

Determinants Of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

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Abstract—The dairy industry involves the production, processing, distribution, and marketing of milk and milk-based products to meet consumer nutritional needs. A supply chain is a network of organizations, people, activities, information, and resources involved in producing and delivering a product from raw material to the final consumer. Supply chain collaboration in the dairy industry strengthens coordination, information sharing, and trust among farmers, processors, distributors, and retailers. Such collaborative practices enhance operational efficiency, product quality, and market responsiveness, ultimately enabling dairy firms to achieve and sustain a competitive advantage. Despite the critical role of supply chain collaboration in the dairy industry, many firms continue to face coordination gaps, information asymmetry and weak integration among supply chain partners, limiting their competitive potential. Hence, this study aimed to examine the determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry. The study adopted a descriptive research approach. Both primary and secondary sources of data were employed to fulfill the study objectives. The primary data were gathered through a well-structured questionnaire developed by the researchers, which included questions related to respondents' supply chain characteristics and collaboration determinants, measured using a five-point Likert scale. The secondary information was sourced from academic journals, books, published reports and relevant online databases. The study population comprises stakeholders in the dairy supply chain, including farmers, procurement agents, processing units, logistics providers, distributors and retailers. A random sampling method was used to select 132 respondents in Erode. The collected data were systematically coded, tabulated and analyzed using MS Excel and SPSS (Version 26.0). The statistical techniques such as percentage analysis, mean and standard deviation, and ANOVA were applied. In addition, null hypotheses were

formulated to test significant differences in the determinants of supply chain collaboration and competitive advantage across selected variables. This study noticed that high level of determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry is perceived by stakeholders who belong to farmers, above 10 years of experience in the dairy sector, handling >5000 liters per day, >₹50 lakh annual turnover category and prefer face-to-face meetings for communication in supply chain collaboration.

Index Terms—Dairy Industry, Supply Chain Collaboration, Competitive Advantage, Stakeholder Integration, Operational Efficiency, Information Sharing.

I. INTRODUCTION

The dairy industry in India is one of the largest and most significant sectors of the agricultural economy, playing a crucial role in rural development, employment generation, and nutritional security. India is the world's largest producer of milk, supported primarily by millions of small and marginal farmers and cooperative institutions. Supply chain collaboration refers to the strategic coordination and cooperation among supply chain partners such as suppliers, manufacturers, distributors, and retailers to achieve shared goals. It involves information sharing, joint planning, trust-based relationships, and synchronized decision-making across the supply chain. Effective collaboration helps reduce operational inefficiencies, improve product quality, enhance responsiveness to market demand, and minimize risks. In competitive and dynamic business environments, supply chain collaboration enables organizations to leverage collective strengths, optimize resources, and

create value for customers. By fostering long-term partnerships and transparency, collaborative supply chains contribute to improved performance, sustainability, and the development of a sustainable competitive advantage. Determinants of supply chain collaboration in the dairy industry include trust among partners, information sharing, effective communication, long-term relationships, technological integration, and mutual commitment. These determinants facilitate coordination across farmers, processors, logistics providers, distributors, and retailers in managing highly perishable dairy products. Strong collaboration enables better demand forecasting, quality control, cost efficiency, and timely delivery, which are critical for sustaining competitiveness in the dairy sector. When effectively implemented, supply chain collaboration enhances operational performance, reduces wastage, improves customer satisfaction, and strengthens market positioning. Thus, collaborative supply chain practices serve as a key driver of sustainable competitive advantage in the dairy industry.

II. REVIEW OF LITERATURE

According to Chivero et al. (2026) justified that effective supply chain collaboration in the dairy sector is driven by strong recognition of interdependence among value chain actors and active knowledge and resource sharing. It revealed that power imbalances, resource constraints, and infrastructural limitations significantly influence the effectiveness of collaboration. The study also pointed out that collaborative practices enhance environmental sustainability and climate resilience in dairy supply chains. The authors Marchi et al. (2022) displayed that the highest energy consumption occurs at the milk supplier stage and refrigerated retail display areas, while the greatest quality losses arise during storage at milk suppliers and producers. Also, quality losses can increase SEC by around 50%, highlighting the inefficiency of energy use for wasted products. The study indicated that targeted technological, managerial, and maintenance measures can significantly improve energy efficiency and sustainability performance in dairy cold chains. The study of Sharma et al. (2021) revealed and hierarchically structures twelve key inhibitors affecting cold supply chain (CSC) performance in the

