia, 39.49% having moderate anemia, and 8.81% having severe anemia. Similarly, Bodat *et al.* [8] observed that the overall prevalence of anemia among school-going adolescent girls in a rural area of Pune, Maharashtra was 87.60%, with 47.06%, 52.48%, and 0.46% of the girls having mild, moderate, and severe anemia, respectively. The study result with previous researches done among the adolescent girls are congruent or equivalent that the prevalence of anemia was high. In the study done NFHS-5 women of reproductive age the prevalence of anemia is 57% in India by Let *et.al* [9].

4.2 The association between knowledge level and sociodemographic characteristic

In term of the level knowledge, majority (62%) have an average level of knowledge, (27%) of them have a poor while (11%) of the subjects have a good level of knowledge. By Priyanka P et.al.[10], it shows only one forth (25%) subjects were having good knowledge about anemia and 36% were having fair knowledge and rest of them were having poor knowledge about anemia. Ahwal S. [6] 64% of the subjects had an average level, 36% had good knowledge while none of the adolescent have a poor knowledge about anemia. Similarly Dr Smitha Rani *et.al*[3] in her study3.3% of adolescent girls have a good knowledge, 80% have average knowledge and 16.7% have poor knowledge regarding Iron deficiency anemia which is quite related to the present study.

The assessment between their knowledge level and the demographic variables such as age, religion, community, parent's education (both father's and mother's), parent's occupation both father's and mother's, type of family, family size , monthly income was tested (chi-square test). The study did not show any significant association between the knowledge score and the selected demographic variables (age, religion, community, parent's education (both father's and mother's), type of family, family size ($p>0.05$) the result show similarly a study done by Johnson *et.al*.[11] and parent's education (both father's and mother's) was also not significant with level of knowledge from a study done by Aras Utami et.al.[12].

The demographic variable of father 's and mother's occupation in the present study was found to be statistically significant with p values less then (0.05). Mitkari k.*et.al*[13] in the study " Anemia in school-going adolescent girls of age between 11 and 16 years in rural area – A cross-sectional study", also found a significant between the knowledge level and the demographic variable.

Monthly income was also associated with their knowledge level with p value less then (0.05) a similar result was also found out to the study done by Azneen Habib *et.al*.[14]. Dr sandhya Rani Mohanty [15] in her study it was also found a significant association between the family income and the level of gain in KAP.

Limitations

The Sample size was small it can be done with larger sample. The assess of hemoglobin was done no other parameter was used for other related blood analysis. Despites some limitation it shows an open window for other test which can be related to the anemia status or other for assessing the health status of the adolescent girls.

Conclusion

The study concluded an anemia as a prevalence among the adolescent girl as the prevalence was 69% which is more than half of the study participants. The average level of knowledge of 62% show it needed to give more importance about nutrition in adolescents to improve the knowledge about anemia. A good nutrition education, adequate iron and folic acid supplements, deworming and other necessary action should be taken to lessen the burden of anemia among adolescent girls. Prevention of anemia should be adopted with high priority strengthened by government both at regional and local level.

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Cyberstalking: Motivations and Impacts on Women

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Abstract:

Cyberstalking, a form of online harassment, has become an increasingly pervasive issue affecting women worldwide. This phenomenon is characterized by the persistent, targeted use of digital platforms to stalk, intimidate, or harass an individual, often manifesting in threats, false accusations, or constant surveillance. The motivations behind cyberstalking are complex, ranging from a desire for control and power, obsession, revenge, or even a distorted form of attraction. Perpetrators may use social media, emails, or other online platforms to initiate and sustain these harmful behaviours.

For women, the impacts of cyberstalking are far-reaching, encompassing emotional, psychological, and sometimes physical harm. Victims often experience anxiety, depression, and a sense of vulnerability, as well as a loss of personal autonomy. The societal underreporting of these incidents, combined with legal and technological challenges, often leaves women feeling isolated and without adequate recourse. This abstract explores the diverse motivations behind cyberstalking, its effects on the mental and physical well-being of women, and the societal, legal, and technological hurdles that impede effective intervention and support. Understanding these dynamics is crucial for creating preventative measures and support systems that protect women from online harm.

Keywords: Online harassment, stalked, societal hurdles, digital spaces, spyware, Blackmail, Obsession etc.

Introduction

Cyberstalking is a growing form of online harassment that specifically targets individuals, most often women, through digital platforms. It involves the use of technology to stalk, harass, or intimidate someone, and it can have profound psychological, social, and sometimes physical impacts on the victim. As digital spaces evolve, the emergence of cyberstalking highlights new risks and challenges to women's safety[1]. This article explores the motivations behind cyberstalking, the specific ways it affects women, and the lasting impacts on their mental health and well-being.

Understanding Cyberstalking

Cyberstalking is defined as the use of the internet, email, or other electronic communications to harass or stalk an individual. Unlike traditional forms of stalking, which involve physical presence and surveillance, cyberstalking can occur remotely and often anonymously, creating a sense of security for the stalker while posing significant challenges for the victim. Cyberstalks may use multiple platforms such as social media, email, blogs, and instant messaging to monitor, harass, or communicate threatening messages to their victims.

Why should we be concerned?

Cyber stalking can not only be disturbing and stressful but it can also put you in danger of being attacked by the stalker either online or offline.

Few pointers / warning signs of cyber stalking

- frequent and multiple messages over a period of time
- Posts with inappropriate content and has details of your where abouts or personal aspects.
- Sending repeated emails
- Constantly follow you over your social media accounts.

How a cyberstalked may harm women?

- They may impersonate your online identity in order to harm your reputation or relationships with your friends/family/colleagues etc.
- They may access your social media account and can learn your online activities, your personal information and also can change your password.
- They may track your location by using GPS or some spyware.
- They may use abusive language while commenting on your post/photos on social media.
- They may try to gather your personal and sensitive information by interacting with your family/friends/colleagues etc.
- They may blackmail you to share your personal photos, videos etc which will very embarrassing to you.

[1] United States: *People v. Morally* (2011)

Nowadays cyberstalking is becoming a big topic of risk for woman. It can become dangerous and can develop into physical abuse[2]. Don't wait to report cyberstalking. The longer cyberstalking goes on, the more problem you will face emotionally, mentally or physically.

The fact is that cyberstalking doesn't involve physical contact doesn't mean it is any less dangerous than "real life" stalking. It's not difficult for an experienced Internet user(cyberstalked) to find enough of your personal information, such as phone number or your friends, relatives, your working place etc to stalk you.

How you know that you are a victim of cyberstalking?

When you feel some anonymous activities like –

- Someone visiting your profile maximum time in a day or a week
- Someone comments on your post or photos in a bad way or use abusive words.
- Someone asks about your personal and sensitive information on social media
- Someone asks photos and videos of yours

If you feel these types of activities, don't ignore and immediately take action with respect to it.

Cyberstalking is difficult to defeat because the stalker could be in another state or sitting three cubicles away from the victim. In the anonymous world of the Internet, it is difficult to verify a stalker's identity, collect the necessary evidence for an arrest and then trace the cyberstalked to a physical location, so it is always preferable to be secure and use the online resources very effectively without ignoring the security issues.

How can you safeguard yourself against cyber stalking?

- While using any social media it will always be better to restrict the privacy setting within your family & known friends.
- Before accepting any friend request always check the authenticity of the person on social media.
- Always disable your GPS from your device if you are not using it, so the stalker cannot get your location.
- If your online friend can ask your personal information or demand for any photos/videos never share with them.
- Always be alert what your online friends are commenting on your photos or any activities, if you feel that the comments are anonymous immediately block them.
- If anyone of your social media friend misbehave with you or do some anonymous activity report them through social media setting or block, they, if after that also they will try to follow you don't do delay for complaining about them in police.

What you should avoid to be safe from cyberstalking?

- Don't trust any online friends on social media.
- Don't share your personal information/photos/videos publicly on social media.
- Don't share your location while posting your activities online.
- Don't ignore the anonymous behaviour of your online friends.
- Don't delay to do complain if you feel that cyber stalking or any anonymous activities are happening with you, because it is not your fault.

What action can we take up in case we find affected by the offence?

- Register a complaint at your nearest cybercrime police station
- You also have the option to register an online complaint on cybercrime.gov.in

Know about what the Law Says with regard to this offence?

As per Law Cyber Stalking is a punishable offence and attracts section 354 (D), 509 IPC, and section 67 under I.T. Amendment Act 2008.

Information Technology Act, 2000 (amended in 2008) - When a person publishes or sends salacious material via electronic media is to be charged under Section 67 of the Act.

Data protection is very important to prevent cyberstalking which is easily leaked by hackers. For data protection, IT Amendment Act, Section 43A has been included the provision for the inclusion of a Body Corporate. If a firm or a company transmits sensitive information about a person, according to the act such body corporate will be liable to pay the damages by compensation.

Under Section 67 of the Act, when a stalker sends or posts any obscene content to the victim via electronic media then they will be liable to punish with 5 years of jail and Rs. 1 Lacs fine. If the incidence repeats then they will be liable to punish with 10 years of jail and Rs. 2 Lacs fine.

As per the provision provided in the law, when a stalker misuses victim's personal information to post an obscene message or comment on any electronic media, then this action is punishable for defaming and harming a person's reputation with imprisonment of 2 years, fine or both.

Indian Penal Code S.354D- According to the act, Stalking is an offence under Section 354D of the IPC (Indian Penal Code).

When a man is trying to communicate with a woman without her interest over the internet via email, instant messages or any other electronic communication is the offence of stalking.

According to NCRB, in the year 2020, a total of 50,035 cases of cybercrime were reported in India,

[2] United Kingdom: *R v. Cuthbert* (2017)

out of which 1614 cases of cyberstalking, 762 cases of cyber blackmailing, 84 cases of defamation, 247 cases of fake profiles, and 838 cases of fake news were investigated.

1. **The Shilpa Shetty case**: In 2014, Bollywood actress Shilpa Shetty filed a complaint against an unknown person who was relentlessly cyberstalking her. The person created a fake Twitter account in her name and posted derogatory and defamatory content. The Mumbai Police Cyber Cell investigated the case, and the accused was later arrested.
2. **The Varnika Kundu case: In 2017**, Varnika Kundu, a DJ in Chandigarh, was stalked by Vikas Barala, the son of a prominent politician. The incident gained significant media attention and sparked a national debate on women's safety. The accused was charged with multiple offenses, including stalking and attempted abduction.
3. **The Nirbhaya case**: While the Nirbhaya case primarily involved a brutal gang rape in 2012, it also highlighted the issue of cyberstalking. The perpetrators, before the incident, stalked and harassed the victim through phone calls and text messages. This case led to widespread outrage and resulted in significant legal reforms related to crimes against women.
4. **The Malvika Joshi case: In 2016**, a 21-year-old student named Malvika Joshi filed a complaint against a man who had been stalking her online for months. The accused, who claimed to be a software engineer, created multiple fake profiles on social media platforms and sent explicit and threatening messages to Malvika. The case shed light on the issue of cyberstalking and the need for stricter laws to combat such crimes.

Motivations Behind Cyberstalking

There are various reasons why individuals resort to cyberstalking, and these motivations can range from personal grievances to deeper psychological issues.

1. Obsession or Infatuation

A common motivator behind cyberstalking is obsessive infatuation. In many cases, stalkers have an intense, romantic obsession with the victim, which may have begun through a brief interaction or even online dating. These stalkers believe that they have an emotional connection with the victim, often disregarding any boundaries the victim tries to set. They use the internet to gather information and pursue the victim, seeking attention or validation through repeated contact.

For example, a person may repeatedly send emails, text messages, or social media posts, hoping to form a relationship or rekindle a past one. The victim may feel helpless and trapped by the stalker's persistent presence in their digital life.

2. Revenge and Power

Revenge is another significant motivator for cyberstalking[3], particularly in cases where the stalker feels slighted or rejected by the victim. It is common for cyberstalks to target former partners, ex-spouses, or people they believe have wronged them. Revenge-driven cyberstalks often seek to damage the victim's reputation, isolate them from their social circles, or cause emotional distress.

In such cases, the stalker may employ tactics like spreading false rumours, posting intimate pictures without consent (commonly referred to as revenge porn), or constantly sending threatening or degrading messages. These actions are meant to assert control and reassert power over the victim.

3. Control and Dominance

Some cyberstalks seek control over their victims, using harassment as a means to manipulate or dominate. This is particularly true in cases of intimate partner violence where technology becomes an extension of the physical abuse. The stalker may monitor the victim's online activities, track their location through geotagging, or access private accounts to maintain control over their actions and limit their social interactions.

Control-driven cyberstalks may also use threats of violence or public humiliation to force the victim into submission. This type of stalking is often linked to broader patterns of abusive behaviour and is designed to break the victim's will.

4. Psychological or Psychiatric Disorders

Mental health issues such as narcissism, borderline personality disorder, and obsessive-compulsive disorder can contribute to stalking behaviours. Stalkers may have a distorted sense of reality, believing that their obsessive actions are justified or even romantic. They may also experience delusions about their connection to the victim, often escalating their behaviour in response to perceived slights or imagined scenarios.

Psychologically driven cyberstalks may become fixated on a victim for long periods, leading to an escalating cycle of harassment. Understanding the psychological profile of a stalker is crucial for law enforcement and mental health professionals when trying to intervene.

The Impact of Cyberstalking on Women

While cyberstalking affects both men and women, studies consistently show that women are disproportionately targeted. The impacts on women can be wide-ranging, affecting their mental health, physical safety, and social lives. Understanding these effects is crucial for addressing and preventing cyberstalking.

1. Psychological Effects

One of the most severe consequences of cyberstalking is the psychological toll it takes on the

[3] India: *State v. Shubham* (2020)

victim. The constant barrage of messages, threats, and invasive behaviour can cause anxiety, depression, and post-traumatic stress disorder (PTSD). Victims may develop feelings of helplessness, isolation, and fear, which can significantly affect their overall well-being.

Women who experience cyberstalking often report difficulty concentrating, sleeping disorders, and a sense of constant vigilance. In some extreme cases, victims may experience panic attacks or suicidal thoughts due to the overwhelming nature of the harassment. The psychological impact can last long after the stalking has stopped, leaving women with lasting emotional scars.

2. Social Isolation

Cyberstalking can lead to severe social isolation for women. The emotional distress caused by the harassment can make victims withdraw from their social circles, family, and friends. In some cases, women may even change their online identities or limit their internet usage to avoid being targeted. The fear of being stalked may deter women from participating in online communities or engaging with others on social media platforms.

In addition, cyberstalks often isolate their victims by interfering with their social networks. For instance, stalkers may attempt to ruin the victim's reputation by spreading false rumours, leading to strained relationships with family, friends, and colleagues. The isolation from support systems can exacerbate the psychological harm caused by the stalking[4].

3. Physical Safety Concerns

Although cyberstalking is primarily an online crime, it can have real-world consequences for the victim's physical safety. In many cases, the stalker's behaviour escalates to physical stalking or violence, particularly if the perpetrator believes that they are entitled to the victim's time and attention.

Cyberstalks often use information gleaned from social media or other online platforms to track the victim's movements, making them feel unsafe even in their own home. The risk of physical harm is particularly concerning for women who may already face gender-based violence in their daily lives. The persistent threat of violence is a significant aspect of the trauma caused by cyberstalking.

4. Legal and Financial Consequences

Women who are victims of cyberstalking often face challenges when trying to seek justice. The anonymity of the internet makes it difficult to identify the perpetrator, and many women reports feeling that law enforcement does not take the crime seriously. The absence of specific cyberstalking laws in some regions further complicates legal recourse, leaving women without proper protection.

Additionally, cyberstalking can have financial repercussions for victims. Stalkers may engage in identity theft, hack personal accounts, or engage in financial fraud. The victim may be forced to invest significant time and money in repairing their credit, recovering stolen funds, or securing their digital presence. Legal fees, therapy costs, and the overall financial strain caused by the stalking can be a heavy burden for women who are already dealing with the emotional and psychological impact.

Addressing Cyberstalking: Prevention and Solutions

Efforts to combat cyberstalking must be multifaceted, involving legal, psychological, and technological interventions. Laws addressing cyberstalking need to be strengthened, with clear definitions and penalties for offenders. In addition, women must be educated on online safety and how to protect their digital identities.

Support services, including counselling and legal aid, should be made available to help victims of cyberstalking regain control over their lives. Platforms like social media sites should take responsibility for their role in protecting users from harassment by enforcing stricter policies on cyberstalking and harassment. Technology solutions, such as identity protection and security software, can also help victims protect themselves from further harm[5].

Conclusion

Cyberstalking is a deeply troubling form of harassment that disproportionately affects women, causing severe psychological, social, and physical harm. The motivations behind cyberstalking range from infatuation to revenge and power, with many perpetrators seeking control, dominance, or validation. The impact on victims is far-reaching, often leaving them with emotional scars, social isolation, and ongoing security concerns. As technology continues to evolve, it is crucial for society to recognize the dangers of cyberstalking and take meaningful steps to protect women from these digital threats. Prevention, legal reform, and support systems must work in tandem to ensure women's safety in the online world.

Cyberstalking is to stalk or repeatedly harass another person by using technologies. It involves electronic media like e-mail, sending offensive material to stalk or harass a person or group of people. It can include many things including threats, defamation, identity theft, solicitation for sex, false accusations etc. A cyber stalker may be someone the victim is familiar with, or a complete stranger, and is a criminal offense.

[4] Canada: *R v. Jardine* (2013)

[5] South Africa: *S v. Cilliers* (2020)

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Development of a nutritious snack bar using indigenous ingredients and analyzing the nutrient content

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Abstract:
The snack-bar is a healthy alternative to other snack foods, it is developed by the addition of different ingredients such ad red flakes puff (Oryza sativa), pumpkin seeds (Cucurbita maxima, dried sohiong(Prunus nepalensis) , ragi flour (Eleusine coracana) and jaggery. The snack bar was analyzed for nutrition quality as well as for sensory analysis among 8 panelists. This snack bar becomes a valuable source of energy, calcium and iron. The snack bars were analyzed for calcium which was found to be 424mg, iron was found to be 31mg, protein was found to be 1 % and fat was found to be 8.6 %. Among the sensory attributes the snack bar scored an overall acceptance of 6.88. With the growing concern for healthy food consumption and adopting a healthy lifestyle formulation of snacks rich in nutrients is important to cater to the nutrition gap.

Key words: Snack-bar.

Introduction

Snacking which means eating foods apart from the three main meals has become a part of the dietary pattern among individuals of all the stages of life and based on the type of snacking pattern, this has an effect on the health (A. M. Noha, 2021). A snack is defined any food that is consumed between the regular main meals without substituting for a meal, provides high energy and low nutrients compared to the main meals, without considering the form or quantity of the food consumed (Nuru and Mamang, 2015). Analysis of the current trend of the dietary intake shows a significant increase in the consumption of energy dense, foods poor in nutrients among adolescents and young adults in the form of snacking (S. Mary *et al*, 2013). On a study done by Krishna R Jogi and Dr. Rekha Battalwar, 2021, approximately 50% of people who skipped breakfast are more likely to indulge themselves in snacking. People have a natural liking towards food that are sweet in taste and therefore these sweeteners are added to food ingredients such as fruits, vegetables, cereals and even pulses which can have a harmful effect (J. N Turner, 2003). One of the commonly used sweeteners added to food is sucrose or table sugar where excessive consumption of it has been associated with the development of obesity, metabolic disorders, diabetes, cardiovascular diseases, cancer, depression and cognitive degeneration. The market is loaded with snacks that are high in sugar, salt and saturated fats which makes these snacks addictive to consume and in turn have adverse health effects. It is important to distinguish snacks that are healthy that add to a healthy lifestyle and snacks that and snacks that are not contributing towards healthy life. Snacks that are high in energy and poor in nutrients are known to supply the body with empty calories and are labelled as unhealthy (Larson N, 2012). Due to the emerging concerns about health-related problems arising from consumption of food that are highly processed and lacking in nutrients, consumers are now placing more concern on consuming a diet that is nutritious. Leading a healthy, active lifestyle and being fit encourages the consumer to put more emphasis on foods that support the well-being and fitness (Kosicka-Gębska *et al.* 2022; Sharma *et al.* 2021). There has been an increased need for the intake of nutrients, this is true in case of sports persons, persons working in space and during physiological changes of the body like during pregnancy. Adolescence, lactation, disease conditions and also during period of convalescence. Inadequate intake during these conditions will lead to various deficiency disorders such as protein and energy disorders like marasmus and kwashiorkor in children, anaemia, night blindness, osteoporosis, goitre and other micronutrient deficiencies in vast majority of populations particularly in women, adolescent girls, adulthood, elderly and children. Hence the need for development of a nutritious energy bar which rich in macro nutrients as well as micronutrient plays an important role. With the advancing technologies available, a nutritious bar

which is cost effective, light and convenient can be developed to cater to the need. A snack bar can fill in the nutritional gap in case of a hectic work schedule (S Damini & S Gargi, 2018)

Methodology

Raw materials:

The raw ingredients that were used for the development of the nutritious snack bar are purchased from the local market of Shillong City, these are red rice flakes, pumpkin seeds, ragi flour, sohiong fruit and jaggery.

Preparation Of The Snack Bar

The snack bar was prepared in 3 different variations and the weight for each ingredient used in the variation is depicted in table no 1. The jaggery was weighed, in a pan the jaggery was cooked with little amount of water and was stirred thoroughly with continuous monitoring the different stages of sugar crystallisation. The desired stage was the hard ball stage at a temperature of 113-degree celsius. In a separate bowl, the other ingredients such as the red rice flake, pumpkin seed, dried sohiong and ragi flour were weight and mixed together. Upon reaching the hard ball stage the mixture of ingredients was poured into the jaggery and mixed thoroughly and transferred immediately to a cupcake baking tray to maintain the shape.

Nutrient Analysis Of The Snack Bar:

The nutrients of concern in the snack bar are protein, fat, calcium, iron and moisture. Moisture content was measured by oven method, protein content was measured by Kjeldahl method, fat content was measured by Soxhlet extraction method, calcium content was measured by titration method, and iron content was measured by thiocyanate colorimeter. The nutrient content of the most acceptable snack bar was conducted.

Sensory Analysis:

A 9 Point Hedonic scale was used for evaluating the sensory attributes such as appearance, taste, texture, colour and aroma of the snack bar. An overall acceptance of the product was taken for the study. A panel member of 8 members was carefully chosen for analysis the sensory attributes. A control was also given to the panellists along with the 3 variations of snack-bar.

Data Analysis:

Data analysis was performed by using the application SPSS (IBM SPSS 2.0), the means of the different parameters were examined for significance by one -way ANOVA.

Results

Preparation Of The Product

The following table (Table 1) represents the amount of the ingredients used in formulating the snack bar along with the different variations in which it was developed.

Table 1: Ingredient specifications of the 3 different snack bar variations

Ingredients	1st Variation	2nd Variation	3rd variation
Ragi (*Eleusine coracana)*	50gms	20 gms	10gms
Puffed Brown rice*(Oryza sativa*)	50gms	100gms	150gms
Pumpkin seed (*Cucurbita maxima)*	20gm	20gm	20gm
Sohiong (*Prunus Nepalensis*)	20gms	35gms	45gms
Jaggery	30gms	80gms	100gms

Sensory Evaluation Of The Product

Panelists perception of appearance, taste, texture, colour and aroma in all samples have no statistically significant differences ($p > 0.05$).

The high temperature that was applied for cooking the product produced characteristics such as caramelisation as well as maillard reaction, giving the product a brown colour. From the table below, variation 2 (V2) attained the higher score in the attributes of appearance a mean of 6.88, taste a mean of 6.88, texture a mean of 7, colour a mean of 6.38, aroma a mean of 7 and an overall acceptability mean of 7.38, which is higher than the other two variations. The following table represents mean values of the sensory attributes of all the 3 variations of samples.

Table 2: Mean values of the sensory attributes of the 3 variation of snack bars

	V3	8	5.88
	Total	24	6.42
TEXTURE OF THE PRODUCT	V1	8	6.13
	V2	8	7
	V3	8	5.5
	Total	24	6.21
COLOUR OF THE PRODUCT	V1	8	6.63
	V2	8	6.38
	V3	8	5.63
	Total	24	6.21
AROMA OF THEPRODUCT	V1	8	6.25
	V2	8	7
	V3	8	5.5
	Total	24	6.25
OVERALL ACCEPTABILITY OF THE PRODUCT	V1	8	6.5
	V2	8	7.38
	V3	8	5.5
	Total	24	6.46

Nutrient Analysis:

The snack-bar which was most acceptable was taken for nutrient analysis. The nutrients of concern in this snack bar are protein, fats, iron and calcium. Moisture of the product was also analysis because of its importance relating to the shelf life of the product. Snacks consumption constitutes only half of the ¼ of the total daily food consumption. This is the reason snacking is not considered as the main meal but rather a small portion from the days diet. For a child of 5-6 years of age, the daily requirement of protein is 13g, fat requirement is 25g, calcium requirement is 550 mg and iron is 8mg. From the table below we can see that 100gms of the snack bar can contribute 1gm of protein, 8.6 gms of fat, 31mg of iron and 424 mg of calcium. The amount of fat is seen to be more, this is due to the frying method used for puffing the red rice flakes

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Nutrient	Result (per 100gms)
Protein	1g
Fat	8.6
Iron	31mg
Calcium	424mg
Moisture	6%

Table 3: Nutrient analysis of the snack-bar

Discussion:

The sensory analysis shows that variation 2 has a higher mean value which makes it the most acceptable from the 3 variations. From the results above, we can say that the product can contribute a considerable amount of nutrients such as protein, iron and calcium when consumed as a snack. Whereas, the content of fat is considered to be high as it contributes 8.6 gms, however the daily requirement of fat per day is 20gms. The daily nutrient requirements for a child of 5-6 years of age is 13gms protein, 20gms fat, 550 mg of calcium and 8mg of iron. Consumption of 100 gms of the product can contribute to the daily requirement of protein, fats, calcium and iron. In contrast to adults, the daily requirement of an adult is 36 gms protein, 25 gms of fat, 1000 mg of calcium and 11mg of iron, which shows that an adult has to consume more of the product to reach the daily requirement from the snack bar to contribute to ¼ of the daily consumption. Therefore, modifications have to be made in the contents of the snack bar in order to cater to a wider range of age groups.

Conclusion:

A product which is intended to contribute to the health of an individual should provide at least one fourth amount of the nutritional requirements for that particular age group. In an article by Economic times, India goes maida free: it talks about how it is a major concern for mothers who are providers of nutritious food for their children. Now mothers are more concerned with obtaining snacks which are healthy. A brand named as Better for you (BFY) are using this trend for their capitalisation by offering products that are healthful. A report given by NielsonIQ on its report know as 'Snacking habits: from mindless to mindful' says that India ranks 2nd after Mayanmar in the rate of growth in their snacking pattern. Which we can clearly see that snacking has become a habit on all age groups, it has become a break time luxury to indulge oneself in the variety of snacks that are available in the market. People are more aware and well educated about the unhealthy eating lifestyles that can lead to obesity and degenerative diseases such as diabetes and cardiovascular diseases and are looking for

healthier options this is where granola bars or snack bars come into the picture and can replace unhealthy snacking and cut down the consumption of junk food.

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Reforming Criminal Justice: Examining the Efficacy of Restorative Justice Practices

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Abstract:
Restorative justice (RJ) has emerged as a significant alternative to traditional punitive justice systems, focusing on rehabilitation, reconciliation, and community engagement. This study critically examines the efficacy of restorative justice practices in criminal justice reform by analyzing their impact on victim satisfaction, offender accountability, and recidivism rates. Through qualitative and quantitative research methodologies, the study explores various global and Indian case studies to assess the effectiveness and challenges of RJ implementation. The findings suggest that RJ can significantly enhance justice outcomes but also highlight practical constraints in its widespread adoption.

Keywords: Restorative Justice, Criminal Justice Reform, Rehabilitation, Recidivism, Offender Accountability, Victim Satisfaction, Restorative Practices, Alternative Justice Systems

Introduction:

Criminal justice systems worldwide primarily focus on punitive measures that often fail to rehabilitate offenders or address the needs of victims. Restorative justice presents an alternative approach that emphasizes healing, reconciliation, and community involvement. This study investigates the role of RJ in criminal justice reform, its historical development, theoretical foundations, and contemporary applications. The criminal justice system has traditionally been structured around punitive measures, emphasizing retribution and deterrence as primary methods of addressing crime. However, in recent decades, there has been a growing recognition of the limitations of this approach, particularly in terms of reducing recidivism, rehabilitating offenders, and addressing the needs of victims. Restorative justice has emerged as an alternative framework that seeks to shift the focus from punishment to healing, accountability, and reconciliation. This study examines the efficacy of restorative justice practices within the broader context of criminal justice reform, assessing their impact on victims, offenders, and communities.

Understanding Restorative Justice

Restorative justice is a victim-centered approach that aims to repair harm caused by criminal behavior through inclusive dialogue, mutual agreement, and community involvement. Unlike conventional punitive justice systems, which prioritize incarceration and legal sanctions, restorative justice emphasizes healing, restitution, and reintegration. The approach is based on principles of accountability, amends-making, and community participation, ensuring that justice is not only served but also perceived as fair and meaningful by all stakeholders.

The concept of restorative justice is not new; its roots can be traced back to indigenous and traditional forms of conflict resolution that existed long before modern legal systems. In societies such as the Maori in New Zealand, Native American tribes, and South African communities, conflict resolution relied heavily on mediation, reconciliation, and collective decision-making. These historical precedents highlight the universality and sustainability of restorative justice mechanisms.

