Journal of Resource Management and Decision Engineering

Volume 4, Issue 1, pp 1-11

Article history:
Received 02 December 2023
Revised 01 February 2024
Accepted 08 February 2024
Published online 12 January 2025

Developing a Value Chain Framework with a Continuous Improvement Approach

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A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Khorshidi, M., Adab, H., Moinzad, H., & Haghight Monfard, J. (2025). Developing a Value Chain Framework with a Continuous Improvement Approach. *Journal of Resource Management and Decision Engineering*, *4*(1), 1-11.
https://doi.org/10.61838/kman.jrmde.4.1.12

A B S T R A C T

The primary aim of this study is to develop a value chain framework grounded in the continuous improvement approach. Cost and time management assist water and wastewater companies in enhancing the processes and activities related to water supply, treatment, sewage management, and water distribution, ensuring a sustainable and enduring provision over time. To achieve this, the present research adopts a qualitative approach utilizing Braun and Clarke's thematic analysis method to identify the key components and dimensions of the value chain from a continuous improvement perspective. The research employs Braun and Clarke's thematic analysis approach. The statistical population of the study includes managers and experts in the water and wastewater sector, selected through purposive sampling. A total of 18 participants were carefully chosen. Data were collected through semi-structured interviews. Based on the interview analysis conducted using MAXQDA software, the model's themes were identified. The analysis revealed 123 initial themes categorized into 25 first-level subthemes and five second-level theme categories. The thematic analysis conducted to construct the value chain framework with a continuous improvement approach identified the following core components: sustainable organizational infrastructure, integrated process efficiency, digital technological transformation, human resource empowerment, and socio-environmental sustainability. This framework, by focusing on these five key components—sustainable organizational infrastructure, integrated process efficiency, digital technological transformation, human resource empowerment, and socio-environmental sustainability—represents a systematic effort to enhance competitiveness, organizational flexibility, and sustainable value creation. Each of these components, as derived from the qualitative findings and interviews, holds a central role in realizing the philosophy of continuous improvement and institutionalizing value addition throughout the entire chain of activities.

Keywords: *Value Chain, Continuous Improvement, Cost and Time Management.*

1. Introduction

The concept of the value chain, initially introduced to dissect organizational processes into discrete activities for competitive advantage, has expanded beyond its traditional confines. Contemporary research emphasizes its interconnection with digital transformation, sustainable development goals (SDGs), and emerging technologies such as artificial intelligence, cloud computing, and blockchain (Saleheen & Habib, 2023). At the same time, value chains have increasingly become the focal point for national and transnational policy frameworks, particularly in industrial, agricultural, and service-based economies (Karshi et al., 2023; Kilima et al., 2024). As supply chains and production networks become more globally dispersed and interdependent, the necessity to embed adaptability and improvement-oriented mechanisms into value chain systems becomes pronounced. Continuous improvement, therefore, is no longer limited to internal operational metrics; it must also encompass dynamic external conditions such as environmental regulations, market volatility, and digital disruptions (Cui et al., 2023; Hajiagha et al., 2022).

Recent literature has shown that the development of integrated and adaptive value chain frameworks significantly enhances the capacity of organizations to align with sustainable and circular practices. In the domain of manufacturing and infrastructure, for instance, there is growing consensus that intelligent automation, dynamic resource allocation, and real-time analytics can drastically improve end-to-end value delivery (Babaei et al., 2023; Egwim, 2023). However, this optimization must be systematically structured through a framework that is not only technologically enabled but also operationally cohesive. Research in the textile and dairy industries has underscored the importance of platform-based coordination and eco-gamification for aligning consumer engagement with upstream and downstream supply chain activities (Alves et al., 2023; Vargas-Bello-Pérez et al., 2024). These cases exemplify how cross-sectoral strategies grounded in continuous improvement can bridge technological capability with environmental and social responsibility.