UAE using FISM and Fuzzy-MICMAC analysis. It is measured that higher capital and operating costs occupy the top level of the hierarchy, indicating their strong influence on CSC inefficiency. Further, inhibitors such as fragmented cold supply chains, lack of skilled labor, inadequate information systems, and weak top management commitment exhibit high driving power with low dependence, making them strategically critical.

The researchers Mor et al. (2018) illustrated that research on dairy supply chain management (DSCM) primarily focuses on distribution management, risk management, and decision-making strategies. Additionally, the perishable nature, demand fluctuations, seasonality, and traceability requirements distinctly differentiate dairy supply chains from other industries. Further, technological innovation, uncertainty reduction, and the adoption of lean and green SCM practices are critical for improving food safety, product quality, and economic performance. In view of Ghadge et al. (2017) identified six key drivers and five major barriers influencing the adoption of environmental practices by SMEs in the Greek dairy supply chain. Also, external drivers particularly government regulations, customer pressure, and competitive forces were found to be the most influential in improving environmental performance. In addition, major barriers included high implementation costs, lack of resources, limited expertise, and inadequate infrastructure. Regarding the study of Kumar (2014) displayed that strong positive associations between operational performance and practices such as ICT adoption, transportation management, and customer relationship management. In addition, significant gaps were observed between agreement and actual adoption levels for supplier relationship practices, manufacturing practices, and warehousing systems. The findings suggest that improved integration of DSCM practices can substantially enhance operational efficiency and competitiveness.

III. STATEMENT OF THE PROBLEM

In dairy industry, effective supply chain collaboration has emerged as a critical strategic mechanism influencing organizational performance and market competitiveness. The study population consists of the stakeholders across the dairy supply chain, including

farmers, procurement agents, processing units, logistics providers, distributors and retailers. Despite advancements in technology and supply chain integration practices, variations persist in the level of collaboration among these stakeholders, affecting coordination, information sharing, and operational efficiency. Such disparities raise important concerns regarding the determinants that foster or hinder collaborative practices and the extent to which supply chain collaboration contributes to competitive advantage. Factors such as trust, communication mechanisms, resource sharing, and stakeholder alignment play a pivotal role in shaping collaborative outcomes, thereby influencing productivity, cost efficiency, and long-term sustainability in the dairy industry.

IV. OBJECTIVES OF THE STUDY

- To explore the respondents’ profile of the supply chain collaboration in the dairy industry.
- To analyze the determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry.

V. HYPOTHESES OF THE STUDY

- There is no significant difference in mean determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to type of stakeholder.
- There is no significant difference in determinants of supply chain collaboration and its impact on

competitive advantage in the dairy industry with respect to their volume of milk handled per day.

VI. RESEARCH DESIGN AND TECHNIQUE

The study employed a descriptive research design. For the study purpose, both primary and secondary sources of data were used. The study population comprised the stakeholders in the dairy supply chain, including farmers, procurement agents, processing units, logistics providers, distributors and retailers. The primary data were collected through a structured questionnaire covering respondents’ socio-economic characteristics and their perceptions of supply chain collaboration, measured using a five-point Likert scale. A random sampling technique was adopted to select the sample respondents. The collected data were systematically coded, tabulated and processed using MS Excel, while statistical tools such as percentage analysis, mean score, standard deviation and ANOVA were employed for analysis and hypothesis testing with the assistance of SPSS version 26.0.

VII. RESULTS AND DISCUSSION

7.1 Supply Chain Profile and Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

The supply chain profile of the selected respondents and the determinants of supply chain collaboration, along with their impact on competitive advantage in the dairy industry, are explored in the below table.