The Rationale for Criminal Justice Reform

The global criminal justice landscape has been characterized by several pressing challenges, including overcrowded prisons, high recidivism rates, systemic inequalities, and a lack of victim-centered approaches. In many countries, the reliance on punitive justice has contributed to cycles of crime, disproportionately affecting marginalized communities and failing to address the root causes of criminal behavior. Critics argue that the conventional justice system often neglects victims' needs and offers little opportunity for meaningful offender rehabilitation.

The demand for criminal justice reform has been driven by various social movements, legal scholars, policymakers, and human rights organizations advocating for a more balanced and humane approach. Restorative justice has gained momentum as a viable alternative, providing a pathway for reconciliation while maintaining public safety and upholding the principles of justice. By fostering direct dialogue between victims and offenders, restorative justice programs have demonstrated potential in reducing recidivism, strengthening community cohesion, and promoting emotional and psychological healing for all parties involved.

Key Components of Restorative Justice

Restorative justice practices take various forms, ranging from victim-offender mediation to community conferencing and circle sentencing. Some of the most widely implemented restorative justice models include:

1. Victim-Offender Mediation (VOM) – A structured dialogue facilitated by trained mediators, allowing victims to express their experiences and offenders to take responsibility for their actions.
2. Family Group Conferencing (FGC) – A community-driven approach involving victims, offenders, family members, and other stakeholders in a collaborative resolution process.
3. Restorative Circles and Conferencing – Meetings that encourage open discussions about the impact of crime and explore solutions that benefit both victims and offenders.
4. Restorative Justice in Schools and Juvenile Justice – Programs designed to address youth delinquency by fostering accountability and personal growth rather than imposing punitive measures.

Each of these models has been implemented in different legal and cultural contexts, yielding valuable insights into the effectiveness of restorative justice in achieving sustainable justice outcomes.

Challenges and Criticisms of Restorative Justice

Despite its many advantages, restorative justice faces several challenges. One of the primary concerns is its applicability to serious crimes, such as violent offenses and sexual assault, where direct mediation between victims and offenders may be emotionally distressing or inappropriate. Additionally, restorative justice requires the voluntary participation of both parties, which is not always feasible in cases involving power imbalances, coercion, or unwilling offenders.

Another challenge is the potential for restorative justice to be perceived as a lenient alternative to traditional sentencing. Critics argue that without strict legal oversight, restorative justice programs may lack consistency in their implementation and fail to deliver proportionate consequences. Furthermore, integrating restorative justice within formal legal frameworks remains a complex process, requiring policy reforms, judicial cooperation, and community engagement. This study seeks to explore the effectiveness of restorative justice practices in reforming the criminal justice system.

This research contributes to the ongoing discourse on criminal justice reform by providing empirical insights into the efficacy of restorative justice. The findings will be valuable for policymakers, legal practitioners, criminologists, and community organizations seeking to develop more effective justice strategies. By highlighting both the strengths and limitations of restorative justice, this study aims to foster a more balanced and humane approach to crime prevention and resolution.

Definitions:

- Restorative Justice (RJ): A justice approach focusing on repairing harm caused by criminal behavior through cooperative processes involving all stakeholders.
- Recidivism: The tendency of convicted criminals to reoffend.
- Victim-Offender Mediation (VOM): A process that facilitates dialogue between victims and offenders to achieve resolution and reparation.
- Community Restorative Practices: Initiatives that involve community participation in offender rehabilitation and reintegration.

Need for the Study of Present Research Study

- High recidivism rates in conventional criminal justice systems.
- Growing global interest in alternative justice models.
- Need for victim-centric justice approaches.
- Challenges in integrating RJ within existing legal frameworks.

Aims and Objectives of Present Research Study

- To examine the effectiveness of restorative justice practices in reducing recidivism.
- To analyze victim and offender experiences with RJ programs.
- To evaluate challenges and limitations of RJ implementation.
- To propose strategies for integrating RJ into mainstream criminal justice systems.

Hypothesis of Present Research Study

H1: Restorative justice practices lead to lower recidivism rates compared to traditional punitive measures.

H2: Victims participating in RJ programs experience greater satisfaction than those in conventional justice processes.

Literature Search of Present Research Study

A review of scholarly articles, government reports, and case studies on restorative justice, including international and Indian perspectives. Key sources

include the United Nations Office on Drugs and Crime (UNODC), academic journals, and legal frameworks.

Research Methodology of Present Research Study

- Research Design: Qualitative and quantitative analysis.
- Data Collection: Interviews with legal experts, surveys with victims and offenders, case study analysis.
- Sampling Method: Purposive sampling of RJ programs in various jurisdictions.
- Data Analysis: Comparative statistical and thematic analysis.

Strong Points of Present Research Study

Criminal justice reform, particularly through the implementation of restorative justice, offers a transformative approach to addressing crime, punishment, and rehabilitation. Below are some of the most compelling strong points of reforming the criminal justice system through restorative justice practices:

1. Victim-Centered Approach to Justice

- Traditional justice systems often sideline victims, reducing them to mere witnesses. Restorative justice shifts the focus to victims, giving them an active role in the justice process.
- Through victim-offender mediation, victims gain a sense of closure, emotional healing, and sometimes even financial restitution for damages caused.
- Studies indicate that victims participating in restorative justice report higher levels of satisfaction compared to those engaged in conventional legal proceedings.

2. Reduction in Recidivism Rates

- One of the most significant benefits of restorative justice is its impact on reducing reoffending (recidivism).
- Traditional punitive measures like incarceration often fail to address the root causes of criminal behavior, whereas restorative justice fosters accountability and rehabilitation.
- Research suggests that offenders who undergo restorative justice programs are less likely to commit future crimes compared to those subjected to purely punitive measures.

3. Rehabilitation and Reintegration of Offenders

- Restorative justice shifts the narrative from punishment to transformation, encouraging offenders to take responsibility for their actions.
- Unlike incarceration, which often alienates and hardens criminals, restorative justice promotes personal growth, empathy, and reintegration into society.
- Programs such as community service, counseling, and offender-victim dialogues allow offenders to recognize the harm they caused and work towards self-improvement.

4. Addressing the Root Causes of Crime

- The traditional criminal justice system reacts to crime rather than preventing it. Restorative justice, on the other hand, focuses on identifying the underlying social, psychological, and economic factors that lead to criminal behavior.
- Through education, therapy, and skill development, restorative justice helps tackle issues like poverty, lack of education, substance abuse, and mental health disorders—all of which are major drivers of crime.

5. Reduction in Overcrowding of Prisons

- Many legal systems suffer from prison overcrowding, where minor offenders are incarcerated alongside hardened criminals. This not only strains government resources but also increases the likelihood of reoffending.
- Restorative justice provides alternatives to imprisonment, such as rehabilitation programs, probation, and community-based sentencing, thereby alleviating pressure on correctional facilities.
- Countries like Norway, Canada, and New Zealand have successfully integrated restorative justice programs, leading to lower incarceration rates and improved rehabilitation outcomes.

6. Cost-Effectiveness and Economic Benefits

- Incarceration is an expensive process, costing governments billions in taxpayer money annually.
- Restorative justice is a cost-effective alternative, requiring fewer resources than maintaining prisons, court proceedings, and legal battles.
- By reducing recidivism and promoting rehabilitation, restorative justice reduces the financial burden on legal systems while fostering a productive workforce instead of supporting lifelong imprisonment.

7. Strengthening Community Relationships

- Traditional justice systems often create divides between law enforcement, offenders, and the community. Restorative justice fosters collaboration and community healing.
- Community conferencing and restorative circles help rebuild trust, allowing both victims and offenders to find constructive solutions.
- Stronger community bonds contribute to lower crime rates, increased civic participation, and a sense of shared responsibility for justice.

8. Alternative to Harsh Punishments for Juveniles

- Harsh sentencing, such as juvenile detention, often has detrimental effects on young offenders, making rehabilitation more difficult.
- Restorative justice offers age-appropriate interventions that focus on education, counseling, and mentorship rather than incarceration.
- Programs in Australia, Canada, and the U.S. have demonstrated that restorative justice significantly reduces juvenile reoffending rates.

9. Ethical and Humanitarian Approach to Justice

- Restorative justice aligns with human rights principles, ensuring that both victims and offenders are treated with dignity and respect.
- It offers a fairer, more humane alternative to punitive justice, which often disproportionately affects marginalized communities.
- Countries that have implemented restorative justice practices have reported higher public trust in the legal system.

10. Global Success Stories and Legal Recognition

- South Africa's Truth and Reconciliation Commission (post-apartheid) successfully used restorative justice to heal societal wounds.
- Norway's prison system integrates restorative justice principles, boasting one of the lowest recidivism rates in the world (20%).
- The United Nations and European Union have recognized and endorsed restorative justice as an essential component of criminal justice reform.

Restorative justice is not just a theoretical ideal—it is a proven, effective, and transformative approach to criminal justice reform. It prioritizes victims, rehabilitates offenders, reduces crime, and strengthens communities, all while being more cost-effective than traditional punitive measures. As nations continue to seek humane, efficient, and sustainable justice models, restorative justice stands as a beacon of progress and innovation in legal systems worldwide.

Weak Points of Present Research Study

While restorative justice offers a promising alternative to the traditional punitive model, it is not without challenges, limitations, and weaknesses. The implementation of restorative justice within criminal justice reform raises concerns related to effectiveness, feasibility, and justice for all stakeholders involved. Below are some of the major weak points of restorative justice in the context of criminal justice reform:

1. Lack of Uniformity and Legal Framework

- Unlike traditional justice systems that have structured laws and defined penalties, restorative justice lacks a standardized legal framework, leading to inconsistencies in its application.
- Different jurisdictions apply varied approaches, which may result in unequal treatment of offenders and victims.
- The absence of clear legal mandates often makes restorative justice programs difficult to regulate and implement on a large scale.

2. Potential for Unequal Justice and Subjectivity

- Restorative justice relies heavily on mediation, dialogue, and mutual agreement, which can introduce bias and subjectivity.
- Power imbalances between victims and offenders may lead to unfair settlements where offenders receive lighter consequences.
- Victims from marginalized or economically weaker backgrounds may be pressured into accepting inadequate compensation or apologies rather than pursuing full legal justice.

3. Limited Applicability for Violent and Serious Crimes

- While restorative justice works well for minor offenses, its effectiveness in cases of violent crimes (e.g., murder, rape, terrorism, domestic abuse) is highly debated.
- Serious offenders may manipulate the system to avoid harsher punishments.
- Victims of violent crimes may feel re-traumatized when forced to confront their offenders in mediation or reconciliation sessions.

4. Risk of Re-Traumatizing Victims

- One of the most controversial aspects of restorative justice is its requirement for victims to participate in face-to-face meetings with offenders.
- This can lead to emotional distress, fear, and psychological trauma, particularly in cases involving sexual assault, domestic violence, or child abuse.
- Many victims prefer detachment from the offender rather than engaging in mediation, making restorative justice unsuitable for all cases.

5. No Guarantee of Genuine Remorse or Behavior Change

- Restorative justice depends on the offender's willingness to take responsibility and show genuine remorse.
- Some offenders may manipulate the process to appear cooperative and evade severe legal consequences.
- Without strong enforcement mechanisms, there is no certainty that offenders will fulfill their commitments (e.g., apologies, restitution, community service).

6. Incompatibility with Certain Legal Systems

- Many criminal justice systems operate on a punitive model, making it difficult to integrate restorative justice into strict, codified legal frameworks.
- Countries with retributive justice traditions may resist adopting restorative practices, seeing them as too lenient or ineffective.
- In cases involving multiple jurisdictions (e.g., international crimes), restorative justice is often not legally recognized as a viable option.

7. Potential for Repeat Offenses (Recidivism Concerns)

- While restorative justice claims to reduce recidivism, some studies suggest that hardened

criminals may not respond effectively to non-punitive measures.

- The lack of deterrence or strict punishment may encourage repeat offenses, especially among criminals who see restorative justice as a soft approach.
- In cases where offenders do not fear serious legal consequences, they may be more likely to reoffend after release.

8. Difficulty in Measuring Success and Effectiveness

- Unlike traditional legal penalties that have clear outcomes (e.g., incarceration, fines, probation), the success of restorative justice is difficult to quantify.
- How do we measure "healing" or "rehabilitation"?
- There is no universal metric to assess whether restorative justice has truly corrected an offender's behavior or prevented future crimes.

9. Public Perception and Resistance

- Many people see restorative justice as a "soft-on-crime" approach, making it politically unpopular in societies that demand harsh punishments for serious crimes.
- Public opinion often favors retributive justice, believing that offenders should suffer consequences rather than be rehabilitated or reintegrated into society.
- Victims' rights advocates argue that restorative justice prioritizes offenders over victims, giving criminals a second chance while neglecting the emotional and financial impact on victims.

10. Cultural and Societal Barriers

- Some societies and legal systems are built on punishment and deterrence, making it culturally challenging to implement restorative justice widely.
- In countries with authoritarian or rigid legal frameworks, alternative justice approaches may be rejected as too lenient or ineffective.
- Communities that distrust law enforcement or lack faith in reconciliation practices may refuse to participate in restorative justice programs.

11. Lack of Resources and Funding

- Restorative justice programs require significant resources, including trained mediators, counselors, and legal professionals.
- Many criminal justice systems lack the budget to implement widespread restorative justice initiatives.
- Without sufficient funding, restorative justice programs may be limited to small pilot projects rather than national-level reforms.

12. Resistance from Law Enforcement and Judicial Authorities

- Police officers, prosecutors, and judges are trained within punitive justice systems, making them reluctant to embrace restorative approaches.
- Some legal professionals argue that restorative justice undermines legal authority and reduces their ability to enforce laws effectively.
- The transition from retributive to restorative justice requires legal education, policy shifts, and mindset changes, which many governments and judicial bodies are unwilling to undertake.

While restorative justice has gained popularity as a humane and rehabilitative alternative, it is not a one-size-fits-all solution. Its effectiveness is limited by legal, societal, and psychological barriers that make implementation challenging, particularly in cases involving violent crimes, repeat offenders, and victims unwilling to engage with their perpetrators.

Current Trends of Present Research Study

The landscape of criminal justice reform is shifting globally, with restorative justice (RJ) gaining prominence as an alternative to punitive measures. Various governments, legal systems, and community-driven programs are integrating restorative practices to enhance rehabilitation, reduce recidivism, and empower victims. Here are the key current trends shaping the adoption and efficacy of restorative justice in criminal justice reform:

1. Expansion of Restorative Justice in Criminal Justice Policies

- Many countries are revising criminal laws to incorporate restorative justice principles.
- Legislative mandates supporting RJ-based diversion programs, alternative sentencing, and victim-offender mediation are increasing.
- Examples include the United States, Canada, New Zealand, and several European nations implementing policies for RJ-based sentencing.
- In India, discussions around reformative justice in juvenile cases and minor offenses are gaining momentum.

2. Integration of Restorative Justice in Juvenile Justice Systems

- Juvenile offenders are increasingly diverted from traditional criminal proceedings to RJ programs.
- Programs like youth offender circles, community service initiatives, and rehabilitation-focused sentencing are being implemented worldwide.
- Countries like Norway, the UK, and Australia have seen a decline in juvenile reoffending rates due to RJ interventions.
- The UN Convention on the Rights of the Child is pushing nations to adopt rehabilitative approaches over punitive measures for minors.

3. Adoption of Restorative Justice in Schools and Educational Institutions

- Schools are replacing punitive disciplinary measures (e.g., suspension and expulsion) with RJ-based conflict resolution strategies.
- The use of peer mediation, conflict circles, and behavioral restoration programs is reducing violence, bullying, and disciplinary issues in educational institutions.
- Countries like the USA, Canada, and the Netherlands are implementing school-based RJ practices to promote accountability and reconciliation.

4. Increased Focus on Victim-Centered Restorative Justice Programs

- Victim-offender dialogues (VODs) are being prioritized to ensure that victims' rights and voices are central to the justice process.
- Governments and NGOs are developing victim support programs to ensure emotional and financial restoration.
- Some countries now allow victims to decide if they prefer a restorative justice process over traditional court proceedings.
- Restorative justice courts in places like New York and the UK facilitate victim participation and rehabilitation-driven resolutions.

5. Restorative Justice in Post-Incarceration Rehabilitation and Reintegration

- Reentry programs using RJ methods are gaining traction to help ex-offenders reintegrate into society.
- Focus on community acceptance, skill development, and reconciliation with victims is reducing post-release recidivism rates.
- The Restorative Justice Project in California supports prisoners in taking responsibility for their crimes while engaging with victims and communities.
- Countries like Norway, Germany, and Canada have seen significant success in reducing repeat offenses through these initiatives.

6. Restorative Justice in Indigenous and Traditional Legal Systems

- Many Indigenous communities have been practicing restorative justice for centuries, and modern legal systems are recognizing their effectiveness.
- Countries like New Zealand (Māori justice), Canada (First Nations Peacemaking), and South Africa (Ubuntu justice) are incorporating traditional RJ principles into formal legal proceedings.
- The Truth and Reconciliation Commission (TRC) model has been used in post-conflict societies to address historical injustices and state-sponsored violence.

7. Use of Restorative Justice in Cases of Domestic Violence and Gender-Based Crimes

- Carefully structured RJ programs are being explored for domestic violence, sexual assault, and family disputes.
- Specialized RJ programs ensure victim safety, emotional healing, and offender accountability in sensitive cases.
- Norway, New Zealand, and some U.S. states have launched pilot programs focusing on restorative justice in intimate partner violence cases.
- However, challenges remain, including the risk of re-traumatization and power imbalances in mediation settings.

8. Growing Use of Restorative Justice in Corporate and White-Collar Crimes

- Corporations and legal systems are exploring RJ for financial fraud, corporate misconduct, and white-collar crimes.
- Instead of focusing only on fines and prison sentences, corporate RJ initiatives focus on victim compensation, corporate accountability, and ethical reforms.
- The European Union (EU) is promoting corporate responsibility through RJ to restore trust between businesses and consumers.

9. Digitalization and Online Restorative Justice Practices

- Virtual mediation platforms are being introduced to facilitate restorative dialogues remotely.
- Online tools help victims and offenders engage in guided discussions without direct face-to-face meetings.
- Countries like Australia, Canada, and the UK are testing AI-driven dispute resolution tools to streamline RJ processes.
- Blockchain technology is also being explored to ensure transparency and accountability in RJ agreements.

10. International and Transitional Justice Using Restorative Approaches

- Post-conflict societies are using RJ principles to address war crimes, human rights violations, and ethnic conflicts.
- The International Criminal Court (ICC) and United Nations (UN) promote RJ-based reconciliation efforts in Rwanda, Bosnia, and Colombia.
- South Africa’s Truth and Reconciliation Commission (TRC) is a model for transitional justice, emphasizing truth-seeking, accountability, and healing.

11. Legal and Judicial Training on Restorative Justice Practices

- Law schools and judicial training institutions are incorporating restorative justice education into their curriculums.

- More judges, prosecutors, and legal professionals are receiving training on how to integrate RJ within the legal system.
- Many legal practitioners are shifting their focus from punitive measures to community-based conflict resolution.

12. Growing Public Awareness and Advocacy for Restorative Justice

- More people are supporting criminal justice reform that focuses on rehabilitation over punishment.
- Documentaries, books, and public debates on RJ are increasing awareness about its benefits and limitations.
- Activist movements, such as prison abolitionists and criminal justice reform advocates, are calling for RJ-based justice systems.

The growing adoption of restorative justice in criminal justice reform signals a paradigm shift from retributive punishment to rehabilitation, reconciliation, and community healing. However, its effectiveness depends on structured implementation, victim protection, and legal integration.

History of Restorative Justice of Present Research Study

The reformation of criminal justice has evolved over centuries, shifting from retributive and punitive models to rehabilitative and restorative approaches. Restorative Justice (RJ), in particular, has historical roots in indigenous traditions, religious doctrines, and evolving legal frameworks. This historical overview traces the origins, development, and institutionalization of restorative justice practices within criminal justice reform.

1. Ancient and Indigenous Roots of Restorative Justice

A. Tribal and Indigenous Justice Systems (Prehistoric–Ancient Times)

- Restorative justice practices date back thousands of years and were common in many tribal and indigenous cultures.
- Early societies in Africa, North America, Asia, and Oceania focused on communal reconciliation rather than punishment.
- Mediation, restitution, and reconciliation were primary methods used by Native American, Maori (New Zealand), and African tribal justice systems.
- Example: The Gacaca courts in Rwanda, rooted in traditional conflict resolution, were used after the 1994 genocide to rebuild community relations.

B. Religious Influence on Restorative Justice

- Many religious texts emphasize forgiveness, restitution, and reconciliation as alternatives to harsh punishment:
  - Christianity: The Bible promotes reconciliation (e.g., Jesus' teachings on forgiveness).
  - Islam: The concept of Diyya (blood money) allows victims' families to forgive offenders in exchange for compensation.
  - Hinduism & Buddhism: Focus on karma, non-violence (Ahimsa), and reconciliation in justice.

2. Medieval and Early Modern Criminal Justice Reforms (5th–18th Century)

A. Rise of Retributive Justice

- During the Middle Ages, most justice systems transitioned to punitive measures, where harsh physical punishments and death penalties were common.
- Feudal systems in Europe imposed punishments controlled by kings and lords, often ignoring victims' rights.
- Example: The Hammurabi Code (Babylon, 1754 BCE) and Roman law introduced punitive justice systems focusing on "an eye for an eye" punishments.

B. Alternative Dispute Resolution (ADR) in Pre-Modern Societies

- Despite retributive laws, informal mediation and restitution remained part of local dispute resolution in China, Japan, India, and Islamic courts.
- Sharia courts, village councils, and family arbitrations often encouraged reconciliation over imprisonment.

3. The Enlightenment Era and the Birth of Modern Criminal Justice (18th–19th Century)

A. Philosophical Shift Toward Rehabilitation

- Enlightenment thinkers like Cesare Beccaria (Italy) and Jeremy Bentham (UK) criticized excessive punishment and advocated for humane justice.
- Beccaria's book *On Crimes and Punishments (1764)* argued for fair sentencing and the abolition of torture and death penalties.
- The idea that punishment should focus on reform rather than revenge laid the groundwork for modern rehabilitative and restorative justice systems.

B. Prison Reform Movements (Late 18th–19th Century)

- The American Quakers pioneered prison reforms in the late 1700s, promoting penitentiaries (places for penitence and reform) instead of brutal punishments.
- The Pennsylvania and Auburn prison models were introduced to rehabilitate offenders through labor, education, and spiritual reflection.
- Restorative principles emerged as alternative justice programs for juvenile offenders and first-time criminals.

4. The 20th Century: Rise of Restorative Justice in Criminal Law (1900–1990s)

A. Post-War Human Rights Movement and Criminal Justice Reforms

- The horrors of World War II led to global justice reforms focusing on rehabilitation and human rights.
- The United Nations (UN), through the Universal Declaration of Human Rights (1948), called for fair trials, humane punishment, and rehabilitation.

B. Early Restorative Justice Models in the 1970s–1980s

- Canada, New Zealand, and the United States began experimenting with RJ models in response to rising incarceration rates.
- Key developments:
  - Victim-Offender Mediation (VOM): Introduced in Canada (1974) and later in the US.
  - Family Group Conferencing (FGC): Developed in New Zealand (1989) based on Maori tribal justice practices.
  - Community Sentencing Circles: Used in Canada among First Nations to help offenders reintegrate.

C. The Shift from Punishment to Rehabilitation

- Juvenile justice reforms introduced diversion programs using RJ principles.
- Western European countries, such as Norway and the Netherlands, introduced RJ-based alternative sentencing for non-violent crimes.

5. The 21st Century: Global Adoption and Institutionalization of Restorative Justice

A. United Nations and International Legal Frameworks

- The UN Basic Principles on the Use of Restorative Justice Programs in Criminal Matters (2002) officially recognized RJ as a valid alternative to traditional justice.
- The International Criminal Court (ICC) and Truth and Reconciliation Commissions (TRCs) used RJ models to address war crimes and human rights violations (e.g., South Africa's TRC post-Apartheid).

B. Expansion of RJ in Criminal Justice Policies (2000s–Present)

- Countries worldwide integrated RJ into juvenile justice, domestic violence cases, and community-based sentencing.
- RJ programs now address issues like corporate crime, gender-based violence, and post-incarceration rehabilitation.

C. Digitalization of Restorative Justice (2020s–Present)

- The rise of online mediation and AI-driven dispute resolution is making RJ more accessible.
- Governments and NGOs are using virtual conferencing for victim-offender dialogue programs.

The historical evolution of criminal justice reform reflects a shift from harsh retributive systems to more rehabilitative and restorative approaches. While punitive justice still dominates many legal systems, restorative justice continues to gain global acceptance as an effective alternative.

Discussion of Present Research Study

- Comparative analysis of RJ models across different jurisdictions.
- Legal and ethical considerations in RJ adoption.
- Societal attitudes toward alternative justice mechanisms.

Results of Present Research Study

- Statistical evidence supporting lower recidivism rates in RJ programs.
- Increased victim satisfaction and psychological closure.
- Identification of systemic challenges in large-scale RJ adoption.

Conclusion

Restorative justice presents a viable alternative to punitive justice systems, promoting healing and rehabilitation. However, its effectiveness depends on legal support, structured implementation, and community involvement. The reformation of criminal justice has undergone a significant transformation from punitive and retributive approaches to a more rehabilitative and restorative model. This evolution underscores the growing recognition that justice is not merely about punishing offenders but also about repairing harm, restoring communities, and preventing recidivism. Restorative Justice (RJ) has emerged as a powerful tool in modern justice systems, proving effective in addressing the needs of victims, offenders, and society at large.

1. The Shift from Punitive to Restorative Approaches

The traditional criminal justice system, dominated by punishment, imprisonment, and deterrence theories, has often led to overcrowded prisons, high recidivism rates, and systemic inequalities. In contrast, restorative justice emphasizes accountability, healing, and reintegration—fostering a more humane and community-centered approach. While punitive justice isolates offenders, RJ encourages dialogue, reconciliation, and personal transformation.

2. The Proven Benefits of Restorative Justice

Across various case studies and international implementations, RJ has demonstrated numerous advantages:

- Victim Empowerment: Restorative processes give victims a voice, allowing them to express their pain and seek closure.
- Offender Rehabilitation: By acknowledging their actions and making amends, offenders are less likely to reoffend.
- Reduction in Recidivism: Studies suggest RJ programs can significantly reduce repeat offenses compared to traditional sentencing.

- Community Engagement: By involving families, communities, and support networks, RJ rebuilds social trust and reduces alienation.

3. Challenges and Limitations of Restorative Justice

Despite its effectiveness, RJ faces several challenges that need to be addressed:

- Implementation Barriers: Many legal systems remain resistant to change, prioritizing punitive measures over RJ practices.
- Lack of Awareness and Training: Judges, lawyers, and law enforcement officers often lack proper training on RJ principles and applications.
- Limitations in Serious Crimes: While RJ is highly effective for minor and non-violent crimes, its applicability to serious offenses (e.g., murder, sexual assault, terrorism) remains a point of debate.
- Cultural and Systemic Biases: Societal attitudes toward crime and justice can sometimes hinder full acceptance of RJ-based models.

4. The Future of Restorative Justice in Criminal Justice Reform

As global justice systems evolve, restorative justice is likely to play an even greater role in shaping equitable, sustainable, and effective legal frameworks. The future of RJ will depend on:

- Policy Integration: Governments must create legal frameworks that institutionalize RJ practices alongside traditional justice models.
- Technology in RJ: The use of digital mediation, AI-driven conflict resolution, and virtual RJ conferences could expand access to justice.
- Intersection with Human Rights: Strengthening RJ as a fundamental human right can further promote its adoption at international levels.
- Expansion into New Areas: RJ principles are being explored beyond criminal justice, including corporate accountability, environmental justice, and political reconciliation.

5. Final Thoughts

Restorative Justice represents a paradigm shift in how society addresses crime, justice, and rehabilitation. While challenges persist, its success in reducing recidivism, fostering community healing, and prioritizing rehabilitation over punishment proves its growing relevance in criminal justice reform. By integrating RJ principles into mainstream legal systems, we move closer to a justice model that is not only fair but also transformative—one that heals rather than harms, restores rather than punishes, and reconciles rather than isolates.

Suggestions and Recommendations of Present Research Study

- Policy reforms to institutionalize RJ in legal systems.
- Training programs for legal professionals and mediators.
- Greater public awareness and acceptance of RJ practices.
- Further empirical research to assess long-term outcomes.

Future Scope:

- Expanding RJ to address corporate crimes.
- AI-based mediation tools for remote RJ facilitation.
- Integration with restorative economic and social justice models.
- Cross-national studies on RJ impact in diverse legal systems.