Within the scope of digital transformation, scholars emphasize that the incorporation of advanced digital infrastructures, including AI-driven automation and data-centric decision-making platforms, transforms traditional value chains into intelligent and responsive systems. AI applications such as predictive analytics, demand forecasting, and performance tracking have proven to be instrumental in real-time decision-making and proactive resource utilization (Lin, 2024; Yang et al., 2021). Similarly, blockchain technology has been explored for ensuring traceability, transparency, and authenticity across multiple nodes in the supply chain, especially in food, textile, and mining sectors (Aydin & Tirkolaee, 2022; Wan, 2024). These technologies, when embedded in a continuous improvement framework, not only accelerate operational efficiency but also bolster strategic agility and risk resilience.

Nevertheless, technological transformation alone is insufficient unless paired with robust human capital strategies. Workforce empowerment, knowledge management, and collaborative learning are integral elements of sustainable value chain evolution. Evidence suggests that organizational capacity to foster innovation, continuous upskilling, and cross-functional communication is pivotal to long-term value creation (Piao & Xiao, 2023; Seif Barghi & Kafshian Ahar, 2022). In emerging markets and developing economies, particularly in sectors such as apparel and agriculture, the development of employee competencies and localized knowledge systems has been shown to influence supply chain resilience and export performance significantly (Nugroho, 2022; Zarei, 2022). A continuous improvement approach in this context enables firms to institutionalize feedback loops, performance reviews, and change-driven learning processes—thereby ensuring strategic alignment across hierarchical and functional domains.

From a policy and governance perspective, the evolution of value chain frameworks has also drawn attention to the necessity of strategic integration across public-private sectors. Governmental initiatives aimed at supporting SMEs, developing entrepreneurial ecosystems, and enhancing circular economy adoption are frequently aligned with industry-specific value chain strategies (Herath & Endagamage, 2022; Vorkiani Pour & Cheragheli, 2022). These policies often emphasize localization of supply chains, investment in green infrastructure, and support for research and innovation. Additionally, value chain reconfiguration in response to geopolitical shifts, climate change imperatives, and pandemics like COVID-19 has become a critical strategic concern. Models that incorporate scenario-based and robust decision-making techniques—particularly those considering cost-time tradeoffs and uncertainty—are increasingly applied to mitigate disruptions and ensure sustainability (Hajiagha et al., 2022).

In tandem with institutional and policy measures, the strategic coordination among different layers of the value chain—suppliers, manufacturers, distributors, retailers, and end-users—necessitates a shared information architecture and process standardization. Continuous improvement frameworks function effectively when supported by real-time monitoring, quality control mechanisms, and integrated process feedback systems (Salari, 2021). This is particularly crucial in complex systems such as dual-channel distribution networks or hybrid sales models, where alignment between online and offline channels depends on synchronized planning and performance assessment (Seif Barghi & Kafshian Ahar, 2022; Yang et al., 2021). Moreover, the ability to leverage these systems toward sustainability metrics, such as carbon footprint reduction, energy efficiency, and material circularity, directly contributes to long-term organizational viability and environmental stewardship.

Furthermore, the notion of value co-creation, which positions the customer not only as the end recipient but also as an active participant in the value generation process, has expanded the conventional boundaries of value chains. Recent innovations such as interactive platforms, consumer-driven product customization, and participatory sustainability assessments demonstrate how consumer behavior can inform upstream production strategies (Alves et al., 2023). In halal value chains, financial structures and ethical frameworks tailored to community values further illustrate the importance of aligning cultural context with value chain architecture (Dzukroni & Afandi, 2023). Such insights emphasize the growing relevance of contextualized, stakeholder-centric models within the broader landscape of continuous value creation.

Ultimately, constructing a value chain framework grounded in continuous improvement requires a multidimensional and systems-oriented approach. Accordingly, this study aims to construct a comprehensive value chain framework with a continuous improvement approach, grounded in strategic foresight, process optimization, and technological integration.

2. Methods and Materials

To develop a value chain framework with a continuous improvement approach, this study adopts a qualitative methodology based on Braun and Clarke's thematic analysis. The target population comprises managers and experts in the water and wastewater industry, selected through purposive sampling. A total of 18 participants were carefully chosen due to their specific characteristics and in-depth experience related to value chain management and continuous improvement within the water and wastewater company. These experts hold key decision-making positions and possess a deep understanding of the challenges and opportunities facing the sector in various operational domains.

