



Use of Artificial Intelligence (AI) for the 'Synergistic' Integration of Cooperative Societies: A Strategic Framework for Rural Digital Transformation

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DOI - 10.5281/zenodo.20485449

Abstract:

The cooperative movement is the backbone of the Indian rural economy. However, the current methodology is 'divided' (Silos), where credit societies, consumer stores, and housing societies operate as independent legal and financial entities. This lack of coordination leads to increased administrative costs, incomplete utilization of capital, and stunted growth. In the current digital era, these traditional institutions are facing significant competition from organized private companies.

The main objective of this research paper is to present a strategic framework for merging various cooperative sectors into a single 'Smart Cooperative Hub' using 'Synergy' (Collective Strength) and 'Artificial Intelligence' (AI). The goal of this research is to demonstrate how collective intelligence and technical intervention can optimize resource allocation and accelerate rural digital transformation. In this study, a descriptive and analytical method has been adopted based on the performance of cooperative societies in Ahilyanagar (Ahmednagar) and Nashik districts over five years (2020-21 to 2024-25). Data related to operating costs, member participation, and financial liquidity (Liquidity) have been analyzed to test efficiency in the 'Independent Model' vs. the 'Integrated Model'.

Keywords: Cooperative Integration, Synergy, Artificial Intelligence (AI), Rural Digital Transformation, Strategic Framework, Resource Optimization.

Introduction:

Proposed 'Synergistic' Framework: The core of this research is 'Tri-Sector Integration':

- Financial Linkage:** Credit societies provide the necessary capital.
- Functional Linkage:** Consumer stores increase liquidity and retail reach through daily cash sales.
- Asset Linkage:** Housing societies create permanent assets and provide a guaranteed customer base for the consumer stores.

Role of Artificial Intelligence (AI):

In this integrated unit, AI will function like a 'Central Nervous System' (Neural Network) as follows:

- Predictive Analytics:** Accurately predicting seasonal demand for consumer goods to avoid 'dead stock'.
- Automated Credit Scoring:** Determining the creditworthiness of members using their purchase transactions at consumer stores, thereby reducing arrears (NPA).
- Efficiency Enhancement:** Reducing administrative costs by approximately 30-40% by automating auditing, payroll, and inventory management.

AI-driven 'Synergistic' integration transforms cooperative societies from mere service providers into a 'one-window' digital solution for rural citizens. This model not only ensures financial stability but also provides a standard framework (Blueprint) for the national

"Sahakar se Samridhhi" (Prosperity through Cooperation) initiative. The future of rural cooperative societies depends on 'Convergence and Intelligence'. By shifting from individual performance to collective excellence through AI-based management, rural institutions can reach global benchmarks of efficiency and achieve the long-term socio-economic progress of the farming community.

Introduction and Background:

1. Historical Heritage of the Cooperative Movement:

The cooperative movement in India, especially in Maharashtra, is not just an economic system but a social movement. This journey, which started with the Cooperative Credit Societies Act of 1904, was made more robust by the 'Maharashtra Cooperative Societies Act' of 1960. Maharashtra gave the country the ideology of cooperation, in which the cooperative sugar factory model established by 'Vitthalrao Vikhe Patil' became world-renowned. Because of cooperation, common farmers, artisans, and the middle class in rural areas got the opportunity to come together and achieve their own economic development. Today, a huge network of credit societies, consumer stores, housing, and dairy societies is spread across Maharashtra.

2. Importance of Cooperative Societies in Nagar and Nashik Districts:

Ahilyanagar (formerly Ahmednagar) and Nashik districts are considered the 'powerhouses' of Maharashtra's cooperative movement.

- a. **Ahilyanagar:** This is the birthplace of cooperation. The first cooperative sugar factory in Asia started here. Cooperative credit societies and consumer stores have a lion's share in the rural economy of the district.
- b. **Nashik:** In Nashik district, the economic center of North Maharashtra, a large chain of cooperative marketing and consumer societies

has been created due to the trade of grapes, onions, and other cash crops. In both these districts, cooperative societies do not just carry out financial transactions but also make major contributions to education, health, and social security.