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मुस्लिम महिला कथाकारों का हिंदी को योगदान

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सारांश (Abstract)

हिंदी साहित्य में मुस्लिम महिला कथाकारों ने अपनी अनूठी दृष्टि और अनुभवों के माध्यम से महत्वपूर्ण योगदान दिया है। यह अध्ययन इन लेखिकाओं के साहित्यिक योगदान, उनकी सामाजिक और सांस्कृतिक पृष्ठभूमि, और उनकी रचनाओं के प्रभाव का विश्लेषण करता है। यह लेखिकाओं की लेखनी में महिला सशक्तिकरण, सामाजिक न्याय, और सांस्कृतिक विविधता जैसे विषयों की खोज करता है। अध्ययन में उनके कार्यों की प्रासंगिकता और हिंदी साहित्य के विकास में उनकी भूमिका पर जोर दिया गया है।

मुख्य शब्द (Keywords): मुस्लिम महिला कथाकार, हिंदी साहित्य, सामाजिक न्याय, महिला सशक्तिकरण, सांस्कृतिक विविधता, साहित्यिक योगदान

परिचय (Introduction)

हिंदी साहित्य में मुस्लिम महिला कथाकारों ने अपनी विशिष्ट पहचान बनाई है। उनकी कहानियाँ समाज के उपेक्षित वर्गों की आवाज़ बनती हैं और वे समाज की चुनौतियों, विशेष रूप से मुस्लिम महिलाओं की समस्याओं और उनके संघर्षों को प्रभावी रूप से चित्रित करती हैं। इस अध्ययन में उनके साहित्यिक योगदान की प्रासंगिकता और हिंदी साहित्य में उनकी भूमिका पर प्रकाश डाला गया है। हिंदी साहित्य, जिसे भारत की सांस्कृतिक धरोहर के रूप में देखा जाता है, अपने व्यापक स्वरूप में विविध सामाजिक, सांस्कृतिक, और राजनीतिक विषयों का प्रतिनिधित्व करता है। इस समृद्ध साहित्यिक परंपरा में मुस्लिम महिला कथाकारों का योगदान अद्वितीय और प्रेरणादायक है। इन लेखिकाओं ने अपनी लेखनी के माध्यम से समाज के उपेक्षित और हाशिए पर खड़े वर्गों की आवाज़ बनने का कार्य किया है। उन्होंने अपने अनुभवों और दृष्टिकोण के आधार पर ऐसी कहानियाँ और उपन्यास लिखे हैं जो समाज की वास्तविकताओं को उजागर करते हैं और साथ ही सामाजिक न्याय, महिला सशक्तिकरण, और सांस्कृतिक विविधता जैसे विषयों पर गहन विचार करते हैं।

हिंदी साहित्य के इतिहास में यह देखा गया है कि महिला लेखिकाएँ समाज के उन पहलुओं को प्रस्तुत करती हैं जिन्हें अक्सर मुख्यधारा के साहित्य में नज़रअंदाज किया जाता है। मुस्लिम महिला कथाकार इस संदर्भ में विशेष रूप से उल्लेखनीय हैं, क्योंकि उनकी रचनाएँ न केवल साहित्यिक दृष्टि से महत्वपूर्ण हैं, बल्कि सामाजिक दृष्टिकोण से भी अत्यधिक प्रासंगिक हैं। इस्मत चुगताई जैसी महान लेखिकाओं ने अपनी कहानियों में समाज के दबे-छुपे पहलुओं को बड़े ही साहसिक तरीके से प्रस्तुत किया। उनकी रचनाएँ लैंगिक असमानता, सामंती व्यवस्था, और धार्मिक रूढ़ियों के विरुद्ध सशक्त प्रतिरोध का उदाहरण हैं।

मुस्लिम महिला लेखिकाएँ अक्सर दोहरी चुनौती का सामना करती हैं: एक ओर उन्हें अपने समुदाय की पारंपरिक सोच और दूसरी ओर मुख्यधारा के साहित्य में

अपनी जगह बनाने की बाधाओं को पार करना पड़ता है। इसके बावजूद, उन्होंने अपने साहित्यिक दृष्टिकोण और अनूठे अनुभवों के माध्यम से हिंदी साहित्य में अपना स्थान बनाया। उनकी कहानियों में समाज के हाशिए पर खड़े वर्गों, विशेषकर मुस्लिम महिलाओं की समस्याओं और संघर्षों का सजीव चित्रण मिलता है।

इस अध्ययन का उद्देश्य इन लेखिकाओं के साहित्यिक योगदान की पहचान करना और उनके साहित्य में मौजूद सामाजिक और सांस्कृतिक विषयों की गहराई से पड़ताल करना है। अध्ययन में यह भी देखा जाएगा कि उनकी रचनाएँ हिंदी साहित्य को किस प्रकार समृद्ध करती हैं और समाज में उनकी प्रासंगिकता कितनी गहरी है।

मुस्लिम महिला कथाकारों की रचनाएँ सांस्कृतिक विविधता और लैंगिक समानता को बढ़ावा देने का कार्य करती हैं। उनकी कहानियाँ पाठकों को न केवल मनोरंजन प्रदान करती हैं, बल्कि उन्हें समाज के प्रति जागरूक और संवेदनशील बनाने का भी कार्य करती हैं। इन रचनाओं में महिला सशक्तिकरण, शिक्षा, और सामाजिक सुधार जैसे मुद्दों को उठाया गया है।

इसके अतिरिक्त, इन लेखिकाओं ने अपनी लेखनी के माध्यम से समाज में व्याप्त रूढ़िवादिता और असमानता को चुनौती दी है। उनकी कहानियाँ यह संदेश देती हैं कि साहित्य केवल मनोरंजन का माध्यम नहीं है, बल्कि यह सामाजिक परिवर्तन और जागरूकता का भी एक महत्वपूर्ण उपकरण है। इस विस्तृत परिचय के माध्यम से यह स्पष्ट होता है कि मुस्लिम महिला कथाकार न केवल हिंदी साहित्य की महत्वपूर्ण धरोहर हैं, बल्कि वे समाज में एक सकारात्मक बदलाव लाने वाली शक्ति भी हैं। उनके योगदान को पहचानने और उनके साहित्य को व्यापक स्तर पर प्रसारित करने की आवश्यकता है ताकि उनकी रचनाएँ आने वाली पीढ़ियों के लिए प्रेरणा स्रोत बन सकें।

परिभाषाएँ (Definitions)

1. **मुस्लिम महिला कथाकार**: वे महिला लेखिकाएँ जो मुस्लिम समुदाय से आती हैं और हिंदी साहित्य में सक्रिय हैं।
2. **साहित्यिक योगदान**: किसी साहित्यकार द्वारा साहित्य के क्षेत्र में दिए गए विचार, शैली और विषयवस्तु के माध्यम से योगदान।
3. **सांस्कृतिक विविधता**: समाज में विभिन्न संस्कृतियों और परंपराओं का समावेश।

आवश्यकता (Need)

मुस्लिम महिला कथाकारों की रचनाएँ हिंदी साहित्य को नए दृष्टिकोण और विविधता प्रदान करती हैं। यह अध्ययन उनके साहित्यिक योगदान को मान्यता देने और उनके विचारों को व्यापक पाठक वर्ग तक पहुँचाने के उद्देश्य से किया गया है।

उद्देश्य (Aims)

1. मुस्लिम महिला कथाकारों के साहित्यिक योगदान का विश्लेषण करना।
2. उनकी कहानियों में प्रस्तुत सामाजिक और सांस्कृतिक मुद्दों की पहचान करना।
3. हिंदी साहित्य में उनके प्रभाव और महत्व को रेखांकित करना।

लक्ष्य (Objectives)

1. मुस्लिम महिला कथाकारों की प्रमुख कृतियों का अध्ययन करना।
2. उनकी लेखनी में निहित महिला सशक्तिकरण और सामाजिक न्याय के मुद्दों का विश्लेषण।
3. उनके साहित्यिक दृष्टिकोण और शैली का मूल्यांकन करना।

परिकल्पना (Hypothesis)

हिंदी साहित्य में मुस्लिम महिला कथाकारों का योगदान समाज में सांस्कृतिक विविधता और लैंगिक समानता को बढ़ावा देता है।

अनुसंधान पद्धति (Research Methodology)

1. **प्राथमिक स्रोत**: मुस्लिम महिला कथाकारों की कृतियों का अध्ययन।
2. **द्वितीयक स्रोत**: उनके कार्यों पर आधारित आलोचनात्मक लेख और शोध पत्र।
3. **गुणात्मक विश्लेषण**: उनकी कहानियों में निहित विचारों और सामाजिक मुद्दों का मूल्यांकन।

मजबूत पक्ष (Strong Points)

1. सांस्कृतिक विविधता और सामाजिक न्याय जैसे महत्वपूर्ण विषयों को प्रस्तुत करना।
2. महिला सशक्तिकरण को बढ़ावा देना।
3. हिंदी साहित्य में नई विचारधारा और दृष्टिकोण का समावेश।

मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान उनके विशिष्ट दृष्टिकोण, साहसी लेखन शैली, और सामाजिक विषयों की गहरी समझ के कारण कई स्तरों पर मजबूत है। उनके साहित्यिक योगदान के मजबूत बिंदु निम्नलिखित हैं:

1. सामाजिक वास्तविकता का जीवंत चित्रण

- मुस्लिम महिला कथाकारों ने अपनी रचनाओं में समाज के हाशिए पर खड़े वर्गों की वास्तविकता को प्रभावी ढंग से प्रस्तुत किया है।
- उनकी कहानियों में मुस्लिम महिलाओं के संघर्ष, शिक्षा, समानता, और सांस्कृतिक पहचान के मुद्दों को गहराई से उठाया गया है।
- सामाजिक रूढ़ियों और पारंपरिक ढांचों को चुनौती देकर वे समाज को आईना दिखाने का कार्य करती हैं।

2. लैंगिक असमानता और सशक्तिकरण के मुद्दे

- इन लेखिकाओं ने महिलाओं के अधिकार, उनकी स्वायत्तता, और लैंगिक असमानता के विषयों को अपनी लेखनी का केंद्र बनाया।
- इस्मत चुगताई जैसे लेखकों की कहानियाँ, जैसे *लिहाफ,* महिलाओं की यौनिकता और उनके अधिकारों को प्रमुखता से उठाती हैं।
- उन्होंने पितृसत्तात्मक सोच और महिलाओं की सामाजिक स्थिति में सुधार के लिए आवाज़ उठाई।

3. सांस्कृतिक विविधता और धार्मिक सहिष्णुता का संदेश

- उनकी रचनाएँ भारत की सांस्कृतिक विविधता और समृद्ध विरासत को दर्शाती हैं।
- लेखिकाओं ने धर्म, संस्कृति, और परंपरा के संदर्भ में सामाजिक समरसता और सहिष्णुता को बढ़ावा दिया।
- उनकी कहानियाँ समाज को धार्मिक और सांस्कृतिक सीमाओं से ऊपर उठने की प्रेरणा देती हैं।

4. साहित्यिक शैली और मौलिकता

- इन लेखिकाओं की लेखनी में मौलिकता और नवीनता झलकती है।
- उन्होंने न केवल यथार्थवादी शैली अपनाई, बल्कि प्रतीकात्मकता और व्यंग्य का भी कुशल उपयोग किया।
- उनकी भाषा और वर्णन शैली पाठकों को सोचने पर मजबूर करती है।

5. साहसिक और निर्भीक लेखन

- मुस्लिम महिला कथाकारों ने उन विषयों पर लिखा, जिन्हें उस समय वर्जित या संवेदनशील माना जाता था।
- उन्होंने समाज में व्याप्त पाखंड और दोहरे मापदंडों को बेबाकी से उजागर किया।
- उनकी रचनाएँ साहस और सत्यनिष्ठा का प्रतीक हैं।

6. महिला सशक्तिकरण का प्रतीक

- इन लेखिकाओं ने साहित्य के माध्यम से महिलाओं को अपने अधिकारों और संभावनाओं के प्रति जागरूक करने का कार्य किया।
- उनकी रचनाएँ महिलाओं के आत्मनिर्भरता और आत्मसम्मान को बढ़ावा देती हैं।
- उन्होंने महिलाओं को सामाजिक बाधाओं को पार करने के लिए प्रेरित किया।

7. सामाजिक और ऐतिहासिक प्रासंगिकता

- इन लेखिकाओं की रचनाएँ सामाजिक सुधार और ऐतिहासिक संदर्भ में अत्यंत प्रासंगिक हैं।
- वे उपनिवेशवाद, विभाजन, और आज़ादी के बाद के भारत के सामाजिक मुद्दों को गहराई से संबोधित करती हैं।
- उन्होंने अपने समय की राजनीतिक और सामाजिक परिस्थितियों को साहित्य में प्रतिबिंबित किया।

8. महिला लेखन की धारा को समृद्ध करना

- मुस्लिम महिला कथाकारों ने हिंदी साहित्य में महिला लेखन को एक नई दिशा और पहचान दी।
- उन्होंने महिला लेखकों की एक सशक्त धारा बनाई, जिसमें विविधता और गहराई है।
- उनकी रचनाएँ महिला दृष्टिकोण से समाज को देखने और समझने का एक नया नजरिया प्रस्तुत करती हैं।

9. समकालीनता और वैश्विक दृष्टिकोण

- इन लेखिकाओं की रचनाओं में स्थानीय मुद्दों के साथ-साथ वैश्विक विषयों की भी झलक मिलती है।
- उन्होंने भारतीय समाज की समस्याओं को वैश्विक संदर्भ में रखकर देखा और समझा।
- उनकी रचनाएँ वैश्विक साहित्यिक परिदृश्य में भी महत्वपूर्ण स्थान रखती हैं।

10. आलोचनात्मक सोच और परिवर्तनकारी दृष्टिकोण

- उनकी रचनाएँ समाज को आलोचनात्मक दृष्टि से देखने और उसमें सुधार लाने के लिए प्रेरित करती हैं।
- उन्होंने साहित्य को केवल मनोरंजन का माध्यम नहीं, बल्कि सामाजिक परिवर्तन का उपकरण बनाया।

- उनकी लेखनी में सुधारात्मक दृष्टिकोण स्पष्ट रूप से दिखाई देता है।

मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान सामाजिक और साहित्यिक दृष्टि से अत्यंत महत्वपूर्ण है। उनकी रचनाएँ केवल साहित्यिक कृतियाँ नहीं हैं, बल्कि समाज में बदलाव लाने और मानवाधिकारों के प्रति जागरूकता बढ़ाने का एक सशक्त माध्यम भी हैं। उनकी लेखनी ने हिंदी साहित्य को नए आयाम दिए और समाज को एक नई दिशा प्रदान की।

कमजोर पक्ष (Weak Points)

1. उनकी रचनाओं का सीमित प्रचार और पाठक वर्ग।
2. साहित्यिक आलोचना में अपेक्षित स्थान की कमी।
3. उनकी कहानियों में कुछ मुद्दों का अधिक गहन विश्लेषण नहीं होना।

मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान महत्वपूर्ण और प्रेरणादायक है, लेकिन कुछ पहलू ऐसे भी हैं जो उनके साहित्यिक प्रभाव और स्वीकृति में कमी का कारण बन सकते हैं। इन कमजोर बिंदुओं को समझना उनकी लेखनी और प्रभाव को और अधिक समृद्ध करने के लिए आवश्यक है।

1. सीमित पाठक वर्ग

- मुस्लिम महिला कथाकारों की रचनाएँ एक विशिष्ट सांस्कृतिक और सामाजिक पृष्ठभूमि से प्रेरित होती हैं, जिससे उनकी स्वीकार्यता मुख्यधारा के पाठकों में सीमित हो जाती है।
- उनकी कहानियाँ कभी-कभी केवल एक विशेष समुदाय तक सीमित रह जाती हैं, जिससे व्यापक समाज तक उनका प्रभाव कम होता है।

2. साहित्यिक स्वीकृति और मान्यता की कमी

- कई मुस्लिम महिला लेखकों को साहित्यिक पुरस्कारों और सम्मानों में उपयुक्त स्थान नहीं मिल सका।
- उनकी रचनाओं को मुख्यधारा के साहित्यिक विमर्श में वह स्थान नहीं मिल पाया, जो अन्य समकालीन लेखकों को मिला।
- साहित्यिक आलोचना में उनकी रचनाओं का पर्याप्त विश्लेषण और मूल्यांकन नहीं हुआ।

3. विषयों की पुनरावृत्ति

- उनकी कहानियों में सामाजिक और लैंगिक असमानता जैसे मुद्दों पर बार-बार चर्चा होती है, जिससे विषय-वस्तु में विविधता की कमी महसूस हो सकती है।
- कुछ रचनाएँ पारंपरिक मुद्दों में उलझी रहती हैं, जो नए सामाजिक संदर्भों को पूरी तरह से नहीं संबोधित कर पातीं।

4. सांस्कृतिक और धार्मिक सीमाएँ

- इन लेखिकाओं की रचनाओं में कभी-कभी सांस्कृतिक और धार्मिक सीमाओं का प्रभाव स्पष्ट रूप से देखा जा सकता है।
- पारंपरिक दृष्टिकोण और सांस्कृतिक बंधनों के कारण उनकी कहानियों में खुलेपन और वैश्विक दृष्टिकोण की कमी महसूस हो सकती है।

5. भाषाई जटिलता

- उनकी रचनाओं में उपयोग की गई भाषा और शैली कुछ पाठकों के लिए जटिल हो सकती है।
- उनकी कहानियों में उर्दू शब्दों और मुहावरों का अधिक प्रयोग हिंदी के सामान्य पाठकों के लिए बाधा बन सकता है।

6. आधुनिक विषयों की कमी

- कुछ लेखिकाओं की रचनाएँ आधुनिक तकनीकी, डिजिटल युग, और समकालीन सामाजिक-आर्थिक परिवर्तनों जैसे विषयों को पर्याप्त रूप से शामिल नहीं कर पातीं।
- वैश्विक मुद्दों की तुलना में स्थानीय और पारंपरिक समस्याओं पर अधिक ध्यान दिया गया है।

7. प्रकाशन और वितरण की कठिनाइयाँ

- मुस्लिम महिला कथाकारों की रचनाओं के लिए उपयुक्त प्रकाशन और वितरण तंत्र की कमी उनके साहित्य को व्यापक रूप से पहुँचाने में बाधा उत्पन्न करती है।
- छोटे प्रकाशकों और कम विज्ञापन के कारण उनकी रचनाएँ व्यापक पाठक वर्ग तक नहीं पहुँच पातीं।

8. आलोचनात्मक विमर्श की कमी

- उनके साहित्य पर गहराई से आलोचनात्मक अध्ययन और विमर्श की कमी है।
- साहित्यिक शोध और शिक्षाविदों द्वारा उनके काम को पर्याप्त रूप से अध्ययन और प्रचारित नहीं किया गया।

9. आर्थिक और सामाजिक बाधाएँ

- कई मुस्लिम महिला कथाकारों को आर्थिक और सामाजिक बाधाओं का सामना करना पड़ा, जिससे उनकी रचनात्मकता और साहित्यिक योगदान सीमित हो गया।
- परिवार और समाज के पारंपरिक ढांचों ने उनकी स्वतंत्रता और लेखन की निरंतरता को प्रभावित किया।

10. अनुवाद और अंतरराष्ट्रीय पहचान की कमी

- उनकी रचनाओं का पर्याप्त अनुवाद अन्य भाषाओं में नहीं हुआ, जिससे वे अंतरराष्ट्रीय स्तर पर कम पहचानी गईं।
- वैश्विक साहित्यिक परिदृश्य में उनकी उपस्थिति सीमित रही।

मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान प्रेरणादायक है, लेकिन उनकी स्वीकार्यता और प्रभावशीलता बढ़ाने के लिए उपरोक्त कमजोर बिंदुओं को दूर करना आवश्यक है। साहित्यिक और सामाजिक क्षेत्र में सुधारात्मक कदम उठाकर इन लेखिकाओं के योगदान को व्यापक रूप से प्रचारित और स्वीकार किया जा सकता है।

वर्तमान रुझान (Current Trends)

1. मुस्लिम महिला कथाकारों की रचनाओं पर शोध और उनकी पुनर्खोज।
2. उनके कार्यों को डिजिटल माध्यमों में प्रस्तुत करने का बढ़ता प्रयास।
3. युवा लेखिकाओं में उनकी प्रेरणा के रूप में बढ़ती स्वीकार्यता।

हिंदी साहित्य में मुस्लिम महिला कथाकारों का योगदान आज भी महत्वपूर्ण और प्रासंगिक है। वर्तमान समय में उनकी रचनात्मकता और साहित्यिक उपस्थिति में अनेक सकारात्मक प्रवृत्तियाँ देखी जा सकती हैं, जो साहित्य और समाज दोनों में नई दिशाएँ स्थापित कर रही हैं।

1. समकालीन सामाजिक मुद्दों पर फोकस

- मुस्लिम महिला लेखिकाएँ अब अधिक से अधिक समकालीन सामाजिक मुद्दों जैसे लिंग भेदभाव, शिक्षा, महिला सशक्तिकरण, और सामाजिक न्याय पर लिख रही हैं।
- इनकी कहानियाँ पारंपरिक ढाँचों से निकलकर आधुनिक समाज की जटिलताओं और संभावनाओं को दर्शा रही हैं।
- समुदाय, घरेलू हिंसा, और पर्यावरणीय समस्याओं जैसे विषयों को भी शामिल किया जा रहा है।

2. डिजिटल प्लेटफॉर्म और ऑनलाइन उपस्थिति

- कई मुस्लिम महिला लेखिकाएँ ब्लॉग, ई-बुक्स, और सोशल मीडिया प्लेटफॉर्म्स का उपयोग कर रही हैं।
- ऑनलाइन साहित्यिक मंचों और प्रकाशनों पर उनकी उपस्थिति बढ़ी है, जिससे उनका साहित्य व्यापक दर्शकों तक पहुँच रहा है।
- पॉडकास्ट, वेबिनार, और वर्चुअल रीडिंग इवेंट्स के माध्यम से वे साहित्यिक संवाद स्थापित कर रही हैं।

3. अनुवाद और बहुभाषीय रचनाएँ

- उनकी रचनाओं का हिंदी के अलावा अन्य भारतीय भाषाओं और विदेशी भाषाओं में अनुवाद हो रहा है।
- यह अनुवाद कार्य न केवल उनके साहित्य को व्यापक पहचान दिला रहा है, बल्कि उनके दृष्टिकोण को वैश्विक मंच पर प्रस्तुत कर रहा है।

4. आत्मकथात्मक लेखन का उभार

- आत्मकथाओं और संस्मरणों के माध्यम से मुस्लिम महिला कथाकार अपने निजी अनुभवों और सामाजिक संघर्षों को साहित्यिक रूप में व्यक्त कर रही हैं।
- यह शैली पाठकों के साथ गहरे जुड़ाव और सहानुभूति उत्पन्न कर रही है।

5. साहित्यिक विमर्श और महिला अध्ययन में भागीदारी

- मुस्लिम महिला कथाकारों की रचनाओं पर साहित्यिक शोध और विमर्श बढ़ा है।
- महिला अध्ययन और जेंडर स्टडीज में उनकी रचनाओं का विश्लेषण किया जा रहा है, जो उनके साहित्यिक योगदान को एक नई दृष्टि प्रदान कर रहा है।

6. वैश्विक साहित्यिक परिदृश्य में पहचान

- भारतीय मुस्लिम महिला कथाकारों की रचनाएँ अंतरराष्ट्रीय साहित्यिक मंचों पर स्थान पा रही हैं।
- उनकी कहानियाँ वैश्विक स्तर पर पढ़ी जा रही हैं, और उन्हें साहित्यिक पुरस्कारों और सम्मानों से नवाजा जा रहा है।

7. युवा लेखिकाओं की उभरती पीढ़ी

- नई पीढ़ी की मुस्लिम महिला लेखिकाएँ साहित्य में अपने पैर जमा रही हैं।
- ये लेखिकाएँ आधुनिक और नवाचारपूर्ण दृष्टिकोणों के साथ साहित्यिक परिदृश्य को समृद्ध कर रही हैं।

8. फिक्शन और नॉन-फिक्शन का संतुलन

- फिक्शन के साथ-साथ नॉन-फिक्शन लेखन में भी उनकी सक्रियता बढ़ी है।
- निबंध, आलोचना, और शोध आधारित लेखन में उनकी भागीदारी अधिक हो रही है।

9. साहित्यिक आंदोलन और साझेदारी

- कई मुस्लिम महिला लेखिकाएँ साहित्यिक संगठनों और आंदोलनों का हिस्सा बन रही हैं।
- वे अन्य महिला लेखकों के साथ मिलकर सह-लेखन और साझा परियोजनाओं पर काम कर रही हैं।

10. साहित्य और सिनेमा का संगम

- उनकी कहानियाँ और उपन्यास सिनेमा और वेब सीरीज के लिए प्रेरणा बन रहे हैं।
- यह प्रवृत्ति उनकी रचनाओं को एक नई मीडिया पहचान और व्यापक दर्शक वर्ग प्रदान कर रही है।

मुस्लिम महिला कथाकारों के साहित्य में वर्तमान समय की प्रवृत्तियाँ न केवल उनके लेखन की प्रासंगिकता को स्थापित कर रही हैं, बल्कि हिंदी साहित्य के विकास में भी नई ऊँचाइयों को छू रही हैं। इन प्रवृत्तियों के माध्यम से वे समाज और साहित्य में सकारात्मक बदलाव लाने की दिशा में महत्वपूर्ण योगदान दे रही हैं।

इतिहास (History)

मुस्लिम महिला कथाकारों ने हिंदी साहित्य में अपनी पहचान 20वीं सदी के मध्य से बनानी शुरू की। इस अवधि में उन्होंने समाज में व्याप्त समस्याओं, विशेष रूप से मुस्लिम महिलाओं की स्थिति, पर ध्यान केंद्रित किया। इनमें इस्मत चुगताई और उनकी कहानियाँ प्रमुख उदाहरण हैं। मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान न केवल उनके सामाजिक संघर्षों और व्यक्तिगत अनुभवों का प्रतिबिंब है, बल्कि यह भारतीय साहित्य की विविधता और समृद्धि का एक महत्वपूर्ण हिस्सा भी है। उनके योगदान का ऐतिहासिक विकास निम्नलिखित बिंदुओं में समझा जा सकता है:

1. प्रारंभिक काल: समाज की बाधाएँ और साहित्यिक मौन

- औपनिवेशिक और पूर्व-औपनिवेशिक काल में मुस्लिम महिलाओं की साहित्यिक गतिविधियाँ सीमित थीं।
- धार्मिक और सामाजिक प्रतिबंधों के कारण उन्हें पढ़ने-लिखने के अवसर कम मिलते थे।
- शिक्षा का अभाव और पर्दा प्रथा ने उनकी साहित्यिक सक्रियता को बाधित किया।

2. शिक्षा और नवजागरण आंदोलन का प्रभाव

- 19वीं सदी के उत्तरार्ध में सर सैयद अहमद खान और अलीगढ़ आंदोलन जैसे सुधार आंदोलनों ने मुस्लिम महिलाओं को शिक्षा प्राप्त करने की प्रेरणा दी।
- इस समय मुस्लिम महिलाओं ने पत्र-पत्रिकाओं के माध्यम से लिखने की शुरुआत की।
- बेगम रुकैया सखावत हुसैन जैसी लेखिकाएँ इस काल में उभरीं, जिन्होंने न केवल उर्दू, बल्कि हिंदी में भी महिलाओं के अधिकारों और शिक्षा पर लिखा।

3. स्वतंत्रता संग्राम और साहित्यिक पुनर्जागरण

- स्वतंत्रता संग्राम के दौरान मुस्लिम महिला लेखिकाओं ने साहित्य के माध्यम से सामाजिक जागरूकता फैलाने का कार्य किया।
- हिंदी साहित्य में इस समय का योगदान लेखिकाओं जैसे हामिदा सुल्तान और बेगम सुल्तान जहान की रचनाओं में देखा जा सकता है।
- उनकी कहानियाँ पारिवारिक और सामाजिक समस्याओं पर केंद्रित थीं।

4. आजादी के बाद का दौर (1947-1970)

- आजादी के बाद मुस्लिम महिलाओं के लिए शिक्षा और रोजगार के अवसर बढ़े, जिससे उनकी साहित्यिक भागीदारी भी बढ़ी।
- इस समय लेखन में पारिवारिक, धार्मिक, और सामाजिक संघर्षों को स्थान मिला।
- मुस्लिम महिला कथाकारों ने सामाजिक बदलाव और परंपरागत मान्यताओं को चुनौती देने वाले विषयों पर काम करना शुरू किया।

5. समकालीन युग की शुरुआत (1970-1990)

- इस समय मुस्लिम महिला कथाकारों ने साहित्यिक मंचों पर अपनी पहचान स्थापित की।
- इस दौर की प्रमुख लेखिकाओं में इस्मत चुगताई का नाम विशेष रूप से उल्लेखनीय है, जिन्होंने हिंदी और उर्दू साहित्य दोनों में महिला स्वतंत्रता और लैंगिक भेदभाव जैसे मुद्दों पर लिखा।
- सामाजिक-आर्थिक परिवर्तनों ने उनकी कहानियों को एक नया आयाम दिया।

6. भूमंडलीकरण और आधुनिक साहित्य (1990 के बाद)

- 1990 के बाद भूमंडलीकरण और तकनीकी विकास के कारण मुस्लिम महिला कथाकारों को व्यापक पहचान मिली।
- उनके लेखन में विषयों की विविधता और गहराई आई।
- इस दौर में लेखिकाएँ सांस्कृतिक पहचान, मुस्लिम महिला होने की जटिलता, और वैश्विक मुद्दों पर लिखने लगीं।
- डिजिटल प्लेटफॉर्म के आगमन ने उनके लेखन को वैश्विक दर्शकों तक पहुँचाया।

7. वर्तमान परिदृश्य: समकालीन लेखन की प्रमुखता

- आज मुस्लिम महिला कथाकार न केवल हिंदी साहित्य बल्कि भारतीय साहित्य के विभिन्न क्षेत्रों में सक्रिय हैं।
- वे साहित्यिक आयोजनों, शोध, और विमर्श का हिस्सा बन रही हैं।
- उनकी रचनाएँ महिला सशक्तिकरण, लैंगिक समानता, धार्मिक स्वतंत्रता, और वैश्विक मुद्दों पर केंद्रित हैं।

प्रमुख योगदान

1. **इस्मत चुगताई**: हिंदी और उर्दू साहित्य में समान रूप से सक्रिय, जिनकी रचनाएँ लैंगिक असमानता और सामाजिक मान्यताओं पर सवाल उठाती हैं।
2. **शहनाज़ बेगम**: महिला अधिकारों और सामाजिक बदलाव पर आधारित कहानियाँ।
3. **तहमीना दुर्रानी**: आत्मकथात्मक लेखन में पहचान बनाने वाली लेखिका।

मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान ऐतिहासिक रूप से सामाजिक और साहित्यिक विकास की कहानी है। उन्होंने न केवल अपनी सामाजिक सीमाओं को पार किया, बल्कि साहित्य के माध्यम से एक सशक्त और समृद्ध परंपरा स्थापित की। उनके योगदान ने हिंदी साहित्य को न केवल विषयगत, बल्कि दृष्टिकोण के स्तर पर भी समृद्ध किया है।

चर्चा (Discussion)

अध्ययन में मुस्लिम महिला कथाकारों की रचनाओं में सामाजिक समस्याओं, लैंगिक असमानता, और सांस्कृतिक जटिलताओं का गहन विश्लेषण प्रस्तुत किया गया है। उनकी कहानियाँ समाज के हाशिए पर खड़े वर्गों को मुख्यधारा में लाने का प्रयास करती हैं।

परिणाम (Results)

1. उनकी रचनाओं ने हिंदी साहित्य में विविधता और समृद्धि प्रदान की।
2. उन्होंने समाज में महिलाओं के प्रति दृष्टिकोण को बदलने में महत्वपूर्ण भूमिका निभाई।
3. उनके साहित्यिक दृष्टिकोण ने समकालीन हिंदी लेखन को एक नया आयाम दिया।

मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान कई प्रकार के सकारात्मक परिणामों का वाहक है। यह न केवल साहित्यिक जगत को समृद्ध बनाता है, बल्कि महिलाओं की स्थिति और पहचान को भी सशक्त बनाता है। इनके परिणाम निम्नलिखित बिंदुओं में विस्तृत किए जा सकते हैं:

1. साहित्यिक क्षेत्र में योगदान का विस्तार

- मुस्लिम महिला कथाकारों ने हिंदी साहित्य में विषय, शैली, और दृष्टिकोण की विविधता लाई।
- उनकी कहानियों और उपन्यासों ने पारंपरिक साहित्य से हटकर समकालीन मुद्दों को प्रमुखता दी।
- उन्होंने हिंदी साहित्य को एक नए आयाम पर पहुँचाया, जहाँ महिला दृष्टिकोण को केंद्र में रखा गया।

2. सामाजिक चेतना का विकास

- मुस्लिम महिला कथाकारों की रचनाओं ने समाज में व्याप्त लैंगिक भेदभाव, धार्मिक रूढ़िवादिता, और सामाजिक असमानता को उजागर किया।
- उनकी कहानियाँ और लेखन सामाजिक सुधारों के लिए प्रेरणा बने।
- उन्होंने महिलाओं को शिक्षा और अधिकारों के प्रति जागरूक किया।

3. महिला सशक्तिकरण में भूमिका

- मुस्लिम महिला लेखिकाओं के साहित्य ने महिलाओं को आत्मनिर्भरता, स्वतंत्रता, और समानता की दिशा में प्रेरित किया।
- उनकी रचनाओं ने महिलाओं को अपने अधिकारों के प्रति जागरूक किया और उनके संघर्षों को साहित्यिक पहचान दी।

4. सांस्कृतिक संवाद की स्थापना

- इन लेखिकाओं ने अपने साहित्य के माध्यम से विभिन्न संस्कृतियों और परंपराओं के बीच संवाद स्थापित किया।

- उनकी रचनाएँ मुस्लिम और गैर-मुस्लिम समुदायों के बीच समरसता और समझ को बढ़ावा देती हैं।
- उन्होंने धार्मिक और सांस्कृतिक विविधता को स्वीकारते हुए एक समावेशी साहित्यिक दृष्टिकोण विकसित किया।

5. साहित्य में नई विधाओं और विषयों की शुरुआत

- मुस्लिम महिला कथाकारों ने हिंदी साहित्य में आत्मकथात्मक लेखन, सामाजिक यथार्थवाद, और मनोवैज्ञानिक कथानकों की शुरुआत की।
- उनकी कहानियाँ अक्सर घरेलू जीवन, धार्मिक मान्यताओं, और सामाजिक संघर्षों पर आधारित होती थीं।
- उन्होंने हिंदी साहित्य में व्यक्तिगत और सार्वजनिक जीवन के बीच की जटिलता को प्रस्तुत किया।

6. वैश्विक पहचान का निर्माण

- मुस्लिम महिला लेखिकाओं की रचनाएँ न केवल भारत में, बल्कि अंतरराष्ट्रीय स्तर पर भी सराही गईं।
- उनकी कहानियाँ और उपन्यास वैश्विक पाठकों तक पहुँचे, जिससे हिंदी साहित्य को एक अंतरराष्ट्रीय मंच मिला।
- उनकी रचनाएँ मुस्लिम महिलाओं के जीवन के विभिन्न पहलुओं को वैश्विक परिप्रेक्ष्य में प्रस्तुत करती हैं।

7. शिक्षा और शोध के क्षेत्र में प्रभाव

- इनकी रचनाओं को हिंदी साहित्य के पाठ्यक्रमों में शामिल किया गया, जिससे विद्यार्थियों और शोधार्थियों को प्रेरणा मिली।
- उनके लेखन पर आधारित शोध कार्यों ने साहित्य और समाजशास्त्र के क्षेत्र में नई दिशाएँ खोलीं।

8. साहित्यिक आंदोलन और विमर्शों की शुरुआत

- मुस्लिम महिला कथाकारों ने महिला साहित्य, दलित साहित्य, और अल्पसंख्यक साहित्य के विमर्शों को मजबूती दी।
- उनकी कहानियाँ इन विमर्शों का हिस्सा बनकर एक व्यापक साहित्यिक आंदोलन का आधार बनीं।

9. समकालीन मुद्दों की समझ

- उनकी रचनाएँ आधुनिक समाज में महिलाओं की समस्याओं और उनके समाधान की संभावनाओं पर केंद्रित हैं।
- उन्होंने लैंगिक समानता, शिक्षा, रोजगार, और महिला अधिकारों जैसे मुद्दों पर प्रकाश डाला।

10. साहित्यिक समुदाय में स्वीकृति और मान्यता

- मुस्लिम महिला कथाकारों को हिंदी साहित्य में उनकी उत्कृष्ट रचनाओं के लिए विभिन्न पुरस्कार और सम्मान मिले।
- उनकी रचनाएँ साहित्यिक संगठनों और सम्मेलनों में प्रमुखता से प्रस्तुत की जाती हैं।

मुस्लिम महिला कथाकारों के हिंदी साहित्य में योगदान का प्रभाव बहुआयामी और गहरा है। उन्होंने साहित्य को न केवल समृद्ध किया, बल्कि महिलाओं की सामाजिक स्थिति को सुधारने में भी महत्वपूर्ण भूमिका निभाई। उनके लेखन ने हिंदी साहित्य में विषयगत और दृष्टिगत क्रांति का मार्ग प्रशस्त किया और समाज में समानता, स्वतंत्रता, और जागरूकता को बढ़ावा दिया।

निष्कर्ष (Conclusion)

मुस्लिम महिला कथाकारों ने हिंदी साहित्य में अद्वितीय योगदान दिया है। उनकी रचनाएँ न केवल साहित्यिक दृष्टिकोण से महत्वपूर्ण हैं, बल्कि सामाजिक और सांस्कृतिक परिवर्तन का भी एक माध्यम हैं। मुस्लिम महिला कथाकारों के हिंदी साहित्य में योगदान को समग्रता में देखें तो यह स्पष्ट होता है कि उन्होंने न केवल हिंदी साहित्य की परंपराओं को समृद्ध किया, बल्कि समाज के व्यापक परिप्रेक्ष्य को भी नया आयाम दिया। उनकी रचनाएँ साहित्यिक और सामाजिक दृष्टिकोण से उल्लेखनीय हैं, क्योंकि उन्होंने उन मुद्दों को उजागर किया, जो लंबे समय तक हाशिए पर रहे थे।

1. साहित्य में नवाचार और विविधता

मुस्लिम महिला लेखिकाओं ने अपने साहित्य में विषय, दृष्टिकोण, और भाषा-शैली में विविधता लाई। उन्होंने हिंदी साहित्य को एक नई दिशा दी, जहाँ महिला सशक्तिकरण, लैंगिक समानता, और सामाजिक न्याय जैसे महत्वपूर्ण मुद्दे केंद्र में थे। उनकी रचनाओं ने साहित्य को सामाजिक परिवर्तन का माध्यम बनाया।

2. सामाजिक चेतना और सुधार का आधार

इन लेखिकाओं ने सामाजिक असमानताओं, धार्मिक रूढ़िवादिता, और लैंगिक भेदभाव के मुद्दों पर खुलकर लिखा। उनकी रचनाएँ केवल साहित्यिक कलाकृतियाँ नहीं थीं, बल्कि सामाजिक सुधार और जागरूकता के लिए एक आंदोलन का आधार बनीं। उन्होंने समाज में निहित

पितृसत्तात्मक मानसिकता को चुनौती दी और महिलाओं की स्थिति में सुधार के लिए साहित्यिक योगदान दिया।

3. महिला सशक्तिकरण में भूमिका

मुस्लिम महिला लेखिकाओं ने महिलाओं के अधिकारों, स्वतंत्रता, और आत्मनिर्भरता को अपने लेखन का मुख्य विषय बनाया। उनकी रचनाएँ महिलाओं को उनके संघर्षों और चुनौतियों का सामना करने के लिए प्रेरित करती हैं। उनकी कहानियाँ और उपन्यास महिलाओं की आवाज बने, जो सामाजिक दबावों के बावजूद अपने अधिकारों के लिए खड़ी हुईं।

4. सांस्कृतिक और धार्मिक संवाद

इन लेखिकाओं ने अपने साहित्य के माध्यम से धार्मिक और सांस्कृतिक संवाद को बढ़ावा दिया। उनकी रचनाएँ विभिन्न धर्मों और संस्कृतियों के बीच समझ और सह-अस्तित्व को प्रोत्साहित करती हैं। उन्होंने समाज की विविधता को अपने लेखन में एक समावेशी दृष्टिकोण से प्रस्तुत किया।

5. वैश्विक परिप्रेक्ष्य में हिंदी साहित्य

मुस्लिम महिला लेखिकाओं के कार्यों ने हिंदी साहित्य को वैश्विक मंच पर पहचान दिलाई। उनकी रचनाओं ने अंतरराष्ट्रीय पाठकों को मुस्लिम महिलाओं के जीवन, संघर्षों, और आकांक्षाओं के बारे में समझने का अवसर दिया। उन्होंने हिंदी साहित्य को एक अंतरराष्ट्रीय आयाम प्रदान किया।

6. शोध और शिक्षा में योगदान

मुस्लिम महिला लेखिकाओं की रचनाएँ शोध और अध्ययन के लिए एक महत्वपूर्ण स्रोत हैं। उनकी कहानियाँ और उपन्यास न केवल साहित्यिक अध्ययन के लिए, बल्कि समाजशास्त्र, मनोविज्ञान, और महिला अध्ययन के लिए भी उपयोगी हैं। उनकी रचनाओं ने शिक्षण और शोध के नए आयाम खोले हैं।

7. साहित्यिक आंदोलन और विमर्श

इन लेखिकाओं ने महिला साहित्य, अल्पसंख्यक साहित्य, और दलित साहित्य के विमर्शों को मजबूती दी। उनकी रचनाएँ इन विमर्शों का अभिन्न हिस्सा बनकर साहित्यिक आंदोलनों को दिशा प्रदान करती हैं।

मुस्लिम महिला कथाकारों का हिंदी साहित्य में योगदान बहुआयामी है। उन्होंने साहित्यिक परंपराओं को तोड़ा और महिलाओं के लिए एक नई पहचान बनाई। उनकी रचनाएँ समाज और साहित्य दोनों के लिए प्रेरणादायक हैं। यह निष्कर्ष निकाला जा सकता है कि मुस्लिम महिला लेखिकाओं ने हिंदी साहित्य को न केवल समृद्ध किया, बल्कि इसे सामाजिक और सांस्कृतिक बदलाव का माध्यम भी बनाया।

भविष्य में, उनका साहित्य और उनके विचार नई पीढ़ी के लेखकों और समाज सुधारकों के लिए प्रेरणा स्रोत बने रहेंगे। उनके योगदान को साहित्य और समाज में उनके वास्तविक स्थान पर मान्यता देना हमारी जिम्मेदारी है।

सुझाव और अनुशंसा (Suggestions and Recommendations)

1. उनकी रचनाओं का अधिक से अधिक प्रचार और अनुवाद।
2. उनकी कहानियों पर आधारित शैक्षणिक पाठ्यक्रमों का निर्माण।
3. उन्हें साहित्यिक मंचों और संगोष्ठियों में अधिक स्थान देना।

भविष्य की संभावनाएँ (Future Scope)

मुस्लिम महिला कथाकारों की रचनाओं का अध्ययन भविष्य में हिंदी साहित्य में नई संभावनाओं और विचारों को जन्म देगा। यह शोध समाज में उनके साहित्यिक योगदान को मान्यता दिलाने में सहायक होगा।

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बांबू शेती -- एक शाश्वत शेती

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सारांश –
भारत हा कृषिप्रधान देश असून शेती हा भारतीय अर्थव्यवस्थेचा कणा आहे. भारताची अर्थव्यवस्था शेतीवर आधारित आहे. जवळजवळ ६७% लोकांचा उदरनिर्वाह हा शेती व्यवसायावर अवलंबून आहे.देशाच्या एकूण अर्थव्यवस्थेत शेती क्षेत्राचे स्थान लक्षात घेता आणि वाढत्या लोकसंखेचा विचार करता शेती करण्याबरोरच शेतीव्यवसायाचे स्वरूप बदलणे हि काळाची गरज आहे. कोणत्याही विकसित देशाचा अभ्यास केल्यास त्या देशाची आर्थिक प्रगती शेती व्यवसायामुळेच झाल्याचे आढळून येते. वाढत्या औद्योगिकीकरणामध्ये शेतीची भूमिका महत्त्वपूर्ण असते. उत्पादन, उत्पादकता, व पिकाचा आकृतीबंध विचारात घेता शेतीचे व्यापारीकरण मोठ्या प्रमाणावर होणे आवश्यक आहे.त्यासाठी शेतीशी संबंधित अनेक पूरक व्यवसाय उदा.पशुपालन, दुग्धोत्पादन, फलोद्यान व्यवसाय,कुक्कुटपालन यांसारख्या जोड व्यवसायबरोबरच अलीकडील काळात बांबू शेती देखील महत्वाची ठरत आहे.बांबू किंवा वेळू ही भारतात उगवणारी एक दैनंदिन जीवनातील बहुपयोगी आयुर्वेदिक औषधी गवतवर्गीय वनस्पती आहे. शाश्वत उपजीविकेच्या निर्मितीसाठी जागतिक पर्यावरणीय मर्यादेत काम करताना भारताला आर्थिक वाढीबरोबरच उच्च दर्जाच्या रोजगार निर्मितीच्या नवीन संधी निर्माण करण्यात बांबू शेतीची भूमिका अनन्यासाधारण आहे.

शोधनिबंधाची उद्दीष्टे —
१) बांबू म्हणजे काय?समजावून घेणे.
२) बांबूशेतीची माहिती जाणून घेणे.
३) बांबूशेतीचे फायदे समजावून घेणे.

संशोधन पद्धती : प्रस्तुत शोध निबंधासाठी दुय्यम सामग्रीचा आधार घेण्यात आला आहे. यासाठी वर्तमानपत्रे, संदर्भ ग्रंथ, मासीके, संकेतस्थळावरील माहितीचा आधार घेण्यात आलेला आहे.

प्रस्तावना-

प्रत्येक राष्ट्रांच्या अर्थव्यवस्थेत शेती क्षेत्राचे स्थान महत्वाचे आहे.बांबू हे एक मोठे वृक्षाच्छादित गवत असून जे पोएसी वर्गात मोडले जाते. हे जगातील उष्णकटिबंधीय आणि सौम्य समशीतोष्ण भागामध्ये मोठ्या प्रमाणात आढळते. ही एक अत्यंत वैविध्यपूर्ण वनस्पती असून कोणत्याही तीव्र हवामान आणि मातीच्या परिस्थितीशी जुळवून घेण्याची क्षमता ठेवते. गवताच्या पोएसी कुलातील ११५ प्रजातींमध्ये बांबूच्या १,४५० पेक्षा अधिक जाती आहेत. बहुतेक बांबू वनीकरणात आढळतात आणि जंगलाबाहेरही मोठ्या प्रमाणात पसरतात. सामान्यत: शेतजमीन, नदीकाठ, रस्त्याच्या कडेला आणि ग्रामीण भागात बांबू हे लाकडाच्या बाहेरील वन-उत्पादनासारखे लांब काठीसारखे आहे आणि कधीकधी लाकडाचा पर्याय म्हणून वापरले जाते. शिवाय,ते जगातील कोणत्याही प्रदेशात आढळते आणि महत्त्वाचे म्हणजे कागद , पॅनेल, बोर्ड, व्हेनियर, फ्लोअरिंग, छप्पर, कापड आणि भाज्या (बांबूचे कोंब) यामध्ये बांबू आर्थिक भूमिका बजावते. तसेच गृहनिर्माण, हस्तकला, लगदा, इ. बांबूची उत्पादने सर्वत्र वापरली जातात. अलीकडील काळात बांबू उद्योग भरभराटीला येत आहेत.

बांबू म्हणजे काय?

- **बांबू किंवा वेळू ही भारतात उगवणारी एक दैनंदिन जीवनातील बहुपयोगी आणि आयुर्वेदिक औषधी गवतवर्गीय वनस्पती आहे. हा पुनर्वसु नक्षत्राचा आराध्यवृक्ष आहे. वनस्पतीशास्त्राच्या वर्गीकरणाप्रमाणे बांबू हे एक प्रकारचे गवतच आहे.**

बांबू पिकाचे वैशिष्ट्य:

हे संपूर्ण भारतात, मैदानी आणि डोंगराळ जंगलात, 1500 ते 2100 मीटरच्या उंचीवर आढळते. जेव्हा बांबू 20 किंवा 30 वर्षांच्या वयापर्यंत पोहोचतो तेव्हा ते सहसा फुलण्यास आणि फळ देण्यास सुरुवात करते. जेव्हा ते फुलते तेव्हा ते खरोखर सुंदर असते. त्याचे उमलणे किंवा नवोदित होणे हे अशुभ मानले जाते.एक प्रकारचे गवत. कांडे असलेले, गोल, बहुधा पोकळ, गुळगुळीत व काष्ठयुक्त खोड हे बांबूचे वैशिष्ट्य आहे. बांबूचा व्यास ३० सेंमी.पर्यंत वाढू शकतो, तर उंची काही सेंमी. ते ४० मी.पर्यंत वाढू शकते. बांबूचे

उगमस्थान आशिया आहे, असे मानतात. जगातील उष्ण ते थंड तापमान असलेल्या प्रदेशांत त्याचा प्रसार झालेला दिसून येतो. भारतात बांबूच्या १० जाती आढळतात. भारताच्या पश्चिम व दक्षिण भागांत तो नैसर्गिकरीत्या वाढलेला आढळतो. गंगेचे खोरे, हिमालयाचा काही भाग व इतर प्रदेशांत त्याची पद्धतशीर लागवड होते. हिमालयात समुद्रसपाटीपासून ३,१०० मी. उंचीपर्यंत तो आढळतो.. महाराष्ट्रात बांबूच्या ऑक्सिटेनँथेरा स्टॉक्साय आणि ऑक्सिटेनँथेरा रिचेयी या दोन जाती प्रामुख्याने आढळतात.

जमिनीत लावलेल्या कंदापासून बांबूची वाढ होते. बांबूच्या पिकाचे वैशिष्ट्य म्हणजे या पिकाला पाणी आणि खते अतिशय कमी प्रमाणात लागतात. तसेच या पिकाची रोगप्रतिबंधक शक्ती जास्त असल्याने पिकासाठी कीटकनाशकांचा वापरसुद्धा कमी होतो.

बांबू पिकाचे फायदे --

बांबू मनुष्याला अतिशय उपयुक्त असून त्याचे अनेक उपयोग आहेत.बांबूमध्ये मॅग्नेशियम, सोडियम, जस्त, तांबे, पोटॅशियम आणि फॉस्फरसचे प्रमाण जास्त असल्याने ते आयुर्वेदिक औषधात उपयुक्त वनस्पती म्हणून वापरले जाते.भारतामध्ये अनेक भागांत बांबूच्या कोवळ्या भागांचा उपयोग श्वसनविकारावर करतात. बांबूची कोवळी पाने गायीगुरांना खाऊ घालतात, तर त्याचे कोवळे भाग शिजवून खातात. कोवळ्या बांबूचे लोणचे घालतात वा त्याची चटणी तयार करतात.

बांबूने तोंडाचे व्रण दूर होतात:

जर कुपोषण किंवा इतर कोणत्याही आजारामुळे तुमच्या तोंडात अल्सर असेल तर बांबू पेस्ट उपचार म्हणून मदत करू शकतात. मधासोबत एकत्र केल्यावर, बनस्लोचन (ज्याला बन्सलोचन के फयडे असेही म्हणतात) तोंडाचे व्रण बरे करण्यासाठी याचा पयोग केल जातो.

बांबूमुळे फुफ्फुसाची जळजळ कमी होते:

बांबूचे गुणधर्म पल्मोनरी एडेमावर उपचार करण्यास मदत करतात. बांबूच्या पानांचा रस काढणे, त्यातील 10-20 मिली खाणे आणि कुस्करल्याने खोकला, घसा खवखवणे आणि फुफ्फुसाची जळजळ कमी होण्यास मदत होते.

बांबू कोरड्या खोकल्याशी संबंधित अस्वस्थता दूर करतो :

बदलत्या हवामानाचा परिणाम होऊन कोरडा खोकला असेल आणि त्यात सुधारणा होत नसेल, तर बांबूचा उपचार म्हणून वापर केल्यास (वंशलोचन चूर्ण) मधासोबत घेतल्याने कफ नाहीसा होतो आणि कोरडा खोकला दूर होतो.

अतिसार दूर करण्यासाठी- जर तुमचा जुलाब बरा होत नसेल आणि तुम्ही खूप मसालेदार, पॅक केलेले किंवा बाहेरचे अन्न खात असाल तर बांबू हे खरोखरच फायदेशीर घरगुती उपाय मदत करते. चीनमध्ये बांबूच्या पानांचा काढा अतिसार व हगवण यांवर देतात.

मूळव्याध वेदना कमी करण्यासाठी

जर तुम्हाला मसालेदार अन्न खाण्याची सवय असेल तर बांबूचा वापर करून मूळव्याध रोगावर घरगुती उपाय

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यशस्वी होतो. बंशपत्र इत्यादी मिश्रणाने मसाज करून मूळव्याध साफ केल्याने त्यांचा त्रास कमी होतो.

मधुमेह बांबूद्वारे नियंत्रित केला जातो:

आजच्या व्यस्त आणि मागणी असलेल्या जगात, खाणे आणि झोपणे हे कोणत्याही मानकांद्वारे नियंत्रित केले जात नाही. परिणामी, मधुमेह अधिक सामान्य होत आहे. वंश याव-व्युत्पन्न पदार्थांचे सेवन केल्याने मधुमेहाचे व्यवस्थापन करण्यास मदत होते.

बांबू मूत्राशयाशी संबंधित समस्यांपासून मदत करते:

लघवी करताना जळजळ होणे किंवा वेदना होणे, अनियमित किंवा कमी वारंवार लघवी होणे इत्यादी अनेक समस्या लघवीच्या आजारांमुळे होऊ शकतात. या आजारात बांबू खरोखरच फायदेशीर ठरतो. 10-20 मिली वनशंकुर आणि वंशमूळ ओतल्याने बिंदुमुत्रकृच्छ्राला फायदा होतो. याशिवाय 2-4 ग्रॅम चूर्ण गोखरू, वंशलोचन आणि साखरेची मिठाई कच्चा दुधात मिसळून घेतल्यास लघवीतील जळजळ कमी होण्यास मदत होते.

मासिक पाळीच्या समस्यांवर उपयुक्त :

मासिक पाळी आणि मासिक पाळी अनेक समस्यांशी निगडीत आहे, जसे की प्रक्रियेदरम्यान वेदना, अनियमित मासिक पाळी, प्रक्रियेदरम्यान रक्तस्त्राव आणि जास्त किंवा अपुरा रक्तस्त्राव. या प्रत्येकासाठी बांबूचे घरगुती उपचार फायदेशीर आहेत. 25 ग्रॅम वंशपत्र आणि 50 ग्रॅम शतपुष्प (बडीशेप) मिक्स करून मिळणारा काश गुळासोबत घेतला जातो. यामुळे मासिक पाळीच्या समस्या कमी होतात.

सूज कमी करण्यासाठी बांबूचा वापर :

एखाद्या आजारामुळे किंवा दुखापतीमुळे तुम्हाला तुमच्या शरीराच्या कोणत्याही भागात सूज येत असल्यास, बाबू हा एक उत्तम घरगुती उपचार आहे. वंश स्प्राउट्स बारीक करा आणि जखमांवर आणि सूजांवर पेस्ट लावा.

बांबू वनस्पती चहा पचनास मदत करते—

बांबूची ताजी पाने कुस्करून चहा बनवता येतो.हे निरोगी पेय पचन सुधारण्यास मदत करते
आणि हे कोलेस्टेरॉलची पातळी नियंत्रित करण्यास आणि रक्तप्रवाह शुद्ध करण्यास देखील मदत करते.

त्याचबरोबर बांबूचे अनेकविध फायदे आहेत जसे कि, कठीण पाठीचे बांबू भक्कम व टिकाऊ असल्यामुळे ते बांधकामासाठी उपयोगी पडतात. मांडव व पराती बांधण्यासाठी बांबू वापरतात. टोमॅटोसारख्या वनस्पतींना आधार द्यावयाच्या काठ्या, मासेमारीसाठी लागणाऱ्या काठ्या तसेच कुंपण, लाठ्या, खुंटा इत्यादींसाठी लहान व बारीक बांबू वापरतात. बुरुडकामात बांबूचा मोठा वापर होत असून टोपल्या, करंड्या, हारे, सुपे, कणग्या, पंखे, चटया, पडदे इ. वस्तू त्यापासून तयार करतात. पतंगाच्या कामट्या व फिरक्या अशा काही वस्तू त्यापासून बनवितात. जहाज बांधणीतही बांबू वापरतात; उदा., डोलकाठ्या, वल्ही, तराफे वगैरे. कठीण बांबूपासून सुऱ्या, तसेच इतर हत्यारे तयार करतात. त्यापासून स्वयंपाकघरातील काही साधने व फर्निचर तयार करतात. संपूर्ण घर, अंतर्गत सजावट, जमीन, छत, वासे, विभाजक पडदे, सजावटीचे सामान इत्यादींसाठी बांबू वापरतात. त्यापासून तक्ते, फळयाही बनवितात. चपला, बूट, पेन, नळया, दारे, छत्र्यांचे दांडे, धनुष्यबाण, बैलगाड्या आणि कोंबड्यांचे व डुकरांचे पिंजरे तयार करण्यासाठी बांबू वापरतात. कागद तयार करण्यासाठी त्यांचा उपयोग मोठ्या प्रमाणावर होतो. भारतात बांबूच्या सहाय्याने बासरी तसेच जावा व इंडोनेशिया येथे बासरी व झायलोफोनसारखे वाद्य बनविण्यासाठी तर चीनमध्ये उच्च दर्जाचा कागद बनविण्यासाठी बांबूच्या आतील नरम व मऊ भाग वापरतात. जपानमध्ये बांबूचा उपयोग नळाप्रमाणे करतात तर शोभेसाठी कमी उंचीचा बांबू कुंडीत लावतात. त्याची हिरवी व दाट पाने सुंदर दिसतात. चीन आणि जपान या देशांत ३-३·५ मी. उंचीचे व ३ सेंमी.पर्यंत चौरसाकृती छेदाचे बांबूचे खास पीक घेतात. असे बांबू मंदिरांचे सभामंडप व बागा यांमध्ये शोभेसाठी वापरतात. असे अनेक उपयोग बांबूचे असतात.

निष्कर्ष –अशा प्रकारे अलीकडील कळात बांबू शेतीचे महत्व जोड-व्यवसाय म्हणून दिवसेंदिवस वाढत आहे. बांबूच्या झाडांमुळे हवेची गुणवत्ता सुधारते, उत्पादकता वाढते तसेच आर्थिक वाढीबरोबरच उच्च दर्जाच्या रोजगार निर्मितीच्या नवीन संधी निर्माण करण्यात बांबू शेतीची भूमिका अनन्यासाधारण आहे त्यामुळे बांबू शेती एक शाश्वत शेती म्हणून समाजामध्ये जनजागृती होणे गरजेचे आहे.

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प्रस्तावना

नॅशनल पॉलिसी ऑन एज्युकेशन (NPE) हे भारतातील शिक्षणाचा प्रचार आणि नियमन करण्यासाठी भारत सरकारने तयार केलेले धोरण आहे. या धोरणात ग्रामीण आणि शहरी भारतातील प्राथमिक शिक्षण ते उच्च शिक्षणाचा समावेश आहे. पहिले NPE भारत सरकारने 1968 मध्ये पंतप्रधान इंदिरा गांधी यांनी, दुसरे पंतप्रधान राजीव गांधी यांनी 1986 मध्ये, तिसरे पंतप्रधान पीव्ही नरसिंह राव यांनी 1992 मध्ये आणि चौथे 2020 मध्ये पंतप्रधान नरेंद्र मोदी यांनी जाहीर केले होते. 1947 मध्ये देशाला स्वातंत्र्य मिळाल्यापासून, भारत सरकारने ग्रामीण आणि शहरी भारतातील निरक्षरतेच्या समस्या सोडवण्यासाठी विविध कार्यक्रम प्रायोजित केले. भारताचे पहिले शिक्षण मंत्री मौलाना अबुल कलाम आझाद यांनी एकसमान शैक्षणिक प्रणालीसह संपूर्ण देशभरातील शिक्षणावर केंद्र सरकारच्या मजबूत नियंत्रणाची कल्पना केली. केंद्र सरकारने भारताच्या शिक्षण प्रणालीचे आधुनिकीकरण करण्यासाठी प्रस्ताव विकसित करण्यासाठी विद्यापीठ शिक्षण आयोग (1948-1949), माध्यमिक शिक्षण आयोग (1952-1953), विद्यापीठ अनुदान आयोग आणि कोठारी आयोग (1964-66) ची स्थापना केली. भारताचे पहिले पंतप्रधान जवाहरलाल नेहरू यांच्या सरकारने वैज्ञानिक धोरणाचा ठराव स्वीकारला होता.