Data collection was conducted through semi-structured interviews, allowing the researcher to guide the conversation using predetermined questions while also encouraging open-ended and qualitative responses. This approach enables the extraction of deep and diverse insights, experiences, and perspectives from the interviewees regarding the development of a value chain framework focused on continuous improvement. The data collected from the interviews were analyzed using Braun and Clarke's thematic analysis method. This method offers a systematic framework for identifying, analyzing, and reporting meaningful patterns within qualitative data and enables the researcher to identify and construct themes and subthemes relevant to the framework under study.

To assess the validity and reliability of the data, the Cohen's Kappa coefficient was employed to evaluate the level of agreement between coders and ensure the accuracy of the thematic analysis results. This indicator is particularly important in qualitative research involving interview data coding, as it provides assurance regarding the precision of the identified themes. Using this approach, the researcher can validate the accuracy and reliability of the findings and ensure that the identified themes reflect the perspectives and lived experiences of the expert participants. Overall, this methodology functions as a robust tool for developing a value chain framework grounded in continuous improvement and effectively captures the viewpoints of managers and specialists in the water and wastewater domain. The interviews were analyzed using MAXQDA software. The interview questions included:

1. From your perspective, how is the value chain defined in your organization, and what are its components?
2. What actions have been taken so far to implement continuous improvement in value chain processes?
3. In your opinion, what are the most important success indicators for a value chain with a continuous improvement approach?
4. In which parts of the value chain is the need for continuous improvement felt most strongly?

5. To what extent is the current organizational structure flexible enough to support continuous improvement initiatives?
6. How receptive is your organizational culture to change, learning, and incremental improvement?
7. What is the role of employee training and motivation in supporting continuous improvement?
8. What challenges exist in engaging employees in the improvement process?
9. What impact have modern technologies (such as automation, artificial intelligence, or blockchain) had on value chain improvement?
10. To what extent does your digital infrastructure support process tracking, analysis, and optimization?
11. What are the main barriers to implementing modern technologies for value chain improvement?
12. How are environmental and social considerations integrated into your value chain processes?
13. What initiatives has your organization undertaken to reduce resource waste, optimize energy use, and promote green innovation?
14. What indicators or systems are in place for evaluating the performance of the value chain and continuous improvement efforts?
15. To what extent does data-driven decision-making play a role in your process improvement strategies?
16. In your opinion, what are the key requirements for designing an effective value chain framework based on continuous improvement?
17. How do you foresee the future of the value chain in your industry, considering technological and sustainability trends?

3. Findings and Results

In this study, purposive sampling was used to select 18 managers and experts from the water and wastewater sector with diverse demographic profiles. Among the participants, 11 were male and 7 were female. In terms of education, 5 held doctoral degrees and 13 held master's degrees. Regarding professional experience, 7 individuals had between 10 to 15 years of experience, while 11 had more than 16 years of experience in the field.

The data obtained from the semi-structured interviews were analyzed using Braun and Clarke's thematic analysis method. This qualitative method involves a systematic process of deeply examining the data to identify key themes and recurring patterns in participants' responses. Initially, the interviews were coded and the data were categorized into various groups. Then, core themes relevant to the main research objective—developing a value chain framework with a continuous improvement approach—were extracted. The analysis included identifying initial codes, grouping them into categories, and then forming overarching themes that represent strengths, challenges, opportunities, and suggested strategies in the studied areas.

To enhance the validity and reliability of the analysis, the Cohen's Kappa coefficient was used to evaluate coder agreement, thereby confirming the precision of the thematic interpretation. The extracted themes revealed a set of shared strategies and challenges concerning the continuous improvement-oriented value chain framework, covering various aspects related to this model. Based on the interview analysis using MAXQDA software, the themes of the framework were identified. Table 1 presents examples of interview excerpts aligned with the corresponding codes.

