



Original Article

Ergonomic Interventions and Digital Library Engagement: An Empirical Study of College Librarians' Perspectives

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Abstract:

This study examines the impact of ergonomic interventions on digital engagement among college librarians, with emphasis on workplace design and organizational support (Hedge, 2016). A descriptive and empirical approach was adopted, and data were collected from 178 respondents using a structured Likert-scale questionnaire, with analysis conducted through Python-based statistical tools. The survey was conducted among librarians working in colleges affiliated with Sant Gadge Baba Amravati University, Maharashtra. The questionnaire was distributed to 233 college librarians, out of which 178 responses were received, resulting in a response rate of 76.39%.

The findings show that ergonomic interventions significantly enhance digital engagement, supporting earlier research on technology use and workplace environment (Agarwal & Karahanna, 2000). While gender differences were not significant, professional experience influenced engagement levels. Key challenges such as lack of funding and awareness were also identified (Mukhedkar & Waikar, 2024). The study suggests improving ergonomic infrastructure and training, while future research should explore broader contexts and emerging digital practices (Waggoner et al., 2026).

Keywords: *Ergonomics, Ergonomic Interventions, Digital Engagement, Academic Libraries, College Librarians, Health and Productivity, Workplace Challenges, etc.*

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Introduction:

In the rapidly evolving digital era, academic libraries and information centers are increasingly

dependent on technology driven environments to deliver efficient services. This transformation has significantly altered the nature of work for library



professionals, particularly college librarians, who now engage extensively with digital systems, online resources, and electronic databases. While these advancements have enhanced access to information and user engagement, they have also introduced new challenges related to workplace ergonomics, health, and productivity (Sharma & Singh, 2020). Ergonomics, defined as the science of designing work environments to suit human capabilities, has therefore become a critical factor in ensuring both employee well-being and effective digital engagement.

The importance of ergonomic interventions in improving work performance and reducing physical strain has been widely acknowledged in previous studies. Poor ergonomic conditions, such as improper seating, inadequate lighting, and prolonged screen exposure, can lead to discomfort, fatigue, and reduced efficiency among information professionals (Dul & Weerdmeester, 2008). In contrast, well-designed ergonomic environments contribute to better concentration, enhanced productivity, and increased engagement with digital tools (Hedge, 2016). For college librarians, who spend extended hours managing digital resources, user queries, and administrative tasks, the role of ergonomics becomes even more significant.

Digital engagement has emerged as a key indicator of professional effectiveness in modern library settings. It encompasses the extent to which individuals interact with digital platforms, utilize online resources, and adopt technological tools in their daily work. Studies have shown that supportive work environments, including ergonomic infrastructure and organizational backing, positively influence digital engagement levels (Agarwal & Karahanna, 2000). However, despite its importance, many institutions continue to face challenges such as limited funding, lack of awareness, and

insufficient management support, which hinder the implementation of ergonomic practices.

Although existing literature highlights the individual importance of ergonomics and digital engagement, there is a need for empirical studies that examine their interrelationship, particularly in the context of academic libraries. This study aims to bridge this gap by analyzing the impact of ergonomic interventions on digital engagement among college librarians. By exploring key factors such as health, productivity, and workplace challenges, the study seeks to provide insights that can support the development of more effective and sustainable work environments in academic institutions.

Review of Literature:

Ergonomics has become an important area of study in library and information science due to its influence on workplace efficiency, health, and service quality. It focuses on designing work environments that suit human capabilities, thereby reducing physical strain and improving productivity. In library settings, ergonomic factors such as furniture design, lighting, and workstation setup play a crucial role in enhancing staff performance and user satisfaction (Dul & Weerdmeester, 2008; Mukhedkar & Waikar, 2024). With the growing dependence on digital systems, the need for ergonomically sound environments has become even more critical for library professionals (Hedge, 2016).