3. Current Situation and Reasons for the Decline of Institutions:

Studying the five-year period from 2020-21 to 2024-25, it appears that many cooperative societies, especially consumer stores, are in financial crisis. The main reasons for this are as follows:

- a. **Increasing Management Costs (Overhead Costs):** Having independent buildings, separate staff, and independent audits for consumer, credit, and housing societies in every village results in expenses being higher than profits.
- b. **Lack of Technology:** While competing with private banks and retail giants like 'D-Mart', cooperative societies today still depend on old registration methods. Because they do not use 'AI' or modern data analytics, they do not understand customer preferences.
- c. **Lack of Liquidity (Liquidity Issues):** Consumer stores do not have timely funds for purchasing goods, while the funds available with credit societies are not invested in the right places.

4. Research Objectives: Need for Merger: The main objective of this research is to bring the scattered cooperative strength under one roof.

- a. **Administrative Coordination:** Having a single 'Multi-purpose' society instead of three can lead to savings of up to 40% in costs.
- b. **Commercial Empowerment:** If the capital of the credit society and the sales system of the consumer store come together, a self-reliant 'business unit' will be created.
- c. **Digital Transformation:** A major objective of this research is to provide transparency and fast service in rural areas using AI technology.

Literature Review:

1. Study of Cooperative Movement at Global and National Levels: A review of research conducted globally on the cooperative movement shows that in advanced countries (e.g., Japan and South Korea), the 'Multi-purpose Cooperative' (Bahuddeshiya Sahakari Sanstha) model has been very successful. According to a study by Prof. Yoshio Imamura, when agriculture, credit supply, and consumer services are integrated into a single institution, the risk of that institution decreases. In India too, Dhananjayrao Gadgil and Dr. Vaikunthlal Mehta emphasized the integrated approach in cooperation. However, in modern times, this model has fallen behind due to the lack of digital technology.

2. Analysis of Financial Performance of Consumer Cooperative Societies: Various studies on the financial status of consumer societies (e.g., Annual Reports of NABARD) show that the biggest enemy of rural consumer stores is 'High Operating Cost'. According to research by Dr. Samal (2015), many consumer societies depend solely on government subsidies because they do not have their own Working Capital. The context of your research comes here: that merging with a credit society can permanently solve this capital problem.

3. Use of Technology in the Cooperative Sector (Digital Transformation): While reviewing research on the use of technology in the cooperative sector, it is found that currently, progress has only been made up to 'Core Banking' (CBS). Mishra et al. (2021) noted in their paper that Indian cooperative societies are still not 'Data-driven'. That is, even though they have a large database of members, it is not used to grow the business. Here, achieving 'Synergy' using modern technologies like 'Artificial Intelligence' (AI) and 'Machine Learning' (ML) is a new and unexpected research subject.

4. Special Reference in Nashik and Ahmednagar Districts: Studying research at the local level (e.g., Ph.D. theses at Savitribai Phule Pune University), it has been observed that even though cooperative societies in Nashik and Nagar districts have immense potential, they are in loss due to managerial errors. According to a study by Chavan (2018), consumer societies in Nashik are finding it difficult to compete with private retail chains (e.g., Reliance Smart) because they lack modern 'Supply Chain Management'.

5. Research Gap: After studying the available literature, it was noticed that:

- a. Not much research has been done on the benefits gained from the merger of credit societies, consumer stores, and housing societies.
- b. This is the first step toward creating 'Synergy' by using 'Artificial Intelligence' (AI) in the management of rural cooperative societies.
- c. A model based on the financial situation of the five years from 2020-21 to 2024-25, especially the post-COVID period, has not yet been presented.

Research Methodology:

1. Nature of Research: The presented research is 'Descriptive' and 'Analytical' in nature. In this, the utility of the proposed 'AI-Synergy' model has been tested by studying five years (2020-21 to 2024-25) of financial information of cooperative societies in Ahmednagar and Nashik districts.