Table 1

Sample Interview Coding

Identified Code	Sample Interview Text
Effective Delegation	Allowing decision-making at lower levels of the organization to increase speed and flexibility.
Reduction of Managerial Layers	Streamlining the organization by reducing bureaucracy.
Matrix or Project-Based Structure	Enabling cross-departmental collaboration through project-based models.
Flexibility in Roles and Responsibilities	Dynamically and adaptively defining roles.
Effective Horizontal and Vertical Communication	Strengthening the flow of information across all organizational levels.
Alignment of Strategic and Operational Goals	Linking macro strategies with departmental objectives.
Participatory Strategic Planning	Engaging stakeholders in strategy formulation.
Continuous Monitoring of Internal and External Environment	Reflecting environmental changes in policies.
Adaptability to New Technologies	Integrating strategies with digital transformations.
Strategic Review and Feedback Mechanisms	Periodically revising policies based on performance outcomes.
Measurable Key Performance Indicators	Defining specific indicators for each unit.

Continuous and Corrective Feedback	Providing feedback for process improvement.
360-Degree Evaluation	Using feedback from managers, peers, and subordinates.
Performance-Based Rewards	Establishing a direct link between evaluations and incentives.
Alignment of Evaluation with Strategic Objectives	Matching metrics with organizational strategic directions.
Optimization of Human and Physical Resource Allocation	Efficient use of labor, equipment, and space.
Internal Supply Chain Management	Aligning internal operations with supply and demand.
Smart Inventory Control	Utilizing just-in-time inventory management systems.
Operational Cost Management	Reducing costs without sacrificing service or product quality.
Leveraging Technology for Productivity	Using digital tools in resource management.
Learning from Mistakes and Failures	Transforming errors into learning opportunities.
Support for Employee Innovation and Ideation	Encouraging experimentation and creativity.
Ongoing and Updated Training Programs	Enhancing employee knowledge based on current needs.
Building Trust and Knowledge Sharing Culture	Sharing information and experiences among staff.
Formal Knowledge Documentation and Transfer Mechanisms	Creating an organizational knowledge repository.
Bottleneck Reduction	Identifying and improving constraints in production or service flow.
Workload Balancing Across Units	Optimally distributing tasks among stations and departments.
Management of Material and Information Flow	Ensuring synchronization of physical transfers and data.
Use of Agile Tools	Real-time inventory control and production planning.
Smart Automation and System Integration	Employing technology to increase speed and accuracy in operations.
Identification of All Forms of Waste	Including time, motion, inventory, overprocessing, defects, etc.
Reduction of Non-Value-Adding Activities	Focusing on activities that deliver customer value.
Improvement of Repetitive and Unnecessary Processes	Redesigning processes to avoid duplication of effort.
Minimization of Excessive Transfers and Movements	Optimizing layouts for greater efficiency.

To analyze the interview data collected in this study, Braun and Clarke's thematic analysis method was applied. This method consists of six essential steps that guide a detailed analysis and extraction of key themes. In the first step—familiarization with the data—the researcher thoroughly reviews all interviews to gain an initial understanding of the content and core topics. This includes reading through all interviews in full and taking notes on key points to form a general perspective on the data. At this stage, information relevant to developing a value chain framework with a continuous improvement approach is carefully examined to identify challenges, opportunities, and strategies.

In the second step—generating initial codes—the researcher begins coding the data. These codes represent specific and significant segments of the interviews that can aid in identifying key themes. This step is critical, as accurate coding significantly influences the quality of the analysis.

In the third step—searching for themes and categorizing—the initial codes are grouped into different categories. These categories should reflect shared topics across interviewee responses. The researcher clusters the codes and explores relationships among them to identify main themes, ensuring that all dimensions of the research topic are addressed. This stage is particularly essential for recognizing complex and multidimensional themes, such as the use of artificial intelligence in green financing within banks.

In the fourth step—reviewing and refining themes—the researcher conducts a detailed review of the identified themes and compares them against the data to ensure their accuracy and credibility. Some themes may require refinement or reconsideration to better align with the core data.

In the fifth step—defining and naming themes—the final themes are clearly defined, and names are assigned that align with the research goals and questions. These labels should be intuitive so that the reader can easily grasp the meaning of each theme and understand its relevance to the research framework.