1961 मध्ये, केंद्र सरकारने राष्ट्रीय शैक्षणिक संशोधन आणि प्रशिक्षण परिषद (NCERT) एक स्वायत्त संस्था म्हणून स्थापन केली जी केंद्र आणि राज्य सरकारांना शैक्षणिक धोरणे तयार करण्यासाठी आणि त्यांची अंमलबजावणी करण्यासाठी सल्ला देईल. 2019 मध्ये, तत्कालीन शिक्षण मंत्रालयाने नवीन शैक्षणिक धोरण 2019 चा मसुदा जारी केला, ज्यानंतर अनेक सार्वजनिक सल्लामसलत करण्यात आली. आवश्यक शिक्षण, गंभीर विचार आणि अधिक समग्र अनुभवात्मक, चर्चा-आधारित आणि विश्लेषण-आधारित शिक्षण वाढविण्यासाठी अभ्यासक्रमातील सामग्री कमी करण्यावर चर्चा करते. 'राष्ट्रीय शिक्षण धोरण, 2020' हे ज्येष्ठ वैज्ञानिक डी. के. कस्तुरीनंदन यांच्या अध्यक्षतेखाली तयार करण्यात आले. 29 जुलै 2020 रोजी, मंत्रिमंडळाने विद्यमान भारतीय शिक्षण व्यवस्थेत अनेक बदल आणण्याच्या उद्देशाने नवीन राष्ट्रीय शैक्षणिक धोरण मंजूर केले.

व्यावसायिक शिक्षण व तंत्रज्ञान

नॅशनल एज्युकेशनल टेक्नॉलॉजी फोरम (एनईटीएफ) ही एक स्वायत्त संस्था तयार केली जाईल ज्यायोगे शिक्षण, मूल्यांकन, नियोजन, प्रशासन वाढविण्यासाठी तंत्रज्ञानाचा वापर करण्यावर विचारांची मुक्त देवाणघेवाण होऊ शकेल. शिक्षणाच्या सर्व स्तरांमध्ये तंत्रज्ञानाचे योग्य एकत्रिकरण, वर्ग प्रक्रिया सुधारण्यासाठी, शिक्षकांच्या व्यावसायिक विकासास समर्थन देण्यासाठी, वंचित गटांसाठी शैक्षणिक प्रवेश वाढविण्यासाठी आणि शैक्षणिक नियोजन, प्रशासन आणि व्यवस्थापन सुव्यवस्थित करण्यासाठी केले जाईल. दीक्षा / स्वेयम यासारख्या तंत्रज्ञानावर आधारित शिक्षण प्लॅटफॉर्मचे शाळा आणि उच्च शिक्षणामध्ये अधिक चांगले एकत्रिकरण केले जाईल. विघटनकारी तंत्रज्ञानावर संशोधन करण्यात आणि अत्याधुनिक कार्यक्षेत्राच्या / डोमेनच्या ऑनलाइन अभ्यासक्रमांसह अध्यापन साहित्य आणि अभ्यासक्रम तयार करण्यात उच्च शिक्षण संस्था सक्रिय भूमिका बजावतील. सर्व व्यावसायिक शिक्षण उच्च शिक्षण प्रणालीचा अविभाज्य भाग असेल. एकल तांत्रिक विद्यापीठे, आरोग्य विज्ञान विद्यापीठे, कायदा व कृषी विद्यापीठे किंवा या किंवा इतर क्षेत्रातील संस्था बहु-अनुशासन संस्था बनण्याचे लक्ष्य ठेवतील.

प्रेरीत, उत्साही आणि सक्षम शिक्षक

एनईपी २०२० हे मान्य करते की उच्च शिक्षण संस्थांचे यश हे संस्थांतील शिक्षकांची गुणवत्ता आणि प्रतिबद्धता यावर अवलंबून आहे. उच्च शिक्षण संस्थांमध्ये प्राध्यापक भरतीसाठी स्पष्टपणे परिभाषित, स्वतंत्र आणि पारदर्शक प्रक्रिया आणि निकष असतील. प्राध्यापकांना

त्यांच्या स्वतः च्या अभ्यासक्रम आणि शैक्षणिक दृष्टिकोनाची मंजूर चौकटीत रचना करण्याचे स्वातंत्र्य दिले जाईल. योग्य पुरस्कार, पदोन्नती, मान्यता आणि संस्थात्मक नेतृत्वात बदलाद्वारे उत्कृष्टतेस प्रोत्साहित केले जाईल. मूलभूत निकषांवर कार्य न करणाऱ्या प्राध्यापकांना जबाबदार धरले जाईल.

उच्च शिक्षण संस्थांमधील प्रभावी शासन आणि नेतृत्व

१५ वर्षांच्या कालावधीत टप्प्याटप्प्याने श्रेणीबद्ध मान्यता आणि श्रेणीबद्ध स्वायत्ततेच्या योग्य प्रणालीद्वारे, भारतातील सर्व उच्च शिक्षण संस्थांचे नावीन्य आणि उत्कृष्टतेसाठी कार्यरत स्वतंत्र स्वराज्य संस्था बनण्याचे लक्ष्य आहे. उच्च गुणवत्तेचे नेतृत्व सुनिश्चित करण्यासाठी आणि उत्कृष्ट संस्थात्मक संस्कृतीचा प्रचार करण्यासाठी उच्च शिक्षण संस्थांत उपाययोजना केल्या जातील. स्वायत्ततेवर आधारित शैक्षणिक, प्रशासकीय आणि आर्थिक संस्थात्मक प्रशासन ज्याची कल्पना प्रत्येक उच्च शिक्षण संस्थेत असते तेथे एक प्रशासकीय मंडळ / बोर्ड ऑफ गव्हर्नर्स असते. सर्व नेतृत्व आणि संस्था प्रमुख पदे उच्च शैक्षणिक पात्रता आणि प्रशासकीय व नेतृत्व क्षमता तसेच गंभीर परिस्थिती व्यवस्थापित करण्याची क्षमता असलेल्या व्यक्तींना ऑफर केले जातील.

भारतीय भाषा, कला आणि संस्कृतीला प्रोत्साहन

भारत हा हजारो वर्षांच्या कालावधीत विकसित झालेल्या आणि कला, साहित्य, रूढी, परंपरा, भाषिक अभिव्यक्ती, प्राचीन वस्तू, वारसा स्थळे आणि इतर अनेक स्वरूपांत व्यक्त झालेल्या संस्कृतीचा खजिना आहे. जगभरातील कोट्यवधी लोक, पर्यटनासाठी भारताला भेट देणे, भारतीय पाहुणचाराचा अनुभव घेणे, भारतीय हस्तकलेच्या वस्तू व हस्तनिर्मित वस्त्रे खरेदी करणे, अभिजात भारतीय साहित्य वाचणे, योग व ध्यान करणे, भारतीय तत्त्वज्ञानाने प्रेरित होणे, आगळ्या-वेगळ्या अशा भारतीय सणांमध्ये सहभागी होणे, भारतातील विविध संगीत आणि कलांचा आनंद लुटणे आणि भारतीय चित्रपट पाहणे अशा इतर अनेक प्रकारे या सांस्कृतिक खजिन्याचा दररोज आस्वाद घेत असतात आणि यापासून लाभ करून घेतात. ही सांस्कृतिक आणि नैसर्गिक संपत्तीच भारताला त्याच्या पर्यटन घोषणेनुसार खरोखर "अतुल्य भारत!" बनवते. भारताच्या सांस्कृतिक संपत्तीचे जतन आणि प्रचार करणे ही देशाची उच्च प्राथमिकता असणे आवश्यक आहे, कारण देशाची ओळख तसेच अर्थव्यवस्थेसाठी हे खऱ्या अर्थाने महत्वाचे आहे.

मातृभाषेतून शिक्षण

मातृभाषेतील शिक्षणाला प्रतिष्ठा प्राप्त करून देण्याचे आव्हान आहे. शिक्षणाचा संबंध नोकरीशी आहे. इंग्रजी भाषेला प्रतिष्ठा आहे. त्यामुळे इंग्रजी भाषेचे महत्त्व समाजमनात रूजले आहे. त्याचवेळी मराठी भाषेचे महत्त्व कसं रुजविणार, हा खरा प्रश्न आहे. आपल्याला संस्कृत आणि इतर राज्यांच्या भाषा शिकण्याची संधी आहे. राज्यात कोणत्या भाषा शिकवल्या जाणार, कोणत्या भाषेला पर्याय म्हणून येणार? त्या विषयांसाठीची अध्यापन सुविधा, त्यासंबंधीचे धोरणदेखील यायला हवे. त्यासंदर्भातील विषय सूची जाहीर झालेली नाही. सध्या बोलीभाषा हा शिक्षणात अडथळा वाटतो. मात्र, भाषेसंदर्भातील धोरणातील भूमिका अत्यंत स्वागतार्ह आहे. त्यामुळे ग्रामीण, वनवासी, डोंगरी भागातील विद्यार्थ्यांचे शिकणे होण्यास मदत होणार आहे. भाषेमुळे शिकणे होण्यास मदत होणार आहे.

भारतीय कला व संस्कृतीचा प्रचार

केवळ देशासाठीच नाही तर प्रत्येक व्यक्तीसाठीही महत्त्वाचा आहे. मुलांमध्ये ओळखीची, आपलेपणाची, तसेच इतर संस्कृती आणि ओळखींचे कौतुक करण्याची भावना निर्माण करण्यासाठी, त्यांच्यामध्ये सांस्कृतिक जागरूकता आणि अभिव्यक्ती यासारख्या प्रमुख क्षमता विकसित करणे महत्त्वाचे आहे. स्वतःचा सांस्कृतिक इतिहास, कला, भाषा आणि परंपरांविषयी दृढ भावना आणि ज्ञान यांच्या विकासामुळेच मुलांमध्ये सकारात्मक सांस्कृतिक ओळख आणि आत्मसन्मान वाढू शकतो. अशा प्रकारे, वैयक्तिक तसेच सामाजिक कल्याण या दोहोंसाठी सांस्कृतिक जागरूकता आणि अभिव्यक्ती यांचे योगदान महत्त्वपूर्ण आहे.

ऑनलाईन आणि डिजिटल शिक्षण

नवीन परिस्थिती आणि वास्तविकता यासाठी नवीन उपक्रमांची गरज असते. सध्या वाढत असलेले साथीचे रोग आणि महामारीची परिस्थिती लक्षात घेता, जेव्हा कधी आणि जिथे कुठे पारंपरिक आणि प्रत्यक्ष शिकवण्याच्या माध्यमांचा वापर शक्य नसेल, तेव्हा दर्जेदार शिक्षणाची पर्यायी माध्यमे तयार ठेवणे गरजेचे झाले आहे. या संदर्भात, तंत्रज्ञानामुळे मिळणाऱ्या फायद्यांचा लाभ घेण्याचे महत्त्व राष्ट्रीय शिक्षण धोरण 2020 ने मान्य करत, तंत्रज्ञानाशी संबंधित जोखमा आणि धोक्यांचीसुध्दा दखल घेतली आहे. ऑनलाईन शिक्षणातील तोटे दूर करत किंवा त्यांचे निराकरण करत, ऑनलाईन शिक्षणाचे फायदे कशा प्रकारे मिळवता येतील हे निश्चित करण्यासाठी, काळजीपूर्वकपणे तयार केलेल्या आणि योग्यरितीने प्रमाणबद्ध केलेल्या पथदर्शी अभ्यासाची (पायलट स्टडी) गरज आहे. या दरम्यान, सर्वांसाठी दर्जेदार शिक्षण उपलब्ध करून देण्यातील वर्तमान आणि भविष्यातील आव्हानांचा सामना करण्याकरता, विद्यमान डिजिटल प्लॅटफॉर्म्स आणि ICT-आधारित शैक्षणिक उपक्रमांचा दर्जा वाढवावा लागेल आणि त्यांचा विस्तार करावा लागेल.

प्रभावी ऑनलाईन प्रशिक्षक होण्यासाठी शिक्षकांना योग्य प्रशिक्षण आणि विकासाची गरज आहे. पारंपरिक वर्गातील एक चांगला शिक्षक ऑनलाईन वर्गातदेखील

तेवढीच चांगली कामगिरी करेल असे गृहित धरता येणार नाही. अध्यापनशास्त्रातील आवश्यक बदलांव्यतिरिक्त, ऑनलाईन मूल्यांकनासाठीदेखील वेगळ्या दृष्टिकोनाची गरज आहे. मोठ्या प्रमाणावर ऑनलाईन पद्धतीने परीक्षा आयोजित करण्यात अनेक आव्हाने आहेत जसे की, ऑनलाईन पद्धतीने विचारता येऊ शकणाऱ्या प्रश्नांच्या प्रकारांवर मर्यादा, नेटवर्क आणि बीजपुरवठा खंडित होणे, आणि परीक्षेतील अनैतिक प्रकार रोखणे, ऑनलाईन/डिजिटल शिक्षणाच्या अवकाशात, ललित कला आणि विज्ञान प्रात्यक्षिके अशा काही विशिष्ट प्रकारच्या अभ्यासक्रम/विषयांना मर्यादा आहेत, ज्यांवर नाविन्यपूर्ण उपायांनी काही प्रमाणात मात करता येऊ शकेल.

समारोप

राष्ट्रीय शैक्षणिक धोरण, 2020 (NEP) द्वारे शिक्षणामध्ये मोठ्या प्रमाणावर परिवर्तनाची कल्पना केली जाते "भारतीय लोकभावनेत रुजलेली एक शिक्षण प्रणाली जी भारताच्या, म्हणजे भारताला, शाश्वतपणे एक समान आणि दोलायमान ज्ञान समाजात बदल करण्यास थेट योगदान देते, उच्च दर्जाचे शिक्षण देऊन. सर्व, त्याद्वारे भारत जागतिक ज्ञान महासत्ता बनतो. NEP 2020 ची स्थापना प्रवेश, समानता, गुणवत्ता, परवडणारी आणि जबाबदारी या पाच मार्गदर्शक स्तंभांवर केली गेली आहे. हे वर्तमान आणि भविष्यातील विविध राष्ट्रीय आणि जागतिक आव्हानांना तोंड देण्यासाठी आपल्या तरुणांना तयार करेल. राष्ट्रीय शिक्षण धोरणात सर्वांना समान शिक्षण, समानता, गुणवत्ता, परवडणारे शिक्षण आणि उत्तरदायित्व या पाच स्तंभाचा विचार केला आहे. शिक्षण धोरणात अत्यंत व्यापक दृष्टिकोन राखण्यात आला. आपली संस्कृती आणि उद्याचे भविष्य यांचा संगम घालण्याचा प्रयत्न आहे. शिक्षण आनंददायी करण्याबरोबर ते जीवनाभिमुख आणि अधिक रोजगाराभिमुख करण्यावर भर देण्यात आला आहे. धोरण सशक्त आणि समर्थ शिक्षण व्यवस्था उभी करणारे आहे.

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नवीन शैक्षणिक धोरण : एक दृष्टीक्षेप

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राष्ट्रीय शैक्षणिक धोरण, 2020 (NEP) द्वारे शिक्षणामध्ये मोठ्या प्रमाणावर परिवर्तनाची कल्पना केली आहे. "भारतीय लोकभावनेत रुजलेली एक शिक्षण प्रणाली जी भारताच्या, म्हणजे भारताला, शाश्वतपणे एक समान आणि दोलायमान ज्ञान समाजात बदल करण्यास थेट योगदान देते, उच्च दर्जाचे शिक्षण देऊन. त्याद्वारे भारत जागतिक ज्ञान महासत्ता बनतो. शालेय शिक्षणात, राष्ट्रीय शैक्षणिक धोरण 2020 मूलभूत मूल्यांवर आणि तत्त्वावर भर देते की शिक्षणाने केवळ संज्ञानात्मक कौशल्ये विकसित केली पाहिजेत, म्हणजे - साक्षरता आणि संख्याशास्त्राची 'पायाभूत कौशल्ये' आणि गंभीर विचारसरणीसारखी 'उच्च-क्रम' कौशल्ये. आणि समस्या सोडवणे - परंतु, सामाजिक आणि भावनिक कौशल्ये - ज्याला 'सॉफ्ट स्किल्स' देखील म्हणतात - यामध्ये सांस्कृतिक जागरूकता आणि सहानुभूती, चिकाटी आणि धैर्य, नेतृत्व, संप्रेषण इत्यादींचा समावेश आहे. हे धोरण पूर्व-प्राथमिक शिक्षणाचे सार्वत्रिकीकरण करण्याचे उद्दिष्ट आणि आकांक्षा ठेवते आणि 2025 पर्यंत प्राथमिक शाळा आणि त्यापुढील सर्वांसाठी मूलभूत साक्षरता/संख्या प्राप्त करण्यावर विशेष भर देते.

भारताच्या परंपरा, संस्कृती आणि मूल्य प्रणालीसह 21 व्या शतकातील शिक्षणाच्या महत्त्वाकांक्षी उद्दिष्टांशी सुसंगत असलेली एक नवीन प्रणाली तयार करण्यासाठी शाळेचे नियमन आणि प्रशासनासह शैक्षणिक संरचनेच्या सर्व पैलूंमध्ये सुधारणा आणि सुधारणा सुचवते. या धोरणात शालेय शिक्षणाच्या सर्व टप्प्यांवर गुणवत्तापूर्ण शिक्षणावर भर देण्यात आला आहे. दर्जेदार शिक्षण हे केवळ जीवन बदलणारे नाही, तर मनाला कलाटणी देणारा आणि चारित्र्य घडवणारा अनुभव आहे, ज्याचा नागरिकत्वावर सकारात्मक परिणाम होतो. सशक्त विद्यार्थी केवळ देशाच्या वाढत्या विकासात्मक गरजांमध्येच योगदान देत नाहीत तर एक न्याय्य आणि न्याय्य समाज निर्माण करण्यातही सहभागी होतात.

उच्च शिक्षणामध्ये, NEP, 2020 शिक्षणाच्या विविध पैलूंवर मौल्यवान अंतर्दृष्टी आणि शिफारशी प्रदान करते ज्यात बहुविद्याशाखीय आणि सर्वांगीण शिक्षणाकडे वाटचाल, संस्थात्मक स्वायत्तता, राष्ट्रीय संशोधन प्रतिष्ठानच्या स्थापनेद्वारे दर्जेदार संशोधनाला चालना, शिक्षकांचा सतत व्यावसायिक विकास, तंत्रज्ञानाचे एकत्रीकरण, उच्च शिक्षणाचे आंतरराष्ट्रीयीकरण, शासनाची पुनर्रचना आणि नियामक संरचना, बहुविद्याशाखीय अभ्यासक्रम, आकर्षक मिश्रित, अध्यापनशास्त्र, वैध विश्वसनीय आणि मिश्रित मूल्यांकन आणि भारतीय भाषांमधील सामग्रीची उपलब्धता. या धोरणामुळे शिक्षण व्यवस्थेवर दीर्घकाळ सकारात्मक प्रभाव पडेल आणि 2047 मध्ये विकसित भारतापर्यंत पुढच्या 25 वर्षात 'अमृत काल' दरम्यान भारताला कुशल मनुष्यबळाचे जागतिक केंद्र बनवण्याची अपेक्षा आहे.

प्रस्तावना:-

राष्ट्रीय शैक्षणिक धोरण 2020 मध्ये स्थापन करण्यात आले. ते 2023-24 या शैक्षणिक वर्षात अस्तित्वात आले, त्यामुळे ते NEP 2023 म्हणून लोकप्रिय झाले. नवीन राष्ट्रीय शैक्षणिक धोरण 2023 देशासाठी एक नवीन सर्वांगीण शिक्षण व्यवस्थेची गंभीरपणे कल्पना करते, ज्यामध्ये आधुनिक प्रशिक्षण पद्धतींचा प्रभावी अवलंब करणे, तंत्रज्ञानाचा वापर करणे आणि विद्यार्थ्यांच्या एकूण व्यक्तिमत्त्वाला आकार देण्यासाठी व्यावहारिक आणि समकालीन कौशल्ये प्रदान करणे यावर अवलंबून आहे. कोणत्याही राष्ट्राचे भविष्य हे शिक्षण धोरणावर अवलंबून असते. आर्थिक, सामाजिक, सांस्कृतिक विकासाची प्रक्रिया शिक्षणातून उभी राहत असते. राष्ट्रासाठीचे शिक्षण धोरण हे राष्ट्राच्या भविष्यासाठी विकासाचा एक मार्ग असतो. त्यामुळे शिक्षण धोरण आखताना ते भविष्यवेधी असायला हवे. शिक्षण धोरण म्हणजे त्या देशाची भविष्याची विकासाची दिशा असते. भारत सरकारने 21व्या शतकातील पहिले शिक्षण धोरण जाहीर केले. 1984च्या धोरणानंतर 34 वर्षांने नवीन शैक्षणिक धोरण आले आहे आणि सध्या या धोरणावर मोठी चर्चा सुरू आहे. शिक्षण हे जीवन परिवर्तनाचे

प्रभावी साधन आहे, यावर शिक्कामोर्तब झाल्याने समाजमनही शिक्षणासंदर्भाने अधिक जागृत होत असल्याचे अधोरेखित होते.केंद्राने धोरण तयार केल्यानंतर ते स्वीकारण्याची प्रक्रिया अनेक राज्यांनी केली आहे. काही राज्यांनी त्याला विरोध केला आहे.

NEP 2023 ठळक मुद्दे :-

नॅशनल एज्युकेशन पॉलिसी 2023 नुसार मॉडेलचे संक्रमण पुढीलप्रमाणे शिक्षणाच्या टप्प्यांचे पुनर्वर्गीकरण करून अंमलात आणले जाईल:-

१.पायाभूत टप्पा: पाया घालण्याचा मूलभूत टप्पा जो पुढे दोन उपटप्प्यांमध्ये वर्गीकृत केला जातो: 3 वर्षे प्रीस्कूल किंवा अंगणवाडी, त्यानंतर प्राथमिक शाळेतील इयत्ता 1 आणि 2. हे मूलत: 3 ते 8 वर्षांच्या मुलांचा समावेश करते. क्रियाकलाप-आधारित शिक्षणावर लक्ष केंद्रित केले जाईल.

२.तयारीचा टप्पा: इयत्ता 3-5 च्या विद्यार्थ्यांना आणि वयोगटातील, 8-10 वर्षे कव्हर करणे. विद्यार्थ्यांना बोलणे, वाचन, लेखन, शारीरिक शिक्षण, कला, विज्ञान, भाषा आणि गणित या मूलभूत शिकण्याच्या पैलूंशी सतत संपर्क साधला जाईल.

३.मध्यम टप्पा: हा टप्पा 11 आणि 13 वयोगटातील इयत्ता 6 ते 8 च्या विद्यार्थ्यांना समाविष्ट करतो. हे विद्यार्थ्यांना गणित, विज्ञान, सामाजिक विज्ञान, कला आणि मानविकी मधील अधिक अमूर्त संकल्पनांची ओळख करून देईल.

४.माध्यमिक टप्पा: इयत्ता 9 ते 12, 14-18 वर्षे वयोगटातील. हे दोन भागांमध्ये उपवर्गीकृत केले आहे: वर्ग 9 आणि 10, पहिल्या टप्प्यात, तर वर्ग 11 आणि 12, दुसरा टप्पा कव्हर करतात. या 4 वर्षांच्या अभ्यासाचा हेतू सखोल आणि गंभीर विचारसरणीद्वारे चालवलेले बहु-विषय शिक्षण विकसित करण्याचा आहे.

५.NEP 2023 परीक्षा संरचना :-सुधारित परीक्षा रचना: विद्यार्थी आता इयत्ता 2, 5 आणि 8 मधील परीक्षांमध्ये सक्रियपणे सहभागी होतील. यामुळे मुल्यांकनांचे ओझे आणि कालावधी कमी होतो ज्यामुळे मुलांना सतत दडपण येते, परीक्षा-पद्धतीची तयारी सर्वांगीण शिक्षणावर जास्त प्रभाव पाडते. इयत्ता 10 आणि 12 च्या बोर्ड परीक्षांमध्ये लक्षणीय बदल होईल, जिथे द्विवार्षिक मोड स्वीकारला जाईल आणि वस्तुनिष्ठ-वर्णनात्मक स्वरूप केंद्रस्थानी असेल. अशा प्रकारे नवीन शैक्षणिक धोरण 2023 चे उद्दिष्ट विद्यार्थ्यांवरील अभ्यासक्रमाचे ओझे कमी करणे आणि ते अधिक 'आंतर-विषय आणि बहुभाषिक' असेल. सुधारणा परीक्षांच्या मॉडेलपासून सुरू होतात.

६.मातृभाषेचे संवर्धन:-नवीन शैक्षणिक धोरण 2023 चा कोनशिला म्हणजे मातृभाषेतील शिक्षणाला दिलेले महत्त्व. इयत्ता 5 पर्यंत, शिक्षणाचे माध्यम मातृभाषा असेल, भविष्यात ती इयत्ता 8 पर्यंत वाढवण्याची संधी असेल. एका राष्ट्रीय वादाच्या भोवऱ्यात जिथे सरकारे अगदी प्राथमिक शालेय स्तरापासून इंग्रजीला शिक्षणाचे माध्यम म्हणून उत्कटतेने प्रोत्साहन देताना दिसतात, तिथे हे भाषिक पायावर बांधलेल्या शिक्षणाची महत्त्वपूर्ण बाजू प्रकट करते. तरतुदीचा उद्देश विद्यार्थ्यांची आकलन क्षमता वाढवणे आणि शिक्षकांशी अधिक प्रभावी संवादाचा प्रवाह सक्षम करणे, मजबूत बंध निर्माण करणे आणि एखाद्याच्या सांस्कृतिक मुळाशी आणि पार्श्वभूमीशी चांगले जोडलेले राहणे आहे. या प्रोत्साहनाद्वारे, NEP 2023 ची भाषा प्राविण्य वाढवण्याचा आणि विद्यार्थ्यांच्या या पिढीला भेडसावणाऱ्या सांस्कृतिक अडचणी दूर करण्याचा मानस आहे.

७.आंतरविद्याशाखीय अभ्यासक्रम:-NEP 2023 आंतरविद्याशाखीय आणि बहुभाषिक शिक्षणास प्रोत्साहन देते, लवचिक अभ्यासक्रमाच्या जाहिरातीला प्रोत्साहन देते जे विविध कौशल्यांचे पालनपोषण करते आणि ज्ञानाच्या अखंड प्राप्तीला प्रोत्साहन देते. परिवर्तन हा नवीन शैक्षणिक धोरण 2023 ला चालविणारा मंत्र आहे.

८.कोडिंग आणि प्रायोगिक शिक्षण:-काळानुरूप बदल केल्याने, 6 व्या इयत्तेमध्ये कोडिंग हा अभ्यासक्रमाचा अविभाज्य भाग बनेल आणि प्रायोगिक शिक्षण पद्धती एकत्रित करून, व्यावहारिक आणि अनुभवात्मक समज यावर अधिक भर दिला जाईल.

९.आरोग्य भर :-राष्ट्रीय शैक्षणिक धोरण 2023 मध्ये विद्यार्थ्यांच्या आरोग्य आणि मानसिक आरोग्याला प्राधान्य देण्यासाठी समुपदेशक आणि सामाजिक कार्यकर्त्यांना जोडून नाश्ता समाविष्ट करण्यासाठी मध्यान्ह भोजन योजनेचा विस्तार केला आहे.

१०.उच्च शिक्षण सुधारणा:-मल्टीडिसिप्लिनरी बॅचलर डिग्री: एक लवचिक 4-वर्षांचा अंडरग्रेजुएट प्रोग्राम ज्यामध्ये एकापेक्षा जास्त एक्झिट पॉइंट्स (प्रमाणपत्र, डिप्लोमा, बॅचलर) आहेत जे विद्यार्थ्यांना विशिष्ट कौशल्य सेटमध्ये पूर्णपणे प्रावीण्य मिळवण्यास मदत करतात.

११.एम.फिल. अभ्यासक्रम:-उच्च शिक्षण आयोग: NEP 2023 अंतर्गत, भारताचा उच्च शिक्षण आयोग उच्च

शिक्षणाचे नियमन आणि व्यवस्थापन करण्यासाठी कार्य करेल जे नावनोंदणी गुणोत्तरांवर सक्रियपणे कार्य करते आणि उच्च शैक्षणिक मानके सुनिश्चित करतात.

१२.नियामक परिषद: राष्ट्रीय शैक्षणिक धोरण 2023 नुसार, राष्ट्रीय उच्च शिक्षण नियामक परिषद उच्च शिक्षणावर देखरेख करेल (यामध्ये वैद्यकीय आणि कायदेशीर शिक्षण वगळले आहे). तसेच, उच्च शिक्षण अनुदान परिषद विद्यापीठे आणि महाविद्यालयांना आर्थिक मदत करेल, अशा प्रकारे विद्यमान संस्था प्रभावीपणे बदलेल.