The rapid advancement of digital technologies has significantly transformed academic libraries, improving access to information and reshaping user engagement. Technologies such as artificial intelligence, digital platforms, and smart library systems have enhanced service delivery but also demand new skills from librarians (Ardyawina et al., 2025; Mutia et al., 2024). Emerging concepts



like “phygital” libraries further emphasize the integration of physical and digital environments to improve user experience (Waggoner et al., 2026). Research also highlights that digital engagement is influenced by factors such as technological infrastructure, digital literacy, and workplace conditions (Agarwal & Karahanna, 2000). Ergonomics plays a crucial role in academic libraries by improving the working conditions of library professionals. Their study highlights that proper seating arrangements, lighting, and workstation design help reduce physical strain and enhance efficiency, ultimately leading to better service delivery (Narkhede & Sarode, 2018). Further, the application of ergonomic principles significantly boosts the productivity and job satisfaction of library staff. They argue that ergonomically designed work environments not only improve comfort but also contribute to higher performance and reduced health-related issues among professionals (Narkhede & Sarode, 2021).

In addition, the physical and organizational environment of libraries plays a significant role in shaping user engagement and professional performance. Well-designed spaces with proper ergonomic support positively influence participation, satisfaction, and academic outcomes (Dianing & Acedera, 2025). However, the implementation of ergonomic practices often faces challenges such as limited funding, lack of awareness, inadequate training, and insufficient management support (Bentil & Liew, 2024). Although existing studies have examined ergonomics and digital engagement separately, there is limited empirical research exploring their combined impact, particularly among college librarians. This gap highlights the need for studies that examine how ergonomic interventions can enhance digital engagement and overall productivity.

Objectives of The Study:

The primary objective of this study is to examine the role of ergonomic interventions in enhancing digital engagement among college librarians. It seeks to understand how factors such as workplace design, health conditions, and organizational support influence the level of engagement in digital environments. The following are the objectives which are framed on the basis of research gap.

1. To examine ergonomic interventions in digital libraries.
2. To analyze college librarians’ perceptions of ergonomic design.
3. To evaluate the impact of ergonomic interventions on the digital library engagement.
4. To identify challenges in implementing ergonomic practices in college libraries affiliated with Sant Gadge Baba Amravati University, Maharashtra.
5. To assess the effect of ergonomic conditions on the health, comfort, and productivity of college librarians.
6. To explore the relationship between ergonomic interventions and the effective utilization of digital library resources and services.

Hypotheses of The Study:

H₀₁: Ergonomic interventions do not have a significant influence on digital library engagement among college librarians.

H₀₂: There is no significant correlation between ergonomic conditions and digital library engagement among college librarians.



Research Methodology:

1. Research Design:

The study uses a descriptive and empirical research design to examine the relationship between ergonomic interventions and digital engagement. The descriptive approach helps to understand the current conditions and perceptions of respondents, while the empirical approach allows testing of hypotheses using statistical data (Weerasekara & Smedberg, 2023). This type of design is widely used to study relationships between variables and assess the impact of different factors in digital and workplace settings (Perrig et al., 2024; Ameen et al., 2024).

2. Sample Size:

The questionnaire was distributed to 233 college librarians, out of which 178 responses were received, resulting in a response rate of 76.39%. The study is based on a sample of 178 college librarians, representing a diverse group in terms of experience, qualification, and institutional background.

Data Analysis and Results:

1. Demographic Distribution:

Table-1: Demographic distribution of the respondents

Variables	Category	Frequency	Percentage (%)
Gender	Male	102	57.30%
	Female	76	42.70%
Age Group	Below 30	28	15.73%
	31-40	52	29.21%
	41-50	61	34.27%
	Above 50	37	20.79%
Qualification	MLISc.	96	53.93%
	PhD	62	34.83%
	Other	20	11.24%
Institution Type	Government	104	58.43%
	Private	74	41.57%
Location	Urban	112	62.92%
	Rural	66	37.08%
Experience	Below 5 years	34	19.10%
	5-10 years	48	26.97%
	11-20 years	56	31.46%
	Above 20 years	40	22.47%
Total		178	100%

3. Sampling Method:

A random sampling technique was employed to select respondents, ensuring that each individual had an equal chance of being included in the study. This approach helps in reducing sampling bias and improving the applicability of the findings.

4. Data Collection Tool:

Data were collected using a structured questionnaire based on a 5-point Likert scales, ranging from strongly disagree to strongly agree. The questionnaire was designed to capture responses related to ergonomic interventions, digital engagement, health and productivity, and associated challenges.

5. Data Analysis Tools:

The collected data were analyzed using Python-based tools, including Pandas, NumPy, and SciPy. These tools were used for data cleaning, descriptive statistics, reliability testing, correlation, regression analysis, and hypothesis testing to ensure accurate and meaningful results.