Table 2

Overarching Theme: Value Chain Framework with a Continuous Improvement Approach

Second-Level Constructive Theme	First-Level Constructive Theme	Initial Theme
Sustainable Organizational Infrastructure	Flexible Organizational Structure	Effective Delegation
		Reduction of Managerial Layers
		Matrix or Project-Based Structure
		Flexibility in Roles and Responsibilities
		Effective Horizontal and Vertical Communication
	Integrated Strategic Policies	Alignment of Strategic and Operational Goals
		Participatory Strategic Planning
		Continuous Monitoring of Internal and External Environment
		Adaptation to New Technologies
		Strategic Review and Feedback Mechanisms
	Performance Evaluation System	Measurable Key Performance Indicators
		Continuous and Corrective Feedback
		360-Degree Evaluation
		Performance-Based Rewards
		Alignment of Evaluation with Strategic Goals
	Internal Resource Management	Optimization of Human and Physical Resource Allocation
		Internal Supply Chain Management
		Smart Inventory Control
		Operational Cost Management
		Leveraging Technology for Productivity
	Organizational Learning Culture	Learning from Mistakes and Failures
		Support for Employee Innovation and Ideation
		Continuous and Updated Training Programs
		Fostering Trust and Knowledge Sharing
		Formal Mechanisms for Knowledge Documentation and Transfer
Integrated Process Efficiency	Streamlined Operational Flow	Bottleneck Reduction
		Workload Balancing
		Material and Information Flow Management
		Use of Lean Tools
		Smart Automation and System Integration
	Waste Elimination and Repetition Reduction	Identification of Waste Types
		Root Cause Analysis
		Elimination of Non-Value-Adding Activities
		Improvement of Repetitive and Redundant Processes
		Reduction of Unnecessary Transfers and Movements
	Process Standardization	Accurate Definition of Workflow Steps
		Use of Standardized Checklists and Forms
		Coordination Across Branches and Units
		Employee Training Based on Standards
		Regular Review and Updating of Standards
	Quality Control System	In-Process Inspection
		Monitoring of Quality Indicators
		Statistical Process Control
		Error and Deviation Reporting Mechanisms
	Cross-Functional Coordination	Formation of Cross-Departmental Teams
		Regular Coordination Meetings Between Units
		Clarification of Roles and Responsibilities in Processes
		Use of Shared Communication Platforms
		Synergy in Defining and Implementing Improvement Projects
Digital Technological Transformation	Integration of Emerging Technologies	Alignment of IT and OT Systems
		Use of Internet of Things (IoT)
		Big Data Analytics
		Use of Artificial Intelligence for Forecasting and Optimization
		Integration of Digital Platforms