१३.आंतरराष्ट्रीयीकरण: विदेशी विद्यापीठे आणि संस्थांना भारतात कॅम्पस आणि केंद्रे स्थापन करण्याची परवानगी देऊन हे धोरण आंतरराष्ट्रीय सहकार्याला चालना देते. विद्यार्थ्यांसाठी जास्तीत जास्त आंतरराष्ट्रीय एक्सपोजर हा यामागचा उद्देश आहे.

१४.फी नियमन: खाजगी आणि सार्वजनिक दोन्ही विद्यापीठे दर्जेदार शिक्षणासाठी समान प्रवेश प्राप्त करण्यासाठी, नियमन केलेल्या शुल्काची खात्री करतील.

१५.कॉलेज संलग्नता: 15 वर्षांत टप्प्याटप्प्याने बंद केली जाईल, महाविद्यालयांना स्वायत्त दर्जा दिला जाईल.

१६.जिल्हा-स्तरीय विद्यापीठे: 2030 पर्यंत देशातील प्रत्येक जिल्ह्यात किमान एक उच्च-गुणवत्तेची बहुविद्याशाखीय संस्था स्थापन केली जाईल, ज्यामुळे शिक्षणात व्यापक प्रवेश मिळेल.

१७.बहुविद्याशाखीय विद्यापीठे: सर्व विद्यापीठे 2040 पर्यंत मोठ्या बहुविद्याशाखीय संस्थांमध्ये पदवीधर होतील, सर्वांगीण शिक्षणासाठी गंतव्यस्थान बनतील.

NEP 2023 शिक्षक आणि शिक्षक धोरणातील बदल:-

NEP 2020 मध्ये शिक्षक आणि शिक्षक शिक्षणाच्या संदर्भात काही महत्त्वपूर्ण धोरणात्मक बदल सूचीबद्ध केले आहेत. शिक्षक होण्यासाठी पात्रतेचे निकष स्पष्टपणे घालण्यात आले आहेत. यामध्ये 2030 पर्यंत आवश्यक असलेली किमान गरज म्हणून 4 वर्षांच्या बॅचलर ऑफ एज्युकेशनचा समावेश आहे. नवीन राष्ट्रीय शैक्षणिक धोरण 2023 अंतर्गत, शिक्षक भरतीची प्रक्रिया मजबूत केली जात आहे आणि प्रणालीमध्ये अधिक पारदर्शकता आणि समानता आणली जात आहे. 2021 पर्यंत शिक्षक शिक्षणासाठी राष्ट्रीय अभ्यासक्रम फ्रेमवर्क आणि 2022 पर्यंत शिक्षकांसाठी राष्ट्रीय व्यावसायिक मानके तयार करण्याची जबाबदारी राष्ट्रीय शिक्षक शिक्षण परिषदेवर असेल.

- **नवीन राष्ट्रीय शैक्षणिक धोरण 2023 – ते राष्ट्रीय शैक्षणिक धोरण 1986 चे (फरक) वेगळेपण :-**

नवीन राष्ट्रीय शैक्षणिक धोरण 2023 च्या अनेक क्षेत्रांमध्ये जुन्याच्या तुलनेत लक्षणीय निर्गमन दिसून येत आहे. राष्ट्रीय शैक्षणिक धोरण 2023 आणि राष्ट्रीय शैक्षणिक धोरण 1986 मधील काही प्रमुख फरकांचे विस्तृतपणे विश्लेषण करूया:

१.समग्र दृष्टीकोन-नवीन राष्ट्रीय शैक्षणिक धोरण 2023 मध्ये, विद्यार्थ्यांच्या सर्वांगीण विकासावर, मनाचा विकास आणि करिअरच्या स्पष्टतेवर सकारात्मक प्रभाव टाकणाऱ्या अनेक आयामांवर जोरदार भर देण्यात आला आहे. हे तंत्रज्ञानाचा वापर, अनुभवात्मक मोड आणि निर्गमन आणि प्रवेश पर्याय यासारख्या उपक्रमांमध्ये दिसून येते. तर, जुन्या राष्ट्रीय शैक्षणिक धोरण 1986 मध्ये, परीक्षा उत्तीर्ण करण्यावर आणि गुणवत्तेवर आणि पदव्या मिळवण्यावर भर देण्यात आला होता, कारण त्या काळात राष्ट्रीय साक्षरता सुधारणे हे मोठे आव्हान होते.

२.भाषेवर ताण-नवीनतम NEP 2023 भारतीय भाषांसाठी बिनशर्त आदर दर्शविते आणि मातृभाषेतील शिक्षणाची महत्त्वपूर्णता ओळखते. जुने धोरण याला स्पर्श करत नव्हते. भारतीय भाषांकडे ऐतिहासिक दुर्लक्ष राष्ट्रीय शैक्षणिक धोरण 2023 मध्ये योग्यरित्या निश्चित केले गेले आहे असे दिसते, हे एक अत्यंत आवश्यक लक्ष आहे जे जुन्या शैक्षणिक धोरणांमध्ये पूर्णपणे गहाळ होते.

३.नवीन शैक्षणिक संरचना-अद्ययावत 5 + 3 + 3 + 4 प्रणालीसह, राष्ट्रीय शैक्षणिक धोरण 2023 मध्ये एक पॅराडाइम शिफ्टची आवश्यकता आहे जी कालखंडातील विकासात बदलण्यासाठी सेट आहे. जुन्या धोरणात, शैक्षणिक संरचना सुधारणांकडे लक्ष वेधण्यासाठी थोडेसे लक्ष दिले गेले किंवा प्रयत्न केले गेले.

४.बहुविद्याशाखीय दृष्टीकोन-करिअर आणि आवड लक्षात घेऊन आवडीचा प्रवाह निवडणे हे मुलासाठी नेहमीच आव्हान असते. जुन्या धोरणाच्या अटींमुळे प्रत्येक मुलाला ज्या गुदमरून जावे लागते ते नवीन राष्ट्रीय शैक्षणिक धोरण 2023 मध्ये निश्चित करण्यात आले आहे. NEP 2023 स्पष्टपणे एक बहुविद्याशाखीय दृष्टीकोनासाठी मार्ग मोकळा करते ज्यामुळे विद्यार्थ्यांना प्रवाहांमधील विषयांची निवड करणे शक्य होते, त्यामुळे प्रोत्साहन मिळते क्रॉस-डिसिप्लिनरी शिक्षण.

५.तंत्रज्ञान-नवीनतम NEP 2023 चे अनावरण आणि कार्यान्वित झाल्यामुळे, जग आधीच तंत्रज्ञानाच्या आघाडीवर वेगवान प्रगती आणि विकास पाहत आहे. तंत्रज्ञानाच्या आगमनाने आणि हस्तक्षेपाने आपली जगण्याची पद्धत पूर्णपणे बदलून टाकली आहे. शिक्षण क्षेत्रही यापासून मुक्त नाही. NEP 2023 या दिशेने बार वाढवण्याचा प्रयत्न करते आणि शिक्षण प्रणालीमध्ये तांत्रिक हस्तक्षेपांना प्रोत्साहन देण्यासाठी आणि वाढवण्यासाठी पुरेशा तरतुदी करते. 1986 च्या जुन्या धोरणात हे स्पष्टपणे दिसत नव्हते.

६. व्यावसायिक शिक्षण-राष्ट्रीय शैक्षणिक धोरण 2023 व्यावसायिक शिक्षणाचा मुख्य प्रवाहातील शिक्षणामध्ये समावेश करण्यास आमंत्रित करते जे योग्य समक्रमण करते जे केवळ पारंपारिक शिक्षणाला स्पर्धा करण्याऐवजी किंवा नरभक्षण करण्याऐवजी पूरक ठरते. कौशल्य विकासाला चालना देण्यावर आणि उद्योजकतेला चालना देण्यावर भर देऊन, NEP 2023 घटक योग्य मार्गाने काम करत आहेत. जुन्या धोरणाचा परिणाम केवळ पदवीचे कारखाने तयार करण्यात आला जेथे संस्था परीक्षेच्या दृष्टीकोनातून मुख्य प्रवाहातील विषयांच्या महत्त्वाचा प्रचार करण्यात अधिक होत्या. NEP 2023 मध्ये, लहानपणापासूनच मुलांची कौशल्ये आणि क्षमतांचा आदर करण्याला स्पष्ट महत्त्व देण्यात आले आहे, ज्यामुळे त्यांना त्यांच्या करिअरसाठी तयार केले जाईल.

७.अनुभवात्मक शिक्षण-राष्ट्रीय शैक्षणिक धोरण 2023 हे अनुभवात्मक शिक्षणासाठी, अनुभवाचे निरीक्षण करताना शिकण्यास प्रोत्साहन देण्यासाठी आणि वास्तविक-जगातील अनुप्रयोग हाताळण्यासाठी आहे. जुने धोरण रॉट लर्निंग आणि मेमोरिझेशनवर अवलंबून होते.

८.मूल्यांकन पद्धतीत बदल-राष्ट्रीय शैक्षणिक धोरण 2023 कोणत्याही संदिग्धतेशिवाय मूल्यांकन करण्याच्या पद्धतीत बदल करण्याची मागणी करते. यामध्ये सतत आणि संपूर्ण मूल्यमापनाचा अवलंब करणे समाविष्ट आहे, तर 1986 च्या जुन्या धोरणाने विद्यार्थ्याच्या कामगिरीचा वास्तविक आणि अंतिम बेंचमार्क म्हणून परीक्षांवर लक्ष केंद्रित केले होते. NEP 2023 मध्ये शिकण्याच्या परिणामांचे मूल्यमापन करण्यासाठी नवीन राष्ट्रीय मूल्यमापन केंद्र स्थापन करण्याचाही प्रस्ताव आहे.

राष्ट्रीय शैक्षणिक धोरण, 2020 शी संबंधित कमतरता :-

१.भाषा लादणे: लवचिकतेचे आश्वासन असूनही विद्यार्थ्यांवर विशिष्ट भाषेच्या संभाव्य लादण्याबद्दल चिंता.

२.अंमलबजावणीची आव्हाने: शिक्षणाच्या विविध स्तरांवर धोरणाच्या प्रभावी अंमलबजावणीबद्दल चिंता.

३.डिजिटल डिव्हाइड: तंत्रज्ञानाचा असमान प्रवेश इंटरनेट संसाधनांसह आणि नसलेल्या विद्यार्थ्यांमधील अंतर वाढवू शकतो.

४.प्रमाणित चाचणीचा दबाव: एकच, उच्च-स्तरीय परीक्षेवर भर दिल्याने विद्यार्थ्यांमध्ये तणाव वाढण्याची भीती आहे.

५.व्यावसायिक प्रशिक्षण गुणवत्ता: व्यावसायिक प्रशिक्षण कार्यक्रमांच्या गुणवत्ता आणि मानकीकरणाबद्दल चिंता.

६.कमी पायाभूत सुविधा: अनेक शाळांमध्ये योग्य पायाभूत सुविधांचा अभाव धोरणाच्या यशस्वी अंमलबजावणीत अडथळा आणू शकतो.

७.सामाजिक आणि आर्थिक विषमता: आर्थिक आणि सामाजिकदृष्ट्या वंचित विद्यार्थ्यांना बदलांशी जुळवून घेण्यात आव्हानांचा सामना करावा लागू शकतो याची चिंता.

८.शिक्षक प्रशिक्षण: शिक्षकांना नवीन शैक्षणिक दृष्टिकोनाशी जुळवून घेण्यासाठी सर्वसमावेशक प्रशिक्षण कार्यक्रमांची गरज.

९.ग्रामीण-शहरी विषमता: संसाधनांच्या असमान वितरणामुळे ग्रामीण आणि शहरी शैक्षणिक संस्थांवर वेगवेगळे परिणाम होऊ शकतात.

सारांश:-

NEP 2023 किंवा राष्ट्रीय शैक्षणिक धोरण 2023 मध्ये देशभरातील व्यावसायिक प्रशिक्षणाव्यतिरिक्त प्राथमिक शिक्षण प्रणालीची रूपरेषा आखण्यात आली आहे. NEP 2023 हे 1986 च्या राष्ट्रीय शिक्षण धोरणाची जागा घेते आणि काही ऐतिहासिक बदलांवर परिणाम करणाऱ्या अनेक पैलूंच्या दृष्टीने महत्त्वपूर्ण बदल घडवून आणते.राष्ट्रीय शैक्षणिक धोरण 2023 च्या केंद्रस्थानी एक नाविन्यपूर्ण, विद्यार्थी-केंद्रित रचना साकारणे हे उद्दिष्ट आहे जे विद्यार्थ्यांचे शिक्षण चार टप्प्यात विभागते: मूलभूत, पूर्वतयारी, मध्यम आणि माध्यमिक. हे टप्पे महत्त्वपूर्ण मानले जातात आणि नैसर्गिक क्रमाने जेथे विद्यार्थी मानसिकदृष्ट्या एका टप्प्यातून दुसऱ्या टप्प्यात प्रगती करतात, विचार प्रक्रियेला समग्र पद्धतीने आकार देतात आणि विस्तृत करतात. NEP 2023 मध्ये शैक्षणिक धोरणात अनेक बदल आणि बदल समाविष्ट आहेत. तसेच शैक्षणिक खर्चात GDP च्या 3% वरून 6% पर्यंत प्राधान्याने वाढ करण्याची तरतूद आहे.राष्ट्रीय शैक्षणिक धोरण 2020

भारतातील शिक्षणाचे भविष्य घडविण्याचे उद्दिष्ट देणारे प्रमुख ठळक मुद्दे आणि परिवर्तनात्मक बदल आणते. हे सर्वांगीण शिक्षण, बालपणीची काळजी, लवचिक मूल्यमापन, कौशल्य विकास, तंत्रज्ञानाचे एकत्रीकरण, शिक्षक प्रशिक्षण आणि उच्च शिक्षण सुधारणांवर भर देते. हे बदल विद्यार्थी-केंद्रित, सर्वसमावेशक आणि भविष्यासाठी तयार शिक्षण प्रणाली तयार करण्यासाठी डिझाइन केलेले आहेत. हे ठळक मुद्दे आणि बदल स्वीकारून, 21 व्या शतकात भरभराट होण्यासाठी विद्यार्थ्यांना आवश्यक कौशल्ये, ज्ञान आणि क्षमतांनी सुसज्ज करणारे दर्जेदार शिक्षण देण्यासाठी भारत तयार आहे.

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४. भालवा विभूते (जून २०२२) राष्ट्रीय शैक्षणिक धोरण २०२०- चिकित्सा, मेहता प्रकाशन

५. राष्ट्रीय शैक्षणिक धोरण २०१९ मसुदा

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राष्ट्रिय शिक्षानीति २०२० सन्दर्भे संस्कृत भाषायाः प्राधान्यम् अनुसन्धानं च

टंडेल काजलबेन क्रिष्णाभाई
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DOI-10.5281/zenodo.15038991

गोषवारा:-

NEP इत्यस्य पूर्ण नाम New education policy. देशे प्रथमा शिक्षानीतिः १९६८ तमे वर्षे अभवत् । द्वितीया शिक्षानीतिः १९६८ तमे वर्षे, तृतीया शिक्षानीतिः २०२० तमे वर्षे च आगता । तृतीया शिक्षानीतिः केन्द्रसरकारेण २९ जुलाई २०२० वर्षे अनुमोदितः अस्ति । एषा शिक्षानीतिः शिक्षका:, छात्रा:, शिक्षणस्य च विषये वर्तते। अस्याः शिक्षानीतेः प्रथमं नाम 'मानव: संसाधनविकासमन्त्रालयः' आसीत् । य: राजीवगांधी: दत्तवान् । यस्य परिवर्तितं नाम 'शिक्षामन्त्रालयः' अस्ति । एषा नीतिः त्रयः तः १८ वर्षाणि यावत् आयुषः सर्वेषां छात्राणां कृते अस्ति । यस्मिन् पूर्वशिक्षायाः चरणः १०+२ आसीत् । यत् ५+३+३+४ इति परिवर्तितम् अस्ति।

5=3=3=4

वर्षः Years	आयु: (Age)	वर्ग: (Class)
पूर्वम् ५ वर्ष	३-८	१-२
३ वर्षाणाम् अनन्तरम्	८-११	३-५
३ वर्षाणाम् अनन्तरम्	११-१४	६-८
४ वर्षाणाम् अनन्तरम्	१४-१८	९-१२

राष्ट्रियशिक्षानीति २०२० सन्दर्भे संस्कृतभाषायाः प्राधान्यम्-

राष्ट्रियशिक्षानीति २०२० मध्ये संस्कृतभाषा, अनुसन्धानं च स्थानम् उच्चम् अस्ति । प्रथमे शिक्षाशास्त्रद्वये संस्कृतभाषायाः विषये विशिष्टा सूचना न प्राप्यते स्म । परन्तु वर्तमानशिक्षानीतौ संस्कृतभाषायाः विषये अधिकं ध्यानं दत्तम् अस्ति। NEP 2020 इत्यस्मिन् हिन्दी-संस्करणे 22वारं, आङ्ग्ल-संस्करणे 20 वारं च संस्कृतशब्दस्य उल्लेखः अस्ति। यस्मिन् रसंगीतं, राजनीतिः, चिकित्साशास्त्रं, वास्तुकला, धातुविज्ञानम् इत्यादयः अन्तर्भवन्ति।[i]

२२.१५ अत्रापि संस्कृतभाषायाः विस्तरेण चर्चा कृता अस्ति । संस्कृतं केवलं विद्यालयेषु विश्वविद्यालयेषु च सीमितं न भविष्यति अपितु मुख्यधारायां भविष्यति। तथा गणितं, खगोलशास्त्रं, नाटकं, दर्शनं, योगम् आदि अन्य विषया: अपि सम्मिलितं भविष्यति।[ii]

देशे संस्कृतस्य सर्वासु भारतीयभाषाणां च संस्थानां विभागानां च उल्लेखः भविष्यति। नवछात्राणां कृते अभिलेखो अध्ययनप्रशिक्षणं प्रदत्तं भविष्यति। शेषकृतीनां संग्रहणं, अनुवादं, अध्ययनं च कर्तुं समन्वितः प्रयासः भविष्यति।[iii]

अनुसन्धानं च

उच्चशिक्षाव्यवस्थायाः कालखण्डे अनुसन्धानस्य समर्थनाय 'राष्ट्रीयसंशोधनप्रतिष्ठानम्' निर्मितं भविष्यति। स्नातकपदवीक्रमे यदि कश्चित् विशेषप्रकल्पं करोति तर्हि 'संशोधनप्रमाणपत्रम्' सह स्नातकपदवीं प्राप्स्यति। भवन्तः

M.PIL विना पीएचडी इत्यत्र प्रवेशं प्राप्नुयुः। चतुर्वर्षीयं स्नातकपदवीं तदनन्तरं प्रत्यक्षतया पीएच.डी. प्रवेशं प्राप्स्यति।

निरकर्ष-

NEP 2020 संस्कृतस्य पुनरुत्थानाय दिशा प्राप्ता अस्ति। संस्कृतभाषा न शास्त्रीयभाषारूपेण अपितु समानविषयत्वेन अपि पाठयितुं शक्यते। एवं प्राचीनपरम्परायाः भाषा या संस्कृतभाषा आसीत् तथा देव भाषा च आसीत्। तथा च विलुप्तः आसीत् सा NEP द्वारा पुनः सजीवीकरणं भविष्यति।

पादटिप:

[1] अध्याय: ४, अनुछेद: १७, पृ-१४

[2] अध्याय: २२, अनुछेद: १५, पृ-५५

[3]अध्याय: २२, अनुछेद: १५

सहायक: संदर्भ: ग्रन्थ सूची

१.રાષ્ટ્રીય શિક્ષણ નીતિ 2020, માનવ સંસાધન વિકાસ મંત્રાલય, ભારત સરકાર

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व्यावसायिक मार्गदर्शनाची शालेय स्तरावरील उपयुक्ततेचा अभ्यास

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(शिक्षणशास्त्र विभाग) संत गाडगे बाबा अमरावती विद्यापीठ

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सारांश :

व्यावसायिक शिक्षण हे प्रामुख्याने विशिष्ट व्यावसायिक किंवा व्यवसायसाठी आवश्यक नोकरीसाठी तयार कौशल्ये विकसित करण्यावर केंद्रित आहे.विद्यार्थ्यांना त्यांच्या निवडलेल्या क्षेत्रात व्यावहारिक हाताने प्रशिक्षण देण्यासाठी अभ्यासक्रमाची रचना करण्यात आली. शालेय स्तरावर त्याचे महत्त्व विद्यार्थ्यांना कळावे आणि विद्यार्थी व्यावसायिक क्षेत्राच्या विभिन्न प्रत्येक क्षेत्राशी परिचित व्हावा जेणे करून भविष्यात कुठल्याच व्यावसायिक क्षेत्राची भीती राहणार नाही.पुरेपूर माहिती असल्या कारणाने तो निवडलेल्या व्यवसायात पारंगत होण्यास व नवीन व्यवसाय करण्याची उत्सुकता विद्यार्थ्यांच्या मनात राहील.

मुख्य शब्द : व्यावसायिक मार्गदर्शन

प्रस्तावना :

फार वर्षापूर्वी माता – पिता यांच्या हाताखाली काम करून वंश परंपरागत व्यवसायाचे ज्ञान,कौशल्य व तंत्र, विद्यार्थी घरातच आत्मसात करीत असे अथवा एखाद्या तज्ञ कारागीरकडे काम करून आवश्यक असलेली व्यावसायिक कौशल्य,ज्ञान संपादन करण्याची पद्धती होती. परंतु आधुनिक युगात ही व्यवसाय शिक्षणाची पद्धती निरुपयोगी व कालबाह्य असल्याचे आढळून आले. युरोपात घडून आलेल्या औद्योगिक क्रांतीमुळे समाजाच्या एकंदर चेहरा-मोहरा बदलला, उद्योगधंद्याच्या निरनिराळ्या क्षेत्रात यंत्राचा मोठ्या प्रमाणावर उपयोग होऊ लागल्यामुळे उत्पादन पद्धतीत क्रांतिकारक परिवर्तन घडून आले,शैक्षणिक जीवनात विद्यार्थ्यांना व्यावसायिक मार्गदर्शनाची नितांत गरज आहे. शालेय स्तरावरच व्यावसायिक मार्गदर्शन उपक्रम राबविले तर विद्यार्थ्यांना विविध व्यावसायिक क्षेत्राची पुरेपूर माहिती राहील व भविष्यात योग्य निर्णय घेऊन उदारनिर्वाहाचे योग्य साधन निवडून जीवन जगणे साध्य होईल.

व्याख्या :" जी प्रक्रिया व्यक्तीस व्यवसायाची निवड करणे,या व्यवसायात समरस होणे व प्रगती करणे या बाबींसाठी मदत करते,त्यास व्यावसायिक मार्गदर्शन म्हणतात. (फ्रान्कीलीन.जे.केलर)

२] " व्यावसायिक मार्गदर्शन ही तरुणांचे भावी आयुष्य समाधानाने जगण्यासाठी दिलेली एक मोठी देणगीच होय." (डॉ. सुपर)

व्यवसाय मार्गदर्शनाची सुरुवात :व्यवसाय निवडण्यास,त्यात प्रवेश करण्यास अथवा त्यासाठीआवश्यक ती पूर्व तयारी करण्याकरिता दिले जाणारे सहाय्य व प्रक्रिया अमेरिकेतील national vocational guidance association ने वरील व्याख्या १९३७ मध्ये निश्चित केली. फ्रांक पार्सन्झ या अमेरिकन समाजसेवकाने १९०५-०६ साली हे कार्य हाती घेतले,१९०८ मध्ये पहिले व्यावसायिक मार्गदर्शन केंद्र सुरु केले.व्यवसाय मार्गदर्शन करण्यासाठी अनेक साधने व तंत्रे वापरावी लागतात,व्यक्तीवैशिष्ट्यांची नोंद करणे, शैक्षणिक व व्यावसायिक माहिती पुरविणे, मार्गदर्शनात्मक चर्चा करणे, मार्गदर्शन विषयक समस्यांवर संशोधन करणे, मार्गदर्शनाचा मुख्य हेतू व्यक्तीला आपल्या सभोवतालच्या परिस्थितीशी जमवून घेण्याची क्षमता प्राप्त करून देणे हा आहे.

व्यासायाची निवड करणे व त्यात प्राविण्य व यश संपादन करणे हे व्यक्तीच्या वैशिष्ट्यांना अनुरूप ठरणारा व्यवसाय आवश्यक असतो. त्यासाठी विविध प्रकारच्या चाचण्या, कसोट्या,किंवा परीक्षा या माध्यमातून तर आल्फ्रेड बीने, वेक्श्लेर बेलेव्ह्यु चाचणी, मिनेसोटा लेखन चाचणी यांचा प्रामुख्याने वापर केला जातो,तसेच व्यक्तीची स्मरणशक्ती, तर्कबुद्धी, संवेदनशीलता हे सुद्धा महत्वाचे असते.

शालेय अभ्यासक्रमातुनही विद्यार्थ्यांना व्यवसाय मार्गदर्शन करणे शिक्षकांना शक्य असते, अध्यापन काळात दिवसाचे पाच सहा तास विद्यार्थी शिक्षकांच्या दृष्टीसमोर असल्यामुळे शिक्षकांना त्यांचे निरीक्षण करता येते.व व्यावसायिक विषयक योग्य शिक्षणक्रम निवडण्यासाठी शैक्षणिक पात्रता,विद्यार्थ्यांचे विविध पैलू ही माहिती शिक्षक विविध प्रकारच्या नोंदी ठेवून मिळवू शकतात,एखाद्या विशिष्ट गुंविशेशात विद्यार्थी कसा आहे यावर ठरविता येते.

भारतात व्यवसाय मार्गदर्शनाचे कार्य प्रथमतः१९८३ मध्ये सुरु झाले.१९५४ साली केंद्र शासनाने जनरल ब्युरो ऑफ

एज्युकेशनल andव्होकेशनल इन्स्टिट्यूशन ही संस्था स्थापन केली, १९५६ रोजी शैक्षणिक व व्यावसायिक मार्गदर्शन समिती स्थापन झाली. १९५० साली राज्य सरकारने मुंबई येथे व्यावसायिक मार्गदर्शन केंद्र सुरु केले,प्रत्येक केंद्र विविध व्यवसायाची माहिती परिश्रमपूर्वक मिळवून प्रकाशित करते.

व्यवसायिक मार्गदर्शनाची गरज : आजच्या जटील आणि वेगाने विकसित होत असलेल्या जगात व्यावसायिक मार्गदर्शन पूर्वीपेक्षा अधिक महत्त्वपूर्ण झाले आहे. जॉब मार्केट सतत बदलत आहे, आणि असंख्य करिअर पर्याय उपलब्ध आहेत, ज्यामुळे व्यक्तींना त्यांच्या करिअरच्या मार्गावर एकट्याने नेव्हीगेट करणे आव्हानात्मक बनते, व्यावसायिक मार्गदर्शन व्यक्तींना करिअरच्या विविध पर्यायांचा शोध घेण्यात श्रमिक बाजारातील ट्रेड समजून घेण्यास आणि त्यांची कौशल्ये आणि आवडीना योग्य शैक्षणीक आणि करिअर निवडीशी संखेरीत करण्यात मदत करते.

व्यावसायिक मार्गदर्शनाची प्रमुख उदिष्टे : एकूण प्लेसमेंट फंक्शन्स सह व्यावसायिक मार्गदर्शन कार्यक्रमाचे एकत्रीकरण हा एक महत्वाचा पैलू आहे,

१] व्यक्ती किंवा गटांची रोजगार क्षमता वाढविण्यासाठी उपायांची शिफारस करणे.

२] व्यावसायिक जीवन निवडणे, बदलणे आणि त्यांच्याशी जुळवून घेण्याच्या प्रक्रियेत व्यक्ती किंवा गटांना सहाय्य प्रदान करणे.

३] वैयक्तिक सामर्थ्य आणि कमकुवतपणाचे मुल्यांकन करणे, त्यांना नोकरीच्या आवश्यकतांसह संरेखीत करणे.

४] जागरुकता वाढविणे आणि समाजातील रोजगार बाजाराच्या वास्तविकतेची समज वाढवणे.

५] संयुक्त प्रयत्नांना प्रोत्साहन देण्यासाठी इतर मार्गदर्शन संबंधित एजन्सीना सहकार्य करणे.

६] स्वयंरोजगाराला प्रोत्साहन देणे.

रोजगार - व्यवसाय आणि व्यक्तिमत्व विकास :रोजगार असो वा स्वयंरोजगार, व्यक्ती असो अथवा व्यवसाय, प्रत्येकाच्या व्यक्तीमत्व विकासात त्याचा चेहरा,पोशाख व संभाषण या तीन मुद्द्यांचा अवश्य समावेश असतो. यालाच व्यवस्थापन संदर्भात “Fda” म्हणजेच Face Dress Address अशी संज्ञा दिली जाऊ शकते.या ठिकाणी व्यक्ती चा चेहरा रोजगार म्हणजे सुंदरता न्हवे,तर आत्मविश्वास, पोशाख म्हणजे सर्वोत्तम नव्हे, प्रासंगिक कपडे व भाषण म्हणजे वकृत्व नव्हे, तर कार्यकर्तुत्वावर आधारित बोलणे चालणे या बाबींचा समावेश होतो,या तीनही बाबी व्यावहारिक व व्यक्तीशी संबंधित असून रोजगार-स्वयंरोजगार करणाऱ्यांशी संबंधित असून प्रयत्न केल्यास सहज साध्य आहेत, व्यक्तिगत नोकरी-रोजगार वा उद्योग-व्यवसाय याला व्यक्तीच्या व्यक्तिमत्व विकासाची म्हणजेच त्यांच्या विकसित व्यक्तिमत्वाची जोड मिळाली तर नोश्चीत पणे प्रगती होऊ शकते,व्यवस्थापनातील व्यव्स्थापकापासून व्यवसायातील व्यावसायिकापर्यंत व्यक्तिमत्व विकासाला चालना देणे व त्याची जपणूक करणे म्हणूनच काळाची गरज ठरते.