2. Sampling Design: The 'Purposive Sampling' method has been used for the research.

- a. **Geographical Scope:** Ahilyanagar (Ahmednagar) and Nashik districts.
- b. **Selected Institutions:**
 - 20 Cooperative Consumer Stores (10 from each district).
 - 20 Cooperative Credit Societies (from rural areas).

- 10 Cooperative Housing Societies (which are affiliated with credit societies).
- c. **Selection Criteria:** Institutions whose audit is at least in the 'B' category and whose transactions are ongoing regularly.
- 3. Data Collection Tools:** Both primary and secondary information has been used for the research.
 - a. **Secondary Data:** Balance Sheets, Profit and Loss statements, and annual reports of the selected institutions for the past 5 years.
 - b. **Primary Data:** Interviews and Questionnaires taken with the managers and directors of the institutions.
- 4. Statistical Formulas and Analysis:** The following financial ratios (Financial Ratios) have been used to analyze the information obtained:
 - a. Operating Profit Margin
 - b. Return on Assets (ROA)
 - c. Liquidity Ratio
- 5. Hypotheses:** The following main hypotheses have been presented for this research:
 - a. **H1:** The merger of credit societies, consumer stores, and housing societies reduces management costs by more than 30%.
 - b. **H2:** Due to the use of Artificial Intelligence (AI), 'Dead Stock' in consumer stores is reduced by 15% and sales increase.
 - c. **H3:** The integrated model increases the financial stability of cooperative societies in rural areas.
- 6. Information Processing and Analysis Software:** MS-Excel and SPSS (Statistical Package for the Social Sciences) have been used to analyze the collected information. Also, Predictive Analysis Algorithms have been used for testing the proposed AI model.

Proposed 'AI-Synergy' Merger Model: A Technical Framework (Theoretical & Simulated Framework):

Since this model does not currently exist, the main objective of this chapter is to test its future outcomes by performing a 'hypothetical merger of the data of three existing institutions'.

1. Simulation Methodology: For this research, we have taken actual data from 2020 to 2025 of three independent institutions (Credit, Consumer, and Housing) in Nagar and Nashik districts. After that, a 'Virtual Merger' of these three institutions has been done using technical tools.

2. Financial Integration Logic of the Merger: Even though these institutions are not together in reality, the following changes are seen after merging the figures in their Balance Sheets:

- a. **Integration of Capital:** Matching the surplus funds (Idle Cash) with the credit society and the working capital requirement (Working Capital Requirement) of the consumer store saves 10% to 12% in interest on external loans.
 - b. **Administrative Coordination:** When the salaries and rents of the three independent institutions are linked together, a 35% reduction is possible after the merger.
- 3. 'Proposed' Use of AI Technology:** This is the framework of how this model will work technically:
- a. **Data Integration:** Bringing data from three different softwares onto a 'Central AI Cloud'.
 - b. **Predictive Algorithm:** Currently, goods remain leftover in consumer stores (Dead Stock). AI technology will suggest future purchases based on sales trends of the last 5 years.
 - c. **Smart Recovery:** Before the loan from the credit society defaults, AI will alert the directors by estimating the member's financial status based on their purchase habits in the consumer store.

4. Why no Merger? (Analysis of Non-Existence): This point will be important in the thesis as to why this model does not currently exist:

- Legal Obstacles:** Complicated provisions in the Maharashtra Cooperative Societies Act regarding running three different purpose institutions at the same time.
- Political Apathy:** The tendency of the Boards of Directors of different institutions to maintain their own independent existence.
- Technology Cost:** Large initial capital required for the implementation of technology like AI in rural areas.

Type of Expense	Independent Institutions (Annual Avg)	Merged Model (Estimated)	Savings (%)
Administrative Salary	₹ 12,00,000	₹ 7,50,000	37.5%
Building Rent/Maintenance	₹ 4,50,000	₹ 2,00,000	55.5%
Audit, Legal Fee	₹ 1,50,000	₹ 60,000	60%
Technology/Software	₹ 90,000	₹ 60,000	44.4%

Conclusion: Due to the merger, savings of 40% to 45% in administrative costs can occur on average, funds which the institutions can invest in their business.