Table-1 shows the demographic profile of the 178 respondents who participated in the study. Male participants (57.30%) are slightly higher in number than females (42.70%), indicating a mild gender imbalance. Most respondents belong to the 41-50 years age group (34.27%), followed by those aged 31-40 years (29.21%), which suggests that mid-career professionals form the largest segment of the sample. In terms of qualifications, over half of the participants hold MLISc. degree (53.93%), while a considerable proportion have a PhD (34.83%), reflecting a well-qualified group. With regard to institutional type, 58.43% of respondents are from government institutions, whereas 41.57% are from

private institutions. A larger proportion of participants come from urban areas (62.92%) compared to rural areas (37.08%), indicating stronger urban representation. Looking at professional experience, the highest share of respondents has 11-20 years of experience (31.46%), followed by those with 5-10 years (26.97%), showing that experienced professionals dominate the sample. Overall, the data points to a respondent group that is largely experienced and academically qualified, with slightly higher representation from males, urban areas, and government institutions.

2. Reliability Analysis:

Table-2: Reliability analysis

Variable	Items	Cronbach's Alpha
Ergonomic Interventions	6	0.86
Digital Engagement	6	0.88
Health & Productivity	6	0.84
Challenges	6	0.81
Ergonomics-Engagement	6	0.89

Table-2 presents the reliability analysis of the study variables using Cronbach's Alpha. All constructs demonstrate strong internal consistency, with alpha values exceeding the acceptable threshold of 0.70. Among the variables, Ergonomics-Engagement shows the highest reliability ($\alpha = 0.89$), followed closely by Digital

Engagement ($\alpha = 0.88$) and Ergonomic Interventions ($\alpha = 0.86$). Health and Productivity ($\alpha = 0.84$) and Challenges ($\alpha = 0.81$) also indicate good reliability. These results confirm that the measurement items used in the study are consistent and reliable, supporting the validity of the data for further statistical analysis.

3. Descriptive Statistics:

Table-3: Descriptive statistics

Variable	Mean	Std. Deviation
Ergonomic Interventions	3.72	0.68
Digital Engagement	3.85	0.64
Health & Productivity	3.66	0.71
Challenges	3.41	0.75
Ergonomics-Engagement	3.89	0.62



Table-3 presents the descriptive statistics of the key variables in the study. The mean scores indicate that respondents generally have a positive perception of all constructs. Among them, Ergonomics-Engagement records the highest mean value (M = 3.89, SD = 0.62), followed by Digital Engagement (M = 3.85, SD = 0.64) and Ergonomic Interventions (M = 3.72, SD = 0.68), suggesting a relatively high level of agreement in these areas. Health and Productivity also shows a favorable

mean score (M = 3.66, SD = 0.71), while Challenges has the lowest mean (M = 3.41, SD = 0.75), indicating comparatively moderate concern among respondents. The standard deviation values across all variables are within an acceptable range, reflecting a reasonable level of consistency in responses. Overall, the findings suggest a generally positive outlook toward ergonomics and its role in digital engagement and productivity.

4. Correlation Analysis:

Table-4: Correlation analysis of hypothesis (H₂)

Variables	Ergonomics	Engagement
Ergonomic Interventions	1.00	0.68**
Digital Engagement	0.68**	1.00

(**p < 0.01)

Table-4 presents the correlation analysis conducted to test Hypothesis H₂. The results show a strong and positive relationship between Ergonomic Interventions and Digital Engagement (r = 0.68, p < 0.01). This indicates that improvements in ergonomic conditions are associated with higher levels of digital engagement among respondents.

The correlation is statistically significant at the 0.01 level, confirming that the relationship is unlikely to have occurred by chance. Therefore, the findings provide clear support for Hypothesis H₂, suggesting that ergonomics plays an important role in enhancing digital engagement.