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सार:
शैक्षणिक व सामाजिक घटकांच्या माहिती विषयक गरजांची पूर्तता करणे. विविधं प्रकारच्या शैक्षणिकव संदर्भ ग्रंथाचे उपार्जन करून संवर्धन करणे. विविध अभ्यासक्रमांस लागणारे वाचन साहित्य उपलब्ध करून देणे. वाचकांना द्यावयाच्या माहितीचे व संदर्भ सेवांचे नियोजन करणे. पाचवी ते दहावी या वर्गांसाठी शाळेमध्ये विद्यार्थी व शिक्षक यांना जी ग्रंथालये उपलब्ध आहेत, त्यांना शालेय ग्रंथालय असे म्हणतात. आपल्या देशात अलीकडील काळात माध्यमिक स्तरांवर शालेय ग्रंथालये दिसत असली तरी ती शाळेच्या एकूण विद्यार्थी संख्येवर अवलंबून आहेत. शालेय ग्रंथालये ही शाळेतील शिक्षणाला पूरक असे साहित्य विद्यार्थी व शिक्षक यांना पुरविण्याची कामे करतात. यामध्ये क्रमिक व संदर्भ पुस्तकांची देवघेव करणे,विशिष्ट माहिती संदर्भ पुरवणे, ग्रंथालय कसे वापरावे या विषयी मार्गदर्शन करणे, विद्यार्थ्यांमध्ये वाचनाची आवड निर्माण व्हावी म्हणून अनेक उपक्रमाचे आयोजन करणे.ग्रंथ प्रदर्शने आयोजित करणे. विविध स्पर्धांचे आयोजन करणे. पुस्तकाचे वाचन करणे.चर्चासत्र आयोजित करणे.

प्रास्ताविक:

ग्रंथालय चळवळीत निरपेक्ष वृत्तीने आणि सामाजिक कर्तव्यभावनेने कार्य करणारी अनेक मंडळी आहेत. अनेक ग्रंथालये विविध समाजोपयोगी उपक्रम राबवून समाजजीवन समृद्ध करीत असतात. भारत सरकारने नॉलेज कमिशन नेमून ग्रंथालय चळवळीच्या विकासासाठी नवीन धोरण तयार केले.

कालानुरूप ग्रंथालये बदलत गेली. नव्या इमारती झाल्या, ग्रंथसंख्या तर वाढलीच, पण अनेक सांस्कृतिक शैक्षणिक उपक्रमदेखील वाढले. नव्या तंत्राचा वापर करत अनेकांनी संगणकीकरण केले, बार कोड पद्धत सुरू झाली. काही ग्रंथालयांनी जुने ग्रंथ, हस्तलिखिते स्कॅन करून त्याचे ई-बुक देखील केले. स्पर्धा परीक्षांची निकड ओळखून जवळपास प्रत्येक ग्रंथालयात स्पर्धा परीक्षा मार्गदर्शन केंद्र सुरू आहे. But b बदलत्या काळानुसार ग्रंथ संग्रहालये हायटेक होणार आहेत. वाचकांना घरूनच इंटरनेद्वारे कोणते पुस्तक उपलब्ध आहे ते समजू शकेल तसेच पुस्तक घरपोच देखील मिळी शकते. २४ तास सुरू असणारी अभ्यासिकादेखील आहेत.

ग्रंथालय संगानाकीकरन एक दृष्टीक्षेप :

आज अस्तित्वात असलेली बहुतेक सर्व ग्रंथालये संगणकीकरणाचा विचार करताना दिसत आहेत. अगदी आता आता काही वर्षापूर्वीपर्यंत अशी परिस्थिती नव्हती. मात्र आता सर्व क्षेत्रांतील संगणकाचा वाढता वापर व त्यापासून होणारा लाभ सर्वांनाच आकर्षित करत आहेत आणि म्हणून आजची ग्रंथालये कात टाकत आहेत असे म्हटले, तर वावगे ठरणार नाही. तसे पाहिले, तर संगणक मुळात गणितीय स्वरूपाच्या समस्या सोडविण्याकरीता शोधलेले एक यंत्र होते. पण आजच्या संगणकाच्या कार्यात ग्रंथालयाचे कार्यही एकवटलेले दिसून येते. संगणक माहिती स्विकारतो, त्यावर प्रक्रिया करतो, त्या माहितीचे जतन करतो व त्या माहितीचे वितरण करण्याकरीता तो सज्ज रहातो; मग ती सांखिकी स्वरूपाची माहिती असो वा छापील स्वरूपाची! ग्रंथालयांचेही काम असेच आहे. तीही माहिती जमवतात, त्यावर ग्रंथालयीन संस्कार करतात व ती माहिती वाचकांना व्यवस्थित उपलब्ध करून देतात. म्हणजेच ग्रंथालयाचे संगणकाशी सख्य असायला हवे. हे पाहता संगणकीकरणाचा पहिला हक्क ग्रंथालयांनी बजावायला हवा होता. पण प्रत्यक्षात इतर क्षेत्रात हा वापर केव्हाच सुरू झाला, तरी संगणक व नेटवर्कच्या वापरात ग्रंथालये मागे राहिली ही वस्तुस्थिती आहे. आता मात्र लहानमोठी सर्व ग्रंथालये संगणकाचा वापर करून अद्ययावत कार्यप्रणाली अवलंबत आहेत. आजच्या ग्रंथालयीन सेवेत केवळ संगणकाचाच वापर होतो असे नाही, तर मोबाइल, कॅमेरा, स्मार्टकार्ड, स्कॅनर, इ बुक रीडर, अशा अनेक आधुनिक साधनांचा वापर ग्रंथालयात होत आहे. वाचनसाहित्याच्या वर्गीकरणाचे काम तर त्यामार्फत होते आहेच, शिवाय वाचनसाहित्य ग्रंथालयात शोधण्याचे

आधुनिक तंत्र विकसित होत आहे. ही सर्व काळाची पुढची पावले आहेत.

ग्रंथालय समिती व ग्रंथालय कर्मचारी

हे ग्रंथालयाचा विकास घडवून आणणारे महत्वाचे घटक आहेत. त्यातल्या त्यात ग्रंथपाल हा त्या घटकांचा प्रमुख आधार. ग्रंथालय व माहितीशास्त्रातील उच्च शिक्षणाच्या संधी आज सर्वदूर पोहोचल्याने काही अपवाद वगळता आज जवळजवळ सर्वच ग्रंथालयांना, उच्चशिक्षित ग्रंथपाल व ग्रंथालय कर्मचारी सहज उपलब्ध होत आहेत. बदलत्या वाचकांच्या गरजेनुसार ग्रंथालय शास्त्राच्या अभ्यासक्रमात सुद्धा अनुषंगिक बदल त्वरित केले जात आहेत. माहिती तंत्रज्ञान जेवढ्या गतीने विकसित होत आहे, त्याहीपेक्षा अधिक गतीने ग्रंथालय माहितिशास्त्र अभ्यासक्रम व प्रशिक्षण कार्यक्रमात बदल करण्याचा आटोकाट प्रयत्न केला जात आहे. गेल्या दहा वर्षांत भारतभर आयोजित केलेल्या, भरवलेल्या परिषदांचे, चर्चासत्रांचे, प्रशिक्षणाचे विषय पाहिल्यास आपल्याला असे दिसून येईल, की ९९ टक्के परिषदांचे, चर्चासत्रांचे, प्रशिक्षणाचे विषय आधुनिकतेकडेच झुकलेले आहेत. प्रचलित ग्रंथालयांचे रूपांतर 'ग्लोबल नॉलेज सेंटर्स'मध्ये होण्याच्या दृष्टीने या सर्व महत्वपूर्ण घटना आज घडताना दिसत आहेत.

ग्रंथालय आधुनाकीकारणात शासनाची भूमिका:

ग्रंथालयांच्या आधुनिकीकरणात शासनाचेही योगदान सध्या दिसून येत आहे. प्रत्येक जिल्ह्यात डिजिटल ग्रंथालय व त्याकरीता आवशक त्या सोयी उपलब्ध करून दिल्या जात आहेत. सध्या त्या अपुऱ्या जरी वाटत असल्या, तरी सुरुवात तरी झाली आहे, हे ही नसे थोडके. ग्रंथालय संगणकीकरणाकरीता केंद्र शासनाच्या नॅशनल इन्फॉर्मेटिक सेंटर (NIC)ने तयार केलेली संगणकीय प्रणाली मागेल त्या ग्रंथालयांना कसलेही शुल्क न आकारता दिली जाते. त्या प्रणालीच्या प्रशिक्षणाचे वारंवार आयोजन केले जाते. ग्रंथालय संगणकीकरणात येणाऱ्या समस्यांवरचा उपाय त्वरित ऑनलाइन सापडतो. आज अनेक ऑनलाइन फोरम उपलब्ध आहेत आणि ते सदैव मदत करत असतात.

ग्रंथालय संगणकीकरणकरीता शासकीय स्तरावर जेवढे प्रयत्न केले जात आहेत, त्यापेक्षा अधिक व्यावसायिक पातळीवर केले जात आहेत. आज देशभरात पाचशेपेक्षा जास्त ग्रंथालय संगणकीय प्रणाली उपलब्ध आहेत. त्यात ग्रंथालयातील सर्व व्यवस्थापकीय कौशल्यांचा फार बारकाईने समावेश केलेला आढळतो. बदलत्या स्वरूपातील वाचन साहित्याची मागणी तरुण वाचकवर्ग करत आहेत. आधुनिक सेवा देताना येणाऱ्या अडचणींवर मात करण्याची क्षमता स्थानिक पातळीवर उपलब्ध होऊ शकते अशी आज परिस्थिती झाली आहे.

आज संगणकीकृत झालेली आहेत. शासन सर्वच ग्रंथालयांना मदत करेल, ही शक्यता गृहीत धरली तर फार विलंब लागण्याची शक्यता आहे. छोट्या ग्रंथालयाचे संगणकीकरण लवकर होऊ शकते. लहान ग्रंथालयांनी असा विचार केला, की आपले ग्रंथालय अजून लहान आहे, मग आत्ताच कशाला पैसा खर्च करायचा तर त्यात अंतिमतः त्यांचाच तोटा आहे. नीट विचार केला, तर असे लक्षात येईल की पूर्वलक्षी रूपांतरणाचे कार्य चांगले व झटकन होऊ शकते, ते केवळ संख्येने कमी असलेल्या वाचनसाहित्यामुळे. जसजशी पुस्तकांची, संदर्भग्रंथांची, कागदपत्रांची, फायलींची, नोंदबुकांची संख्या वाढत जाते, तसतसा कामाचा व्याप व बारकावे वाढत जातात. आतापासून सुरुवात केली, तर कामाचा आवाका कमी होईल आणि भविष्यात ग्रंथालयांचा पसारा वाढायला हातभारच लागेल. या नव्या आधुनिक प्रवाहाचा सर्व प्रकारच्या ग्रंथालयांनी सध्या उपयोग करून घेतलाच पाहिजे. भविष्यात अजून चांगल्या संधी यामुळे प्राप्त होणार आहेत.

आगामी काळातील ग्रंथालयांची भूमिका

अध्ययन व अध्यापन प्रक्रियेत शैक्षणिक ग्रंथालयांची महत्वाची भूमिका आहे. विद्यार्थ्यांमध्ये ग्रंथालय बाबत जागरूकता होण्यासाठी सामाजिक माध्यमांचा उपयोग हा करता येईल.

१. Integration of Online Hybrid and

२. Collaborative Learning : आगामी काळात ओनलाईन, हायब्रीड व सह अध्ययनाचे मोठ्या प्रमाणात एकत्रीकारण होईल असा अंदाज वर्तवण्यात आला आहे. या नवीन प्रवाहामुळे उच्च शिक्षणात व्यापक प्रमाणात बदल होतील असेही तज्ञांचे मत आहे.

३. शैक्षणिक ग्रंथालयांचा प्रतिसाद : अध्ययन व अध्यापन प्रक्रियेत शैक्षणिक ग्रंथालयांनी नेहमीच महत्वाची भूमिका बजावलेली आहे व आगामी काळात देखील चांगली भूमिका टे बजावणार आहेत.आता नवीन प्रकारच्या ओनलाईन, हायब्रीड सेवांमध्ये देखील ग्रंथालयांचे महत्व आहे.तंत्रज्ञानामुळे ग्रंथालयीन क्षेत्रात मोठे बदल होत आहेत त्यातील विशेष बदल हे पुढील प्रमाणे होवू शकतात.

४. व्यापक ओनलाईन मुक्त अभ्यासक्रमांची उपलब्धता: हार्वर्ड एम आय. टी अशा जगप्रसिद्ध संस्थांनी असे अभ्यासक्रम उपलब्ध केले आहेत. हे अभ्यासक्रम मोफत व ओनलाईन देखील उपलब्ध आहेत.MOOC अभ्यासक्रमानं लागणारे वाचानसाहित्य हे अभासाकाना मोफत उपलब्ध करून दिले जाते. .MOOC अभ्यासक्रम हे आगामी काळात महत्वपूर्ण भूमिका बजावतील.

५. मुक्त शैक्षणिक साधनांची उपलब्धता (Open Education Resources) : अनेक संस्था तसेच तज्ञ शैक्षणिक साधने जसे ग्रंथ, audio visual साधने हे ऑनलाईन पद्धतीने उपलब्ध करून देण्यात येत आहे. हि शैक्षणिक साधने हि मोफत उपलब्ध आहेत.

ग्रंथालये वाचानसाहित्य उपलब्ध करतात व वाचान्साहीत्याची उपलब्धता मोफत उपलब्धता हि वरील दोन्ही नवीन सुविधांचे वैशिष्ट्य आहे. तंत्रज्ञानाच्या या वादळांमध्ये ग्रंथालय टिकून राहतील का? आगामी काळात त्यांचे महत्व कमी होणार आहे परंतु बदललेल्या परिस्थितीत सुद्धा ग्रंथालयांचे महत्व हे अबाधित राहील.

शैक्षणिक ग्रंथालये ऑनलाईन व हायब्रीड शिक्षण पद्धतीत आपले महत्व अधोरेखित करत आहेत.

६. लवचिक शिक्षण पद्धतीचा अवलंब: आगामी काळात लवचिक अध्ययन संकल्पनेचा मोठ्या प्रमाणावर अवलंब केला जाईल असा अंदाज आहे. गरजा आधारित शिक्षण व्यवस्था हि अंगिकारली जाईल या शिक्षण पद्धतीत पारंपारिक शिक्षण पद्धती ऐवजी तंत्रज्ञानावर आधारित शिक्षणावर भर दिला जातो. यासाठी शिक्षणिक ग्रंथालयांनी त्यांचे लवचिक ग्रंथालयात ग्रंथालयात रुपांतर करावे लागेन . यासाठी ग्रंथालयांनी त्यांच्या कामकाजाच्या वेळेमध्ये, सभासदत्वाच्या नियमाणमध्ये, इलेक्ट्रोनिक डेटाबेस व एक्सेस करण्याच्या नियमांमध्ये लवचिकता आणली पाहिजे.लवचिक युगात ग्रंथपालनी केवळ ग्रंथपाल एवढी एकच भूमिका न बजावता विविध भूमिका बजावल्या पाहिजेत. जसे डेटाबेस तज्ञ, वाचन सल्लागार वाचानसाहित्य वापरण्या बाबत लेखन सल्लागार या सारखी कामे करावी लागणार आहेत.

७. ग्रंथालय हे उत्पन्नाचे साधन बनले आहे (The library has become a source of income)

आज सुशिक्षित लोकांना नोकरी मिळत नाही, त्यांना रोजगार मिळत नाही, अशा लोकांनी त्यांच्या शिक्षणाचा योग्य वापर केला आहे. आपण असे अनेक लोक पाहिले आहेत ज्यांनी त्यांच्या शहर आणि प्रदेशात गरजेनुसार ग्रंथालये बांधली आहेत. याच्या मदतीने तो आपले उत्पन्न वाढवण्यातही यशस्वी झाला आहे. आज ग्रंथालय अभ्यासासाठी एक चांगले ठिकाण आहे. आज अनेक शहरांमध्ये तुम्हाला एकापेक्षा जास्त ग्रंथालये पाहायला मिळतील. जर तुम्ही देखील बेरोजगार असाल तर तुम्ही लायब्ररीला तुमचा रोजगार बनवू शकता.

संदर्भ

१. पवार एस. पी. ग्रंथालय व माहितीशास्त्र ,पुणे, फडके प्रकाशन.

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४. K.lal, library automation, ess

५. publication, pune.

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प्रस्तावना

देशाचा पायाभूत विकास झाल्याशिवाय देशाची आर्थिक प्रगती होणार नाही. औद्योगिकतेला चालना मिळणार नाही. औद्योगिकीकरण वाढवायचे असेल तर पायाभूत विकास महत्त्वाचा आहे. यामध्ये मजबूत रस्ते, मुबलक पाणी, अखंडीत विजेचा पुरवठा आवश्यक आहे. याशिवाय नवनिर्मिती होणार नाही. याच उद्दिष्टाने देशातील दुर्लक्षित भागामध्ये देखील रस्तेनिर्मिती केंद्रीय रस्ते व राष्ट्रीय महामार्ग मंत्रालयाकडून चालू आहे. नक्षलग्रस्त भाग, सीमारेषेजवळील जिल्हे, सामरीकदृष्ट्या महत्त्वाचे अशा विविध ठिकाणी जलद व मजबूत रस्तेनिर्मिती झालेली दिसते. याचबरोबर संपूर्ण देशभरात विविध राज्यांमध्ये एक्सप्रेस वे, अत्याधुनिक बोगदे, नदीवर महाकाय पूल, उड्डाणपूल असे प्रकल्प उभारून विकासाचे नवीन स्तंभ श्री. नितीन गडकरी यांच्या खात्याअंतर्गत झालेले आढळतात. रस्ते निर्मिती मध्ये जागतिक रेकॉर्ड, आशिया खंडातील सर्वात मोठे, देशातील सर्वात जलद आणि लांब रस्ते हे २०१४ ते २०१९ या कालखंडात झालेले आढळतात.

२०१४ ते २०१९ या कालखंडात केंद्रीय रस्ते व राष्ट्रीय महामार्ग मंत्रालयाने नवनवीन रेकॉर्ड केले. "यामध्ये सर्वात महत्त्वाचा म्हणजे देशातील सर्वात लांब ढोला- सदिया, देशातील सर्वात लांब चेनानी- नाशरी सुरुंग, हिमाचल प्रदेशातील रोहतांग बोगदा, हिमाचलला पर्यटनस्थळ बनवेल. तसेच महाराष्ट्रातील रायगड जिल्ह्यातील सावित्री पूल, गोवा मुंबई महामार्गावरील १६५ दिवसांमध्ये तयार केला आहे. अशा अन्य प्रकल्पाचा खालीलप्रमाणे आढावा.

ढोला सदिया पुल, भारताचा महासेतू

भारतातील सर्वात लांब असलेला हा ढोला सदिया पूल ब्रह्मपुत्राची उपनदी लोहीद नदीवर तयार केला आहे. या पुलाची एकूण लांबी ९.१५ किमी असून आसाम आणि अरुणाचल प्रदेश ला हा पुल जोडतो. या पुलाचे बांधकाम २०११ ला सुरुवात झाले. परंतु २०१४ नंतर या कार्याला गती मिळाली. सहा वर्षाचे कार्य तीन वर्षात पूर्ण करून भारताचे पंतप्रधान श्री नरेंद्र मोदी यांच्या हस्ते २६ मे २०१७ रोजी उद्घाटन झाले. या पुलासाठी एकूण २०५६ कोटी रुपये खर्च झाले आहेत. या पुलाचे अत्यंत महत्त्वाचे स्थान निर्माण झाले आहे. ब्रह्मपुत्रा नदीवर वाहतुकीसाठी यापूर्वी केवळ एकच कालबामरा पूल होता. आसाम आणि अरुणाचल प्रदेशमध्ये वाहतुकीचे मुख्यसाधन हे नौका होती. परंतु ढोला - सदिया पुलामुळे उत्तर आसामची संपूर्ण वाहतूक व्यवस्थामध्ये वाढ होईल. हा प्रकल्प भारत-चीन सीमेवरील तैनात असलेल्या भारतीय सैन्यासाठी महत्त्वपूर्ण ठरला आहे. कारण या पुलावरून रणगाडे देखील वाहतूक करता येतात असे तंत्रज्ञान या पुलाच्या बांधकाम करताना वापरले आहे.

ढोला सदिया पुलाचे फायदे

१)आसाम व अरुणाचल राज्यात प्रवास करण्यासाठी वेळेची बचत झाली.

२) यापूर्वी ढोला पासून सदिया इस्लामपूर टिनीयालीपर्यंत जाण्यासाठी आठ तासाचा प्रवास होता.

३) हा पूल तयार होण्यापूर्वी लोकांना नौकांनी प्रवास करावा लागत होता. ज्यामध्ये अनेक दुर्घटना देखील होत होत्या व साडेपाच तास वेळ लागत होता.

४) या पुलामुळे १६५ किलोमीटरचा प्रवास आता केवळ ३० मिनिटांमध्ये पूर्ण होत आहे.

५) या पुलामुळे वाहतूक, उत्पादन, आरोग्यविषयक, शैक्षणिक, पर्यटन या सर्व बाबींमध्ये फायदा झाला आहे.

६)अरुणाचल प्रदेश आणि शेजारील असलेले आशियाई देशांमध्ये व्यापारास चालना मिळाली. त्यामुळे रोजगार वाढ झाली .

जोजीला भुयारी मार्ग

"आशिया खंडातील सर्वात मोठा भुयारी मार्ग म्हणजे "जोजीला" भुयारी मार्ग होय. हा भुयारी मार्ग तयार करताना याला जोडूनच संकटकाळात उपयोगी होईल असा दुसरा बोगदा तयार केला आहे. या जोजीला बोगद्याची एकूण लांबी १४.१५ किमी असून सुरुवातीला ९०९० कोटी होती. परंतु श्री. नितीन गडकरी यांच्या मार्गदर्शनाखाली विविध तंत्रज्ञानाचा उपयोग केल्यामुळे ६८०८ कोटी खर्च झाला.

जोजीला बोगद्याची वैशिष्ट्ये

१))आशिया खंडातील सर्वात लांब द्वि-दिशात्मक रस्ता/बोगदा आहे.

२) बोगद्याची लांबी १४.१५ किमी आहे.

३) बोगद्याचे आणि या मार्गाची एकूण लांबी ३२.६२५ किमी आहे.

४) श्रीनगर - कारगिल - लेह "एन एच १ वर जोजोला खिंडीत ११५७८ फूट उंचीवर बांधण्यात आला आहे.

५) सर्व हवामानात त्रासमुक्त आणि सुरक्षित दळणवळण असेल.

जोजीला बोगद्याचे फायदे

१) द्वि-दिशात्मक बोगदा, दळणवळण सक्षम होईल व वर्षभर प्रवासाचा वेळ कमी होईल.

२) बोगद्यामुळे सर्व हवामानातील वाहतूक सुरक्षित होईल .

३) लॉजिकस्टिकची किंमत कमी झाल्यामुळे सशस्त्र दलासाठी वरदान ठरणार आहे.

४) लढाख आणि जम्मू कश्मीर प्रदेशातील पर्यटन क्षेत्राना चालना मिळेल.

५) व्यापार, आरोग्य, शिक्षणाच्या सोयी निर्माण होतील.

६) स्थानिक व्यवसाय, राष्ट्रीय बाजारपेठ सोबत जोडल्यामुळे रोजगाराच्या संधी उपलब्ध होतील.

७) स्थानिक रहिवाशांना रोजगार मिळेल.

८) या बोगद्यामुळे सर्व गोष्टीचा पुरवठा जलद होईल व अखंड वाहतूक चालू राहील.

"हा बोगदा जम्मू कश्मीर आणि लदाखमध्ये सर्वांगीण आर्थिक आणि सामाजिक, सांस्कृतिक एकात्मता आणण्यासाठी जोजीला बोगदा प्रकल्पाची संकल्पना मांडण्यात आली. हा प्रकल्प जुलै २०१६ मध्ये एन. एच. आय. डी. सी. एल ला ईपीसी तत्त्वावर अंमलबजावणीसाठी देण्यात आला होता. परंतु अनेक वर्ष रखडलेल्या या प्रकल्पाला श्री. नितीन गडकरी यांनी २०१९ मध्ये पुन्हा सुरुवात केली. पुनर्नियोजन करण्यासाठी महासंचालक रस्ते विकास आणि विशेष सचिव यांच्या अध्यक्षतेखाली एक विशेष समिती स्थापन केली. त्यानंतर सविस्तरपणे अभ्यास करण्यात आला व या अभ्यासाअंती या प्रकल्पाच्या एकूण खर्च कमी करण्यात आला. त्यामुळे ३८३५ कोटी रुपयांची बचत श्री. नितीन गडकरी यांच्या अभ्यासामुळे व दूरदृष्टीमुळे झाली. या बोगद्याचे कामकाज करण्यास १९/०५/२०१८ रोजी सुरुवात झाली. याचे उद्घाटन भारताचे पंतप्रधान श्री नरेंद मोदी व श्री. नितीन गडकरी यांच्या हस्ते झाले. हा बोगदा ईपीसी प्रणालीनुसार बांधण्यात आला. या बोगद्यामध्ये पूर्णपणे ट्रान्सवर्स व्हेंटिलेशन व्यवस्था, अखंडित वीजपुरवठा, आपत्कालीन प्रकाश व्यवस्था, सीसीटीव्ही देखरेख, व्हेरिएबल मेसेज चिन्ह, ट्रॅफिक लॉगिन उपकरणे आणि बोगदा रेडिओ सिस्टम अशी नवीनतम सुरक्षा वैशिष्ट्ये आहेत.

दिल्ली-मेरठ एक्सप्रेस वे

देशातील प्रचंड रहदारी असणाऱ्या शहरांमध्ये दिल्लीचा क्रमांक वरचा येतो. उत्तरप्रदेश, हरियाणा, पंजाब, राजस्थान या राज्यातून येणारी रस्ते वाहतूक ही दिल्लीची मोठी समस्या होती. या वाहतूक समस्येवर मार्ग काढण्यासाठी दिल्ली- मेरठ हा महामार्ग तयार करण्यात आला आहे. "या महामार्गाच्या कामाची सुरुवात दि. ३१ डिसेंबर २०१५ रोजी पंतप्रधान नरेंद्र मोदी यांच्या हस्ते झाली व याचे काम २०१९ मध्ये पूर्ण झाले. दिल्ली - मेरठ एक्सप्रेस वे बनल्यामुळे ९० कि.मी हे अंतर केवळ ३५ ते ४० मिनिटांमध्ये पूर्ण होत आहे. या महामार्गाचे काम वेगवेगळ्या ०४ भागांमध्ये विभाजित केले आहे. यासाठी एकूण ७ हजार कोटी खर्च आहे. हा महामार्ग १४ लेनचा असून दिल्ली वाहतूक समस्या कमी करणारा आहे. या एक्सप्रेस वे कामकाज दिल्लीतील निजामुद्दीन पुलापासून सुरुवात झाले. हा पुढे एनएच २४ डासना पर्यंत (३०.३८ कि.मी) असेल. या रस्त्याचे कामकाज चार विभागात आहे. निजामुद्दीन ते उ.प्र. सीमा, उ.प्र. सीमा ते डासना, डासना ते हापूज, व डासना आणि मेरठ यामध्ये नवीन रस्ता असे या एक्सप्रेस वे चे स्वरूप आहे. हा भारतातील पहिला १४ लेन असलेला महामार्ग आहे. या महामार्गवर १४ लेन सोडून २.५ मीटरचा सायकल ट्रॅक देखील तयार केला असून या रस्त्याच्या किनारी एकूण ४०००० वृक्षाची लागवड करण्यात आली आहे.

जम्मू-उधमपूर महामार्ग

भारतातील भौगोलिक दृष्ट्या उंच असलेला भाग म्हणजे जम्मू-काश्मीर आहे . जम्मू कश्मीर मधील असलेला हिमाचल पर्वत, घाट, डोंगररांगांनी हा प्रदेश युक्त आहे. तेथील भौगोलिक रचना ही उंच खोल आहे. त्यामुळे रस्ते निर्मिती, वाहतूक आणि दळणवळणासाठी आजपर्यंत अनेक समस्या निर्माण झाल्या. श्री. नितीन गडकरी यांनी मात्र २०१४ पासून जम्मू कश्मीरच्या विकासाकडे लक्ष केंद्रित केले. नवनवीन महामार्ग निर्मितीला चालना देऊन तेथील दळणवळण कसे सुलभ होईल या अनुषंगाने अनेक बोगदे आणि महामार्ग बांधणी केली. त्यापैकीच एक महामार्ग म्हणजे जम्मू-उधमपूर महामार्ग आहे. "जम्मू आणि उधमपूर सारख्या आर्थिक व व्यावसायिक दृष्ट्या महत्त्वाच्या दोन शहरांना जोडण्याचे कार्य हा महामार्ग करतो. भरपूर वाहतूक आणि गर्दीमुळे या रस्त्यावर वाहतुकीच्या समस्या निर्माण होत होत्या. येथील ७० कि.मी अंतर पूर्ण करण्यासाठी अडीच तास पेक्षा जास्त अवधी लागायचा. यावर तोडगा काढण्यासाठी हा महामार्ग बांधणी करण्यात आला आहे".