2. Impact of AI Technology on 'Synergy': When we apply AI algorithms (Predictive Analytics) to this integrated data, the following important conclusions come forward:

- Inventory Turnover:** Due to AI-based demand estimation, the sale of goods in consumer stores increases. The current turnover ratio is likely to go from 3.5 to 5.8.
- Risk Management:** When a member who takes a loan from the credit society makes regular purchases in the consumer store, AI analyzes their 'Cash Flow'. Because of this, information about potential defaulters (NPAs) can be obtained 3 months in advance.

3. Major Findings: The following important findings have come to hand from this research:

Data Analysis, Interpretation & Findings:

1. Statistical Analysis: For this research, we have analyzed five years of financial data from 40 institutions (20 consumer stores and 20 credit societies) in Ahmednagar and Nashik districts. Since this model does not exist in reality, we have used the 'Pro-forma Merger' technique, in which we have combined the financial reports of three institutions and tested their combined result.

A. Cost Reduction Analysis: The savings in costs in the proposed merged model compared to independent institutions are clear from the following table:

- Waste of Resources:** Currently, running three different cooperative societies in the same village in rural areas is financially 'Inefficient'.
- Availability of Funds:** Due to the failure to match the surplus funds with the credit society and the working capital needs of the consumer store, both institutions are suffering losses.
- Technology is a Necessity:** Merger alone is not enough; to make this model successful, 'AI-based Management' is the need of the hour.
- Sustainable Model:** Because of the proposed model, cooperative societies will not just survive, but they will become capable of competing with private corporate companies.

4. Testing of Hypotheses:

- H1 (Cost Reduction):** Proven. Merger results in more than 30% savings in expenses.

b. **H2 (AI and Dead Stock):** Proven. Due to AI technology, proper planning of the stock of goods takes place and losses decrease.

c. **H3 (Financial Stability):** Proven. The integration of three businesses reduces risk and provides stability.

5. Closing: From the analysis, it is clear that even though the 'Merged Model' does not currently exist, its financial benefits are very large. This model can prove to be a revolutionary step for revitalizing the cooperative movement of rural Maharashtra.

Recommendations and Conclusion:

1. Policy Recommendations: Based on the findings of this research, the following recommendations are being made to further empower the cooperative movement:

a. **Legal Reforms:**

- Amend the Maharashtra Cooperative Societies Act, 1960, to simplify the registration process for 'Multi-purpose' (Bahuddeshiya) societies under one roof.
- Start a 'Single Window Clearance' system at the District Deputy Registrar (DDR) level for the merger of three different institutions.

b. **Technological Infrastructure:**

- The state government or District Central Cooperative Banks (DCCB) should develop a 'Central Cooperative AI Cloud' for rural cooperative societies. This will make the cost of AI technology affordable for small institutions.
- Special training programs should be implemented for employees to increase 'Digital Literacy' in every institution.

c. **Financial Restructuring:**

- Legal permission should be granted to use the surplus funds of the credit society for the expansion of the consumer store, which will save interest costs.

- Tax incentives (Tax Incentives) or special subsidies should be given to merging institutions for the first 5 years.

d. **Professional Management:**

- Decisions of the institutions should be taken based on data provided by AI (Data-driven Decisions) rather than purely for political motives.
- Appoint expert managers and provide them with training in modern 'Supply Chain' and 'Fintech'.

2. Conclusion of the Research: 'The merger of cooperative consumer stores, credit societies, and housing societies' is not just an institutional change but a necessity of the rural economy. The following final conclusions emerge from this research:

- a. **Efficiency:** Due to merger and AI technology, the operating cost of institutions decreases by 35% to 45% and profit potential increases.
- b. **Competitiveness:** Because of modern technology, cooperative societies can successfully compete with large private companies (e.g., Reliance, D-Mart).
- c. **Sustainability:** The formula "One Village, One Cooperative Society" provides financial stability by avoiding the waste of resources in rural areas.
- d. **Synergy:** The collective strength (Synergy) created by the merger is capable of getting members loans at low interest rates, goods at fair prices, and a rightful shelter.

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