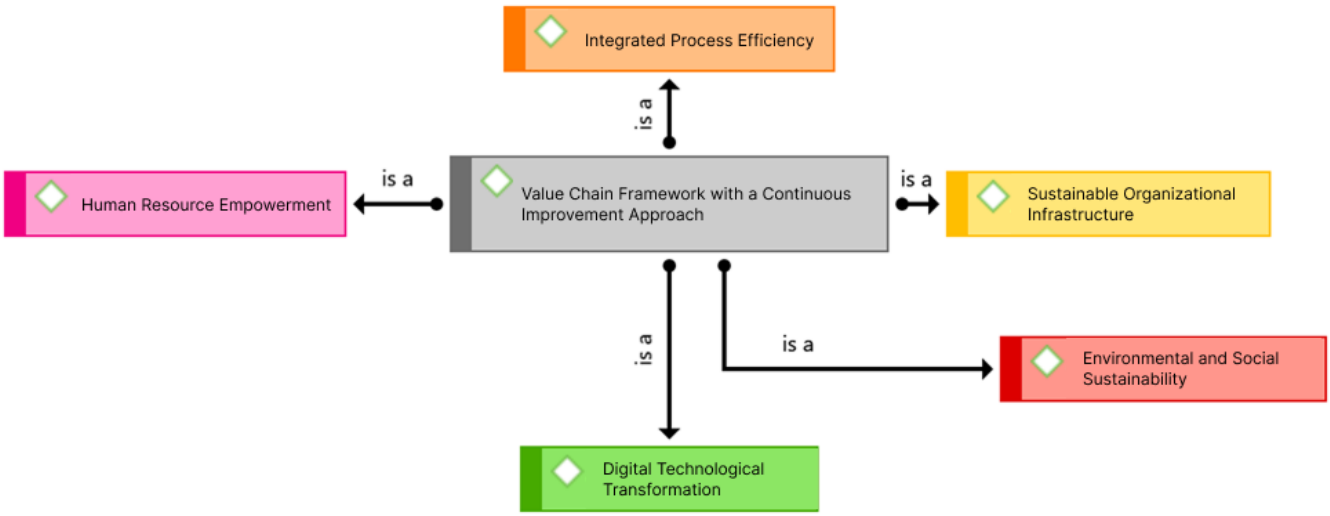
	Smart Process Automation	Software Robots
		Business Process Management Systems
		Production Line Automation
		Integration of AI with Automation
		Real-Time Process Monitoring
	Cloud-Based Digital Infrastructure	Cloud Data Storage
		Cloud Computing for Heavy Analytics
		Centralized Resource Management via Cloud ERP
		Real-Time Support and Automatic Updates
		Enhanced Remote Collaboration
	Data Security and Privacy	Data Encryption
		Role-Based Access Control
		Real-Time Security Monitoring
		Privacy Policies Compliant with Regulations
		Secure Data Backup and Recovery
	Blockchain in Supply Chain Traceability	Distributed Ledger for Supply Chain Data
		Authenticity Verification from Origin to Destination
		Transparent Information Sharing Among Stakeholders
		Real-Time Transaction Recording
		Smart Contracts Implementation
Human Resource Empowerment	Continuous Specialized Training	Skill-Based Training Programs Aligned with Job Needs
		On-the-Job and Experiential Learning
		Regular Updates of Technical Knowledge Based on New Technologies
		Training with Innovative Methods
		Evaluation of Training Effectiveness and Application
	Job Motivation and Participation	Effective Reward and Recognition Systems
		Delegation and Participation in Decision-Making
		Clearly Defined and Achievable Career Paths
		Creation of a Positive and Supportive Work Environment
		Identification and Development of Talented and High-Potential Employees
	Organizational Knowledge Management	Documentation of Tacit Knowledge and Employee Experiences
		Creation of Organizational Knowledge Databases
		Knowledge Exchange Among Units and Individuals
		Culture of Knowledge Sharing
		Use of Technology in Knowledge Management
	Continuous Improvement Culture Among Employees	Encouragement for Submitting Improvement Suggestions
		Formation of Quality Improvement Teams
		Promoting a Learning-Oriented Mindset
		Training on Gradual Improvement Culture
		Recognition of Effective Contributions
	Development of Communication and Creative Skills	Interpersonal Skills Training
		Enhancement of Presentation Skills
		Promotion of Critical Thinking
		Design Thinking Workshops
		Intellectual Collaboration and Co-Thinking
Environmental and Social Sustainability	Corporate Social Responsibility	Programs Supporting Local Communities
		Participation in Charitable Activities
		Transparent and Periodic CSR Reporting
		Compliance with International Standards
		Mechanisms for Assessing Social Impact
	Reducing Environmental Impact	Waste Reduction and Recycling of Consumables
		Reducing Air, Water, and Soil Pollution in Processes
		Designing Environmentally Friendly Products
		Product Life Cycle Assessment
		Use of Biodegradable and Sustainable Packaging
	Optimal Use of Energy and Resources	Implementation of Energy Management Systems
		Use of Renewable Energy Sources

	Water Recycling and Reuse in Processes
	Optimization of Raw Material Consumption
	Real-Time Energy Consumption Monitoring
Stakeholder Rights Compliance	Consulting Stakeholders in Strategic Decision-Making
	Establishing Complaint Handling Mechanisms
	Balancing the Interests of Employees, Shareholders, Customers, and Society
	Transparent Communication of Activities, Risks, and Opportunities
	Adherence to Ethical Business Principles for All Stakeholders
Supporting Green Innovations	Investment in Green R&D
	Support for Green Startups and Contractors
	Development of Clean and Low-Carbon Technologies
	Implementation of Eco-Design-Based Production Processes

Based on the conducted analyses, 123 initial themes were identified and classified into 25 first-level constructive themes and 5 second-level constructive theme categories.