5. Regression Analysis:

Table-5: Regression analysis of the hypothesis (H₁)

Model Summary			
R	R ²	Adjusted R ²	
0.68	0.46	0.45	
ANOVA			
F-value	Sig.		
149.32	0.000		
Coefficients			
Variable	Beta	t-value	Sig.
Ergonomic Interventions	0.68	12.22	0.000



Table-5 presents the regression analysis conducted to test Hypothesis H₁. The model summary indicates a strong relationship between ergonomic interventions and digital engagement, with an R value of 0.68. The R² value of 0.46 suggests that ergonomic interventions explain 46% of the variance in digital engagement, which reflects a substantial level of explanatory power. The ANOVA results show that the model is statistically

significant (F = 149.32, p < 0.001), confirming that the regression model is a good fit for the data. Furthermore, the coefficient analysis reveals that ergonomic interventions have a significant positive effect on digital engagement ($\beta = 0.68$, t = 12.22, p < 0.001). These findings support Hypothesis H₁ and indicate that improving ergonomic conditions can significantly enhance digital engagement among respondents.

6. t-Test (Gender Difference):

Table-6: t-Test

Variable	Male	Female	t-value	Sig.
Digital Engagement	3.82	3.88	1.12	0.26

Table-6 presents the results of the independent samples t-test comparing digital engagement between male and female respondents. The mean scores show that female respondents (M = 3.88) report slightly higher digital engagement than male respondents (M = 3.82). However, the

difference between the two groups is not statistically significant (t = 1.12, p = 0.26), as the p-value exceeds the conventional threshold of 0.05. This indicates that gender does not have a meaningful influence on digital engagement in the context of this study.

7. ANOVA (Experience):

Table-7: ANOVA

Experience	Mean
Below 5 years	3.75
5-10 years	3.82
11-20 years	3.91
Above 20 years	3.95
F-value	Sig.
3.87	0.01

Table-7 presents the results of the ANOVA test examining differences in digital engagement across varying levels of professional experience. The mean scores show a gradual increase in digital engagement with higher experience, rising from 3.75 for respondents with less than 5 years of experience to 3.95 for those with more than 20

years. The ANOVA results indicate that these differences are statistically significant (F = 3.87, p = 0.01), as the p-value is below the 0.05 threshold. This suggests that professional experience has a meaningful influence on digital engagement, with more experienced individuals demonstrating slightly higher levels of engagement.



8. Challenges Analysis:

Table-8: Challenges analysis

Challenges	Mean
Lack of funds	3.78
Lack of awareness	3.52
Management support	3.49
Space constraints	3.33
Training issues	3.44
Resistance to change	3.29

Table-8 highlights the major challenges faced by respondents in relation to ergonomics and digital engagement. Among the identified factors, lack of funds emerges as the most significant challenge (M = 3.78), indicating that financial constraints are a primary concern. This is followed by lack of awareness (M = 3.52) and issues related to management support (M = 3.49), suggesting gaps in institutional backing and understanding. Training issues (M = 3.44) and space constraints (M = 3.33) are also reported as moderate challenges. Resistance to change records the lowest mean score (M = 3.29), though it still reflects a noticeable barrier. Overall, the findings suggest that both financial and organizational factors play an important role in limiting the effective implementation of ergonomic practices.

Discussion of Findings:

The findings highlight that the respondents are largely experienced and well-qualified professionals, with a stronger representation from urban and government institutions. The analysis confirms that all study variables are reliable and show generally positive perceptions toward ergonomic interventions and digital engagement. A strong and significant positive relationship is observed between ergonomics and digital engagement, indicating that better ergonomic

conditions are associated with higher levels of engagement. Regression results further support this by showing that ergonomic interventions have a meaningful influence on digital engagement.

The results also reveal that gender does not significantly affect digital engagement, suggesting similar experiences across male and female respondents. However, professional experience plays a significant role, with more experienced individuals reporting slightly higher engagement levels. Key challenges identified include lack of funds, limited awareness, and insufficient management support, which may hinder effective implementation. Overall, the study emphasizes that while ergonomic interventions enhance digital engagement, institutional support and resource availability are crucial for achieving optimal outcomes.

Conclusions:

The study concluded that ergonomic interventions play a significant role in enhancing digital engagement, supported by strong relationships and positive perceptions among respondents. While factors such as gender do not significantly influence engagement, professional experience and institutional conditions do have an impact. However, challenges such as limited funding, lack of awareness, and inadequate



management support hinder effective implementation. Based on these findings, it is suggested that institutions should invest in ergonomic infrastructure, organize training and awareness programs, and strengthen administrative support to improve outcomes. For future research, similar studies can be conducted with larger and more diverse samples, including different regions and disciplines, and may also explore additional variables such as technological readiness and user behavior to gain deeper insights into the long-term impact of ergonomics on digital engagement.

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