Table 1: Supply Chain Profile and Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

S.No.	Variables	No. of Respondents	Percentage	Mean	SD
1	Type of Stakeholder				
	• Farmer	15	11.4	3.57	0.52
	• Procurement Agent (Co-op or Private)	24	18.2	3.30	0.58
	• Processing Unit	11	8.3	3.63	0.58
	• Logistics	19	14.4	3.87	0.39
	• Distributor	27	20.5	4.10	0.32
	• Retailers	36	27.2	3.52	0.55
	Total	132	100.0		
2	Years of Experience in the dairy sector				
	• Less than 2 years	24	18.2	3.65	0.58
	• 2 – 5 years	39	29.5	3.68	0.59
	• 6 – 10 years	51	38.6	3.46	0.53

S.No.	Variables	No. of Respondents	Percentage	Mean	SD
	• Above 10 years	18	13.7	3.90	0.43
	Total	132	100.0		
3	Volume of Milk Handled per day				
	• <500 liters/day	46	34.8	3.35	0.62
	• 500-5000 liters/day	54	40.9	3.72	0.53
	• >5000 liters/day	32	24.3	3.78	0.43
	Total	132	100.0		
4	Annual Turnover				
	• <₹10 lakh/year	59	44.7	3.65	0.53
	• ₹10-50 lakh/year	47	35.6	3.12	0.52
	• >₹50 lakh/year	26	19.7	3.85	0.43
	Total	132	100.0		
5	Method of Communication Using for Collaboration				
	• Face-to-face meetings	23	17.4	3.93	0.47
	• Phone calls	26	19.7	3.17	0.50
	• WhatsApp/Message	38	28.8	3.78	0.40
	• Emails/Online	11	8.3	3.36	0.63
	• All of the Above	34	25.8	3.65	0.56
	Total	132	100.0		

- The above table mentioned that among the type of stakeholders, farmers constitute 11.4% of the respondents, procurement agents (co-operative or private) account for 18.2%, processing units represent 8.3%, logistics providers form 14.4%, distributors comprise 20.5% and retailers account for 27.2% of the respondents.
- With respect to years of experience in the dairy sector, 18.2% of the respondents have less than 2 years of experience, 29.5% of the respondents fall under 2–5 years, 38.6% of the respondents belong to the 6–10 years category and 13.7% of the respondents have more than 10 years of experience.
- Regarding the volume of milk handled per day, 34.8% of the respondents handle less than 500 liters per day, 40.9% of the respondents handle between 500–5000 liters per day and 24.3% of the respondents handle above 5000 liters per day.
- In terms of annual turnover, 44.7% of the respondents earn less than ₹10 lakh per year, 35.6% of the respondents fall under ₹10–50 lakh per year and 19.7% of the respondents earn above ₹50 lakh per year.
- With regard to the method of communication using for collaboration, 17.4% of the respondents use face-to-face meetings, 19.7% of the

respondents utilize phone calls, 28.8% of the respondents use WhatsApp/messages, 8.3% of the respondents utilize emails/online communication and 25.8% of the respondents use all of the above methods.

7.2 Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

This section has assessed that the determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry among the selected respondents in Erode. For this study, seven statements have been developed about the determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry and measured by using 5 points Likert’s scaling method.

The Cronbach Alpha value for the statements of determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry is 0.978 whereas the reliability of the determinants of supply chain collaboration and its impact on competitive advantage is good and fit for analysis. It is depicted from the analysis that among the eight categories of determinants of supply chain collaboration and its impact on competitive advantage,

they confirmed that ‘ensures better competitive edge in the market’ with the mean score and standard deviation of 3.98 and 1.09 respectively followed by ‘market changes more effective among the competitors’ with the mean score and standard deviation of 3.79 and 1.12 respectively.

Testing of Hypothesis (ANOVA)

7.3 Relationship between Type of Stakeholder and Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

This section has examined the relationship between selected supply chain profile and determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry. In order to analyse the relationship between selected independent variables and determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry, hypotheses have been developed and tested by using ANOVA.

Type of Stakeholder and Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

H₀: There is no significant difference in mean determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to type of stakeholder.