Figure 1

Value Chain Framework with a Continuous Improvement Approach



4. Discussion and Conclusion

The findings of this study led to the development of a comprehensive value chain framework with a continuous improvement approach, grounded in five key second-level dimensions: sustainable organizational infrastructure, integrated process efficiency, digital technological transformation, human resource empowerment, and socio-environmental sustainability. Each dimension was formed through inductive thematic analysis of expert interviews and coded data, producing 123 initial codes, categorized into 25 first-level themes and consolidated into the overarching framework. These findings reflect the increasingly systemic nature of value chain governance, where organizational learning, digitalization, environmental considerations, and adaptive leadership form the cornerstone of sustainable value creation.

The identification of sustainable organizational infrastructure as a core dimension underscores the importance of organizational agility, strategic alignment, and effective governance in enabling continuous improvement. Thematic categories such as flexible structures, strategic feedback mechanisms, and integrated performance evaluations suggest that organizations must adopt participatory and responsive governance systems. This aligns with Karshi et al.'s (Karshi et al., 2023) findings on the necessity of innovation-oriented structures in industrial value chains and with Vorkiani Pour and Cheragheli's (Vorkiani Pour & Cheragheli, 2022) emphasis on value chain policy frameworks in sustainable urban development.

Furthermore, the inclusion of decentralized decision-making and strategic synchronization mirrors the participatory governance principles found in global value chain literature (Wan, 2024).

The second major component, integrated process efficiency, highlights the importance of streamlining operations through lean methods, standardization, intelligent inventory control, and cross-functional coordination. These subthemes support the findings of Cui et al. (Cui et al., 2023), who stress the importance of robust control strategies in dynamic supply environments. The inclusion of tools like root cause analysis and lean optimization aligns closely with the process improvement focus in the manufacturing and logistics sectors, as explored by Salari (Salari, 2021). In parallel, Gol Sabbagh's (Gol Sabbagh, 2022) emphasis on ERP-based integration across supply chain functions reflects the need for seamless data flow and procedural coherence. Moreover, the notion of eliminating non-value-adding activities confirms the centrality of lean philosophies in improving resource efficiency and cycle time (Aydin & Tirkolaee, 2022).

The third dimension, digital technological transformation, was underscored by themes such as AI-enabled forecasting, IoT deployment, smart automation, cloud infrastructure, and blockchain-based traceability. These findings indicate a paradigm shift from conventional manual systems to intelligent, interconnected ecosystems capable of real-time decision-making and transparency. This corresponds with Lin's (Lin, 2024) global analysis of AI integration into value chains and Egwim et al.'s (Egwim, 2023) insights into AI applications across the construction lifecycle. The role of blockchain, highlighted by its ability to ensure authenticity and transparency in supply transactions, is supported by Alves et al. (Alves et al., 2023), who emphasize consumer-facing technologies like gamified traceability platforms in circular supply chains. These technological subthemes reinforce the findings of Yang et al. (Yang et al., 2021) regarding the integration of digital feedback mechanisms in dual-channel value chains and suggest that digital transformation is both a driver and enabler of continuous improvement.

The fourth dimension, human resource empowerment, was extensively represented through themes related to training, participation, knowledge management, motivational systems, and the development of creative and interpersonal competencies. These results point to the central role of human capital in the operationalization of improvement efforts and align with Saleheen and Habib's (Saleheen & Habib, 2023) assertion that performance in value chains hinges on embedded organizational attributes and people-centric metrics. The presence of institutional learning, tacit knowledge codification, and participative decision-making highlights an organizational culture that fosters adaptive capacity and collective intelligence. Herath and Endagamage (Herath & Endagamage, 2022) similarly found that employee involvement and performance feedback systems significantly affect manufacturing outcomes, reinforcing the strategic alignment between HRM and operational performance. Moreover, the emphasis on skill-based training echoes Kilima et al.'s (Kilima et al., 2024) study on capacity-building within East African milk value chains, suggesting that technical upskilling is a universal necessity across sectors and regions.