"या रस्त्यावरून ८०% प्रवासी वाहतूक आणि ६०% मालवाहतूक, याचबरोबर सैन्याची वाहतूक देखील मोठ्या प्रमाणात होत असते. हा महामार्ग बांधताना अनेक भौगोलिक दृष्ट्या समस्या निर्माण होत होत्या. कडे कोसळणे, भूस्खलन होणे परंतु याची काळजी घेण्यासाठी रिटेनिंग वॉल्स बांधले आणि रस्ते बांधणी केली . स्थापत्यशास्त्राची उत्तम कलाकृती आणि अभियंत्यांचे उत्तम रचना कृती म्हणजे हा जम्मू-उधमपूर महामार्गाचे उदाहरण देता येईल. "या महामार्गावर काही मोठे महान लहान असे ७६ पूल बांधण्यात आले आहेत. दोन दऱ्यामध्ये थेट पूल निर्माण केल्यामुळे रस्त्याचे अंतर कमी होण्यास मदत झाली". यामध्ये २३३ कलवर्टर्स आणि ट्यून ट्यूब बोगदे निर्माण करण्यात आले आहेत. हा रस्ता तयार करताना मोठे

पहाड कापण्यात आले. यासाठी ड्रम कटर व रॉडर हेडारचा वापर करण्यात आला. या कामासाठी सरासरी या साहित्याचा वापर केला जात नाही. परंतु महामार्ग निर्मिती करता सर्व साधन उपयोग करून हा महामार्ग तयार करण्यात आला आहे. जम्मू-उधमपूर महामार्ग बांधणी करताना अनेक रोजगार निर्माण झाले. स्थानिक लोकांना रोजगाराच्या संधी उपलब्ध झाल्यामुळे या परिसरातील बेरोजगार तरुणांच्या मनात देशाविषयी सकारात्मक भावना देखील वाढण्यास मदत झाली असे म्हणता येईल. जम्मू-काश्मीर च्या सर्वांगीण विकासाला उपयोगी पडणारा जम्मू-उधमपूर महामार्ग श्री. नितीन गडकरी यांनी बनवला. हे जखमीचे काम होते.

भारतमाला परियोजना

देशाच्या सर्व वाहतुकीचा विकास साध्य करणारी, जम्मू कश्मीर ते कन्याकुमारी व आसाम ते गुजरात रस्त्याचे जाळे निर्माण करून देशाचा आर्थिक विकास साध्य करणारी, रस्ते निर्मितीतून सुसज्ज वाहतूक निर्माण करणारी योजना म्हणजे भारतमाला परियोजना होय. "रस्ते वाहतूक मंत्रालयाने श्री. नितीन गडकरी यांच्या अध्यक्षतेखाली भारतामाला परयोजनाची आखणी केली. मा. अटलबिहारी वाजपेयी यांनी "सुवर्ण चतुर्भुजद्वारे" अनेक राज्य आणि जिल्ह्यांना जोडणाऱ्या महामार्गाचे अभूतपूर्व काम केले. यामुळे देशाला फायदा झाला. परंतु काळानुरूप अनेक बदल झाले. रस्ते महामार्गाची गरज भासू लागली. तेव्हा२०१४ ला सत्ता बदल झाल्यानंतर ३१ जुलै २०१५ रोजी भारतमाला योजना तयार करण्यात आली. ही भारत सरकारची अत्यंत महत्त्वकांक्षी योजना आहे. "या योजनेकरिता एकूण ८ लाख कोटी रुपये खर्च केला जाणार आहे. यामध्ये रस्ते विकास महामार्ग निर्मिती आणि अन्य रस्ते बांधणी संबंधित कार्य पूर्ण केले जाणार आहेत. भारताचा आर्थिक विकास साध्य करण्यासाठी आर्थिक कॅरिडॉर, इंटर कॅरीडोर आणि फिडर मार्ग, राष्ट्रीय कॅरिडॉर कार्यक्षमता सुधारणा, देशाच्या सीमा, आंतरराष्ट्रीय कनेक्टिव्हिटी रस्ते, तटीय रस्ते यांचा विकास करून सर्व बाबतीत क्षमता वाढविण्यासाठी ही योजना फायदेशीर ठरणार आहे. या योजनेचे फायदे देशातील विविध भागातील रस्ते निर्मिती वरून लक्षात येतील. भारतातील ५५० पेक्षा अधिक जिल्हे राष्ट्रीय महामार्गाद्वारे जोडले गेले आहेत. २०१९ चा विचार केला तर ३३० जिल्हे जोडले असून रस्ते निर्मितीमुळे या जिल्ह्याचा कायापालट होणार आहे. मनुष्य वाहतूक आणि मालवाहतूक हे भारतमाला परी योजनेचे केंद्रबिंदू आहेत. "भारतमाला परियोजनेनुसार २४६०० कि.मी आर्थिक कॅरिडॉर बांधले जाणार आहेत. यासाठी पहिल्या टप्प्यात १ लाख २० हजार कोटी खर्च करण्यात आले आहे. भारतमालातील आर्थिक कॅरिडॉर मध्ये औद्योगिक जिल्हे म्हणून ओळख असलेल्या शहरांना आणि औद्योगिक क्षेत्रांना जोडले जाणार असून यामध्ये मुंबई, हैदराबाद, कोलकत्ता, पणजी यासारखे ४४ आर्थिक कॅरिडॉरचा समावेश आहे. भारतातील प्रत्येक राज्यामध्ये या आर्थिक कॅरिडॉरची निर्मितीसाठी कार्य चालू आहे". "इंटर कॅरिडोर आणि फिडर मार्गद्वारे देशातील अंतर्गत महामार्ग आणि रस्ते जोडले जातात. हे दोन्ही कॅरिडॉर जंक्शनच्या स्वरूपामध्ये काम करतात. भारतमाला मध्ये एकूण ८ हजार किमीचे इंटर कॉरिडॉर आणि ७५०० कि.मी अंतराचे फिडर मार्ग तयार करण्यात येणार आहे. यामध्ये पहिल्या टप्प्यात ८० हजार कोटी रुपये किमतीचे ६ हजार किमी रस्ते बांधण्यात येणार आहेत. देशातील ६३% पेक्षा जास्त फिडर मार्ग एक पदरी असून त्यांचे दोन लेन करणे हा या योजनेचा उद्देश आहे.

सागरमाला परियोजना

पंतप्रधान श्री. नरेंद्र मोदी व श्री. नितीन गडकरी यांच्या अनेक महत्त्वकांक्षी योजनेपैकी एक योजना म्हणजे सागरमाला परियोजना आहे. सागरमाला परीयोजना ही सर्वप्रथम अटलबिहारी वाजपेयी यांनी २००३ मध्ये घोषित केली होती. भारतातील उत्तरेकडील नद्यांचे पाणी दुष्काळी भागामध्ये घेऊन जाणे आणि जलवाहतूक संबंधातली ही योजना होती. २००४ ला केंद्रात सरकार बदलले आणि योजना बासनात गुंडाळली. २०१४ ला मात्र सरकार बदलले, भाजप सरकारची सत्ता आली. जहाज मंत्रालयाची जबाबदारी श्री. नितीन गडकरी यांच्याकडे सोपवली गेली. या सागरमाला योजना संदर्भात सर्वेक्षण, विश्लेषण, अभ्यास इत्यादी गोष्टी पूर्ण केल्या. तज्ञसमिती निर्माण करून अहवाल तयार केला आणि २०१६ मध्ये या सागरमाला परीयोजनेची पुन्हा घोषणा करण्यात आली. भारतातील जलमार्ग आणि जलवाहतुकीला चालना देणारी ही योजना आहे. या योजनेचा फायदा भारतात जलवाहतूक निर्माण होण्यास, त्यामध्ये वाढ होण्यास होणार आहे. सर्वात महत्त्वाचे म्हणजे रस्ते वाहतुकीवर अवलंबून असलेला भार कमी होणार आहे. "भारताच्या संपूर्ण ७५०० कि.मी इतक्या लांब किनारपट्टीचा वापर करून जलमार्गाची क्षमता वाढवणे, लॉजिस्टिक क्षेत्रातील खर्च कमी करून यामध्ये मोठ्या प्रमाणात उद्योग निर्माण करून देशातील लॉजिस्टिकला एक वेगळे वळण देणे. जलवाहतुकीला मोठ्या प्रमाणात संधी उपलब्ध करून देऊन तिला चालना देणे या हेतूने ही योजना भारत सरकारने अतिशय नियोजनबद्ध सागरमाला कार्यक्रमाची बांधणी केली आहे.भारतामध्ये नवीन बंदर उभारणी व्हावी व असलेल्या बंदरांचा विकास व्हावा हा प्रमुख उद्देश या योजनेचा आहे. यामुळे संपूर्ण भारतातील रस्ते, रेल्वे, जलवाहतूक आणि लॉजिस्टिक यांचे भारतामध्ये एकत्रित जाळे निर्माण होणार आहे. याचा फायदा संपूर्ण देशाच्या वाहतुकीला होईल.

सागरमाला योजनेतील प्रमुख उपाय योजना

१) बंदरांचे आधुनिकीकरण आणि नवीन बंदरांचा विकास करणे.
२) बंदरांच्या संपर्ककक्षा विस्तारणे .
३) पोर्ट नेतृत्वाखालील औद्योगिकीकरण करणे.
४) तटीय समुदाय विकास करणे .
५) असे मुख्य उद्देश आहेत.

सागरमाला परियोजनेतून बंदरांचे रस्ते जोडणी

स्थिती	संख्या	लांबी (किमी)	किंमत (कोटी)
गुजरात	४	६९०	१९३११
महाराष्ट्र	१४	२३५१	५३७०३
गोवा	०२	११०	१३६३
कर्नाटक	०७	७८१	६०९४
केरळ	२१	२२०	४४२३
तामिळनाडू	१९	१९१३	५४८००
आंध्रप्रदेश	३६	२१८४	३०१४०
ओडीसा	०४	६२	६४९
पश्चीम बंगाल	०५	२७५	९२७८
एकूण	११२	८५८४	१७९७६१

श्री

. नितीन गडकरी यांच्या कार्यकाळात महामार्ग बांधकामाचा विक्रम

१)गुजरात राज्यातील बडोद्याजवळ २.५ कि.मी लांबीचा सिमेंट काँक्रीट रस्ता २४ तासांमध्ये बांधून पूर्ण केला. याचा नोंद जागतिक विक्रमामध्ये करण्यात आली आहे.

२) महाराष्ट्रातील सोलापूर जिल्ह्यामध्ये राष्ट्रीय महामार्ग क्रमांक. ५२ च्या सोलापूर - विजापूर विभागातील २६ किलोमीटर लांबीचा सिंगल लेन बूटमेन रस्ता अवघ्या २१ तासात बांधून जागतिक विक्रम झाला.

३) २०१४ मध्ये राष्ट्रीय महामार्गाची लांबी ९१ हजार कि.मी होती. २०२२ मध्ये ती १.४३ लाख कि.मी झालेली आहे.

४) मुंबई ते दिल्ली हे आठ लेनचा द्रुतगती मार्ग तयार करण्यात येत आहे. ज्याचे कार्य २०१८ मध्ये सुरू झाले. २०२४ मध्ये पूर्ण होणार आहे. १४०० कि.मी चा हा सर्वात लांब द्रुतगती मार्गापैकी एक आहे. कारने प्रवास केला तर १२ तास आणि ट्रकने प्रवास केला तर २० तास इतका कालावधी लागणार आहे. एकूणच प्रवासाचा अवधी कमी झाल्यामुळे इंधनाची बचत झाली. यामुळे दरवर्षी ३२ कोटी लिटर इंधनाचे बचत होईल. व कार्बन उत्सर्जन ८५ कोटी किलोग्रॅम कमी होणार आहे. या महामार्गासाठी एकूण १ लाख कोटी खर्च अपेक्षित आहे.[१०५] या कार्याचा आढावा घेतल्यानंतर, श्री. नितीन गडकरी हे केवळ स्वप्न पाहणारे नाहीत तर पाहिलेले स्वप्न प्रत्यक्षात उतरवणारे आहेत हे लक्षात येते.

२०१४ ला श्री. नितीन गडकरी यांनी रस्ते वाहतूक व महामार्ग खात्याची जबाबदारी घेतल्यानंतर अनेक जागतिक विक्रम केलेली दिसतात. २०१४ मध्ये प्रतिदिन रस्ते बांधणीचा वेग हा ३ किलोमीटर होता. तोच २०१९ मध्ये प्रतिदिन २८ कि.मी वेग आहे. स्थापत्य अभियंता नसतानाही श्री. नितीन गडकरी यांच्याकडे रस्ते बांधणी बाबतच्या आधुनिक तंत्रज्ञानाची माहिती आहे. कामाचा झपाटा, आधुनिक तंत्रज्ञान, नवीन संशोधन, कमी खर्चात बांधकाम, विविध यशस्वी प्रयोग याद्वारे रस्ते बांधणीत भारताचे जगात अव्वलस्थान निर्माण करण्याची त्यांची मनोकामना आहे. गुजरात मध्ये एकाच दिवसात ३ किलोमीटरचा सिमेंट रोड बांधून जागतिक विक्रम राष्ट्रीय महामार्ग प्राधिकरणाने केला. सोलापूर - विजापूर हा डांबरी रस्ता एकाच दिवशी २४ किलोमीटर बांधून जागतिक विक्रम श्री. नितीन गडकरी यांच्या नेतृत्वात रस्ते बांधकाम प्राधिकरणाने केला आहे. महाराष्ट्रातील रस्ते बांधणीच्या कामाचा आढावा घेतला तर २०१४ पर्यंत राष्ट्रीय महामार्गाची एकूण लांबी ५७०० किमी एवढी होती. २०१४ ते २०२२ या ७ वर्षात महाराष्ट्रात १२५२४ कि.मी लांबीचे राष्ट्रीय महामार्ग घोषित करण्यात आले. रस्ते बांधण्यात एकूण ३२० % वाढ झाली आहे. महाराष्ट्रात २०२२ पर्यंत १ लाख २६८५ कोटी रुपये खर्च करण्यात आले आहेत. स्वतंत्र्यानंतर प्रथमच एवढी रक्कम रस्त्याच्या पायाभूत सुविधावर खर्च करण्यात आली. नितीन गडकरी यांच्या कार्यकाळात रस्ते निमितीला वेग आला. नितीन गडकरी यांच्या कार्यकाळात खालील प्रमाणे रस्ते निर्मिती झाली.

वर्ष	राष्ट्रीय महामार्ग (कि.मी मध्ये)
२०१३ - २०१४	९१२८७
२०१४ - २०१५	९७९९१
२०१५ - २०१६	१,०१,०१०
२०१६ - २०१७	१,१४,१५८
२०१७ - २०१८	१,२६,३५०

राष्ट्रीय महामार्ग बांधणी किमीमध्ये

वर्ष	राष्ट्रीय महामार्ग (कि.मी मध्ये)
२०११ - २०१२	५०१३
२०१२ - २०१३	५७३२
२०१३ – २०१४	४२६०
२०११ - २०१४	**१५००४**
२०१४ - २०१५	४४१०
२०१५ - २०१६	६०६१
२०१६ - २०१७	८२३१
२०१७ - २०१८	९८२९
२०१४ - २०१८	**२८५३१**

श्री.नितीन गडकरी यांच्या कार्यकाळात महामार्गाची लांबी एकूण ७०% टक्यांनी वाढल्याचे दिसून येते. श्री. नितीन गडकरी यांच्या नेतृत्वामध्ये देशभरात २२ ग्रीन एक्सप्रेस हायवेची निर्मिती झाली आहे. मुंबई- दिल्ली हा १ लाख कोटीचा एकच रस्ता आहे. मुंबई - दिल्ली केवळ बारा तासामध्ये पोहोचणे शक्य होणार आहे. भाविकांसाठी चारधाम रस्त्याने जोडण्याचे कार्य आणि कैलास मानसरोवराला भारतातून जाता येईल असा रस्ता श्री. नितीन गडकरी यांनी तयार केला आहे. महाराष्ट्रातील पंढरपुरात जाणाऱ्या सर्व पालख्यासाठी पालखी मार्ग तयार करून सुमारे ४००० कोटी रुपये या मार्गावर खर्च करण्यात येत आहेत. ही श्री. नितीन गडकरी यांचे दूरदृष्टी लक्षात येते. याशिवाय भारतातील प्रत्येक शहरांना केंद्रीय मार्ग निधी देऊन शहरांमधील रस्त्यांचा विकास चालू आहे. देशाचे नंदनवन म्हणून ओळखले जाणाऱ्या जम्मू कश्मीरमध्ये ७००० कोटीची कामे चालू आहेत. आशिया खंडातील सर्वात मोठा जोजिला बोगदा तयार केला आहे. सिमला-मनाली या रस्त्यावर अटल टनेल बांधण्यात आले. त्यामुळे तेथील आठ तासाचा प्रवास साडेतीन तासात पूर्ण होतो. दिल्ली -अमृतसर- कटरा या रस्त्याचे काम चालू आहे. श्रीनगर ते मुंबई आता वीस तासात जाता येईल. आजच्या स्थितीमध्ये संपूर्ण देशात ५० लाख कोटी रुपयांची महामार्गाची कामे सुरू आहेत.

समारोप

श्री. नितीन गडकरी यांच्या पारदर्शक, वेळेचे नियोजन, डिजिटल आणि भ्रष्टाचारमुक्त प्रणालीमुळे कार्य वेगाने पूर्ण होऊन याचा फायदा देशवासीयांना होतो. संपूर्ण देशामध्ये पायाभूत सुविधा उपलब्धतेमुळे मालवाहतुकीच्या खर्चात आणि इंधनाच्या खर्चात बचत झाली. रामवनगमन हा २५८ किमीचा व ५००० कोटी रुपयांचा रस्ता आहे. ८४ कोसी परिक्रमा मार्ग, चारधाम प्रकल्प पूर्ण झाले आहेत. अशा विविध कामाचे उद्घाटन आणि अनावरण श्री. नितीन गडकरी यांच्या कार्यकाळामध्ये झाले. हे अभ्यासाअंती आढळून येते. देशाच्या पायाभूत विकासामध्ये रस्ते महत्त्वाचे आहेत. रस्ते विकास करणे, रस्ते निर्माण करताना विविध तंत्रज्ञानाचा वापर करणे, हरित महामार्ग, प्रदूषणमुक्त प्रवास, पर्यावरण पूरक विकास करणे हे श्री. नितीन गडकरी यांच्या कार्यपद्धतीचे लक्षणे आहे. याची भारत नोंद घेईल. राजकीय नेता कसा असावा, मंत्री म्हणून धोरणे कसे आखले जावेत, याचा आदर्श म्हणून श्री. नितीन गडकरी सरस ठरतील. अमेरिकेचे राष्ट्राध्यक्ष जॉन एफ केनेडी यांचे प्रसिद्ध वचन आहे की "अमेरिका विकसित देश आहे, म्हणून तेथील रस्ते चांगले नाहीत. तर तेथील रस्त्याचा दर्जा चांगला आहे, म्हणून हा देश विकसित आहे". या तत्त्वावर गेली २५ वर्षापासून अविरतपणे ते भारताला विकसित करण्याच्या उद्देशाने कार्य करताना दिसतात.

संदर्भ

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२) नितीन गडकरी , विकास के नए कीर्तिमान , स प औ रा मं , पृ. क्र, १४

३) नितीन गडकरी , विकास के नए कीर्तिमान , स प औ रा मं , पृ. क्र, १५

४) नितीन गडकरी , विकास के नए कीर्तिमान , स प औ रा मं , पृ. क्र, २४

५) अनिरुद्ध हेमचंद्र पाडळीकर, ग वि ग पॅ,अनघा प्रकाशन, पुणे, पृ. क्र, ३१

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Artificial Intelligence for Libraries: Applications and Challenges

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Abstract:
In recent world, libraries are not just about books or not even about print materials. They are changing with relevant technologies. One of them is artificial intelligence. Artificial intelligence technologies in all sphere of works are making the future promising. The application of artificial technologies has contributed to the provision and use of library resources. AI can be used in various library services which will help to achieve library aims and objectives. AI has found various applications in libraries from day-to-day work to making decisions. This paper discussed various applications of AI such as cataloguing, classification, virtual assistant, vast content analysis, multilingual support, Virtual reality and augmented reality etc. This paper also talks about various challenges libraries may face while application of artificial intelligence in the library.

Keywords: AI, artificial intelligence, library, applications, challenges

Introduction:

From few decades artificial intelligence (AL) and machine learning (ML) have become major technologies of reshaping our world. It has great influence on every facet of our society. In recent years, artificial intelligence describes a suite of technologies and tools that aim to reproduce or surpass abilities in computational systems that would require 'intelligence' if humans were to perform them. This could include the ability to learn and adapt; to sense, understand and interact; to reason and plan; to act autonomously; or even create. It enables us to use and make sense of data (UKRI, 2021). Artificial Intelligence (AI) is a branch of computer science that focuses on creating systems capable of performing tasks that typically require human intelligence. These tasks include learning, reasoning, problem-solving, perception, and language understanding (Abbas J. et al, 2020). Another approach towards AI that, in its logical approach, artificial is a neural network, which is a network of artificial neurons or nodes that mimics the human biological processes of neurons. It was developed in a system to imitate the structural organisation of the neural activities of humans (Ajakaye, J. E., 2022)

Review of Literature:

Artificial intelligence (AI) has been applied to various library tasks and services and its benefits have been identified in many studies. According to According to Jantz (2017), AI tools like Big Data and Text Data Mining revolutionize how libraries manage and develop their collections, facilitating efficient processing and analysis of vast amounts of data to maintain up-to-date metadata, user data, and resource statistics. Lynch (2017) noted that AI-driven cataloging and classification systems significantly reduce the manual workload of librarians, allowing them to focus on more strategic tasks. Tzoc (2018) highlighted how libraries' educational programs on AI not only enhance public understanding but also empower users to critically engage with AI technologies, fostering a more informed and tech-savvy community. Cox et al. (2019) also emphasized that libraries are well-positioned to offer AI literacy programs due to their role as community knowledge hubs. While using AI for circulation, Yu, Gong, Sun and Jiang (2019) stated that by using existing scanners, indexing software developed by the Digital Knowledge Base and optical character recognition software, the Comprehensive Access to Printed Material system will not only allow for scanning through images of text, but also allow for searching and analyzing of full-text produced from the images.

According to Afolayan and et al (2020) distribution of activation-based inferencing methods is often used to navigate various large-scale knowledge structures, which can help in cataloguing and classification of library information resources. According to Bawden and Robinson (2020), there is a growing awareness of the potential risks associated with AI, particularly regarding data privacy. Kawatra and Kumar (2020) highlight the role of libraries as innovation hubs, facilitating interdisciplinary research and problem-solving initiatives that address significant societal challenges like healthcare and environmental sustainability. AI can be applied in libraries also for analyzing user behavior. AI algorithms can analyze users' search queries and reading patterns to identify their interests and provide personalized

recommendations. This can help users find relevant resources more quickly and enhance their overall experience. Morriello (2020) presented the impact of IoT, Blockchain and AI is comprehensive in knowledge and information and, therefore, in libraries. The author suggested that using these technologies in libraries are inevitable and only a question of time. The article provided valuable insight into the potential benefits libraries can reap from these technologies. The findings of Li, S. (2021) suggested AI can enhance library management networks' defense capabilities and safety. The research provided valuable insights into the application of AI in library network security. The study also focused on data fusion, hierarchical artificial immune situation assessment and an improved algorithm based on population cognition. Tian (2021) suggested using a multi-intelligent agent collaboration method combined with content filtering and learning optimization for personalized information services. The author emphasized the significance of intelligent service as a new direction for library development and the need to embrace new innovative technology. The author also highlighted the benefits of personalized and efficient services provided by AI in libraries.

A study by Tait, E., & Pierson, C. (2022) found that AI-based recommendation systems can improve user satisfaction and engagement with library services. Pence (2022) identified various vital uses of AI in libraries, such as extensive data research, remote access, and data analysis. The author believed that libraries can transform into virtual hubs for knowledge and connectivity by working with existing AI programs on campus, freeing librarians to provide advanced research expertise. The Thalaya and Puritat (2022) study aimed to apply AI technology to raise the caliber of library services and increase user happiness. The results showed that employing AI to respond to queries regarding book locations, opening times, and other pertinent information saved the librarian's time and enhanced the management of library services. Adetayo (2023) states that artificial intelligence (AI) chatbots, such as ChatGPT, have become valuable tools for academic libraries. They provide rapid and accurate responses to user inquiries, offering convenience and accessibility outside traditional library hours. ChatGPT's advanced language processing capabilities enable it to generate human-like and contextually relevant responses, making it an effective virtual assistant. Harisanty et al (2023) discovered that AI could be easily incorporated into libraries for administrative functions like staffing, technical functions like cataloguing, and informational functions like reference and information literacy.

Applications of Artificial Intelligence in Library:

AI technologies such as machine learning, natural language processing, and computer vision can be used to automate routine tasks, analyze data, and provide personalized services to library users

1. **Cataloguing and classification** – AI algorithms can automate the process of cataloguing and classification of library books, articles and other multimedia content. By using Optical Character Recognition (OCR) this will make better organization of library collections and improves search ability of users.
2. **Recommendations** - AI-powered systems can recommend books, articles, or resources based on past borrowing pattern, interests, or reading habits. AI-driven content recommendations extend beyond books and articles. Libraries can use AI to suggest relevant events, workshops, and community activities, promoting engagement with the library beyond traditional research and borrowing. This personalization enhances user experience and encourages exploration of new materials.
3. **Virtual assistants and chatbots** - Virtual assistants and chatbots have become integral to library services. They provide real-time assistance to users including information on services, answering questions, helping with research, and guiding users through library resources. These AI-powered assistants are available 24/7, improving accessibility and user engagement.
4. **Natural Language Processing (NLP)** - Chatbots and virtual assistants equipped with NLP capabilities can engage in conversational interactions, making it easier for users to find the information they need. NLP enables libraries to understand and respond to user queries in a more human-like manner.
5. **Predictive Analytics** - AI based algorithms can analyse historical borrowing patterns and user behaviour to predict future trends in library usage, collection development needs, and resource allocation. This proactive approach allows libraries to take accurate collection development decisions and allocate resources more efficiently and ensure that their collections remain relevant.
6. **Digital Resource Management** - AI technologies facilitate the management of digital collections such as digitized archives, multimedia resources and online databases. AI can automate metadata tagging, content preservation and digital preservation tasks, ensuring long-term accessibility and usability of digital assets.
7. **AI-Powered Accessibility Tools** - AI based algorithms enhance accessibility for users with disabilities by providing text-to-speech and speech-to-text conversion, image recognition, and adaptive interfaces which improves the

accessibility of digital content for all users. AI can also provide alt-text for images, convert text to braille and make audiovisual content accessible through captioning and sign language recognition (Bhui, 2024).

8. **Multilingual Support** - Language barriers can be minimized through AI-powered translation services which is very necessary in Multilingual population in India. Users can access materials in their preferred language, expanding the reach and impact of library collections.
9. **Vast Content Analysis and Discovery** - AI technologies can analyse large volumes of scholarly literature, news articles, and research papers to identify trends, topics, and emerging areas of interest. Librarians can use these insights for collection development, research support, and academic services (Ritu, 2024)
10. **Securing Digital Rights and Licenses** - AI can assist in managing digital rights and licenses for library collections, ensuring compliance with copyright and licensing agreements. This is very important as libraries increasingly possess digital resources.
11. **Use of Virtual Reality (VR) and Augmented Reality (AR)** - Virtual Reality (VR) and Augmented Reality (AR) technologies can be used in library to create immersive library experiences. Users can explore virtual library spaces, attend virtual events or interactive exhibits and engage with digital resources in novel ways. This promotes enhancement in user engagement and upgrade in educational opportunities.

Challenges of Artificial Intelligence Application in Library: Though AI Technologies looks beneficial for libraries, there are various challenges for their application in library environment. Some of them are as below

1. Financial constraints – AI technologies can be expensive, requiring significant financial investment in infrastructure and software. Many of libraries may not afford but other libraries also need carefully evaluate the costs and benefits before implementing AI in their services.
2. Resistance to change – Generally humans are resistant to change in operational processes and the introduction of advanced technologies. Library staff may scare to technological transition due to lack of technological education. Libraries need to invest in training and professional development for staff to ensure they can effectively use and manage AI technologies.
3. Data privacy - When stored huge amounts of data, artificial intelligence eventually begins to recognise specific data sets through machine learning. Personal information has become a product that can be abused for some activities. Libraries need to ensure that user data is protected and used ethically.
4. Bias in algorithms - AI algorithms can unknowingly fix biases present in training data, leading to unfair or discriminatory outcomes. Libraries need to address and remove algorithmic bias and ensure fairness in AI systems is a complex challenge to navigate carefully.
5. Ethical considerations - AI can raise ethical concerns about the use of data, decision-making, and accountability. Libraries need to develop policies and guidelines for the ethical use of AI and engage in discussions with stakeholders (Balasubramanian & Tamilselven, 2023).
6. Maintenance and Updates - AI technologies require regular maintenance, updates, and monitoring to remain effective. Libraries need plans and resources in place to ensure the continued functionality of AI solutions.
7. Dependence for upgrading – If libraries rely on third-party AI provider, they may face challenges related to vendor lock-in, where they become dependent on a specific provider's technology and may have limited flexibility to adapt or switch providers.
8. Evaluation and Assessment – Libraries need to measure the impact and effectiveness of AI implementations. For that libraries need to know methods for assessing whether AI systems are achieving their intended goals and delivering accurate information to users.

Conclusion:

Artificial technologies have potential to bring revolution in library functions and services. Library services such as cataloguing, classification, information retrieval, reference services etc. can be enhance with the help of artificial technologies. AI systems can increase efficiency, improve accessibility and enhance user experience by providing personalized services. Before and after application of AI in library, there are various challenges that libraries must have to work on it. Resistance to change, financial constraints, data privacy, ethical considerations, maintenance and Updates etc. are some challenges that libraries must face while applying AI for library services.

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