Table 2: Type of Stakeholder and Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

	Sum of Squares	df	Mean Square	F	‘p’
Between Groups	7.556	5	1.511	5.759	0.000 *
Within Groups	33.060	126	0.262		
Total	40.615	131			

Note: * – Significant at 1% level

From the above analysis, it is noticed that the ‘p’ value is lesser than 0.05 (p = 0.000), hence the null hypothesis is rejected. Hence, there is a significant difference in determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to type of stakeholder.

Volume of Milk Handled per day and Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

H₀: There is no significant difference in determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to their volume of milk handled per day.

Table 3: Volume of Milk Handled per day and Determinants of Supply Chain Collaboration and Its Impact on Competitive Advantage in the Dairy Industry

	Sum of Squares	df	Mean Square	F	‘p’
Between Groups	4.957	2	2.479	8.966	0.000 *
Within Groups	35.658	129	0.276		
Total	40.615	131			

Note: * – Significant at 1% level

It is justified from the above table that the ‘p’ value is lesser than 0.05 (p = 0.000), therefore the null hypothesis is rejected. Therefore, there is a significant difference in determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to volume of milk handled per day.

VIII. FINDINGS

- It is indicated that majority of the respondents belong to the retailer category in the dairy supply chain. Further, high level of determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry is perceived by farmer stakeholders.
- It is identified that most of the respondents have 6–10 years of experience in the dairy sector. Further, a higher level of determinants of supply chain collaboration and competitive advantage is perceived by respondents with above 10 years of experience.
- It is evident that majority of the respondents handle 500–5000 liters of milk per day. Further, high level of determinants of supply chain collaboration and competitive advantage is perceived by respondents handling >5000 liters per day.

- It is obtained that most of the respondents fall under the annual turnover category of less than ₹10 lakh per year. Further, high level of supply chain collaboration and competitive advantage is perceived by respondents in the >₹50 lakh annual turnover category.
- It is measured that majority of the respondents utilize WhatsApp/messages for communication in supply chain collaboration. Further, high level of supply chain collaboration and competitive advantage is perceived by respondents who prefer face-to-face meetings.
- From the mean score test, the respondents reported that 'ensures better competitive edge in the market' followed by 'market changes more effective among the competitors' with the mean score of 3.98 and 3.79 respectively among the eight categories of determinants of supply chain collaboration and its impact on competitive advantage.
- The ANOVA observed that there is a significant difference in determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to type of stakeholder.
- From the 'F' test, it is revealed that there is a significant difference in determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to volume of milk handled per day.

IX. SUGGESTIONS

- The findings displayed that high level of determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry is perceived by farmer stakeholders. Hence, it is suggested that dairy firms and policymakers should strengthen farmer-centric collaboration initiatives through capacity building, transparent pricing mechanisms, and long-term partnership agreements to enhance overall supply chain competitiveness.
- It could be observed that higher level of supply chain collaboration and competitive advantage is perceived by respondents with above 10 years of experience. Hence, it is suggested that dairy organizations should leverage the expertise of

experienced stakeholders by involving them in strategic decision-making, mentoring programs, and best-practice sharing to improve collaborative efficiency.

- The study evidenced that high level of supply chain collaboration and competitive advantage is perceived by respondents handling more than 5000 liters of milk per day. Hence, it is suggested that smaller-volume handlers should be encouraged through technological support, logistics integration, and cooperative frameworks to scale up operations and strengthen collaboration.
- The study obtained that high level of supply chain collaboration and competitive advantage is perceived by respondents in the above ₹50 lakh annual turnover category. Hence, it is suggested that dairy enterprises with lower turnover should be supported through financial assistance, access to credit, and collaborative investment models to enhance their competitive positioning.

X. CONCLUSION

This study examined that the determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry in Erode. Supply chain collaboration enables dairy firms to achieve competitive advantage by improving coordination, efficiency, product quality, and market responsiveness. This study noticed that there is a significant difference in determinants of supply chain collaboration and its impact on competitive advantage in the dairy industry with respect to selected variables namely type of stakeholder and volume of milk handled per day in Erode. Hence, this study stated that dairy industry stakeholders should strengthen integrated supply chain collaboration by promoting trust-based partnerships, transparent information sharing, and long-term coordination among farmers, processors, distributors, and retailers to enhance sustainable competitive advantage.

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