The fifth and final dimension, socio-environmental sustainability, encompassed themes such as energy and resource optimization, social responsibility, stakeholder inclusion, green innovation, and environmental compliance. This reveals an evolving understanding of value chain performance that goes beyond profitability to include ESG (environmental, social, and governance) criteria. The inclusion of lifecycle analysis, emission reduction, and green design strategies supports the conclusions drawn by Babaei et al. (Babaei et al., 2023) and Hajiagha et al. (Hajiagha et al., 2022), who examined carbon-conscious supply chain models. The focus on circularity, recycling, and biodegradable packaging aligns with Aydin and Tirkolaee's (Aydin & Tirkolaee, 2022) systematic review on circular production planning. Likewise, Alves et al. (Alves et al., 2023) demonstrated that integrating environmental education tools, such as eco-gamification, can effectively mobilize consumers toward sustainability goals, highlighting the bidirectional nature of value creation in modern chains.

Additionally, the study's framework is notable for its emphasis on vertical and horizontal integration across the value chain. Vertical integration, reflected in strategic alignment and cascading performance metrics, echoes the findings of Piao and Xiao (Piao & Xiao, 2023) regarding the role of supply chain finance in reducing risk asymmetries. Horizontal integration, manifested in cross-functional collaboration and process standardization, reflects Seif Barghi and Kafshian Ahar's (Seif Barghi & Kafshian Ahar, 2022) study on synchronizing traditional and digital channels to improve delivery responsiveness. Together, these elements highlight the necessity of a unified

governance system that supports real-time information exchange, responsiveness, and stakeholder coordination.

The framework's inclusion of small and medium-sized enterprises (SMEs) in the value chain narrative is also noteworthy. Insights from Nugroho (Nugroho, 2022) reveal that SMEs enhance their global participation and export performance when they align with sustainability and process improvement standards. Similarly, Dzukroni and Afandi (Dzukroni & Afandi, 2023) emphasized the integration of ethical and religious standards in halal value chains, reinforcing the relevance of cultural and contextual adaptability in operational design. This supports the idea that continuous improvement frameworks must be both scalable and adaptable, accommodating the diverse constraints and goals of varied enterprise types.

While this study presents a robust framework informed by expert input and validated through thematic analysis, it is not without limitations. The research was conducted using qualitative data gathered from a specific industry context—primarily water and wastewater management—which may affect the generalizability of results to other sectors. Additionally, although the sample included experienced managers and professionals, the relatively small number (18 participants) could limit the diversity of perspectives captured. The thematic analysis, while systematic, is inherently interpretive and may reflect researcher bias despite efforts to maintain objectivity. Lastly, the framework is conceptual in nature and has not yet been empirically tested through implementation in a real-world organizational setting.

Future research can extend this study by quantitatively validating the proposed framework using structural equation modeling or confirmatory factor analysis across multiple industries. Comparative studies across sectors such as manufacturing, logistics, agriculture, and services would help assess the transferability and adaptability of the identified dimensions. Furthermore, longitudinal studies that monitor the implementation of continuous improvement strategies over time can provide valuable insights into the dynamic interactions between framework components. It would also be beneficial to explore the influence of national policy, institutional quality, and cultural variables on the efficacy of continuous improvement models, particularly in developing and emerging economies.

Organizations seeking to operationalize continuous improvement within their value chains should begin by assessing their current infrastructure and capabilities in the five identified dimensions. Strategic investments in digital transformation and human resource development will yield compounding returns when integrated with lean operational practices and sustainability goals. Firms should adopt agile governance structures that encourage participation, feedback, and iterative learning. Environmental and social sustainability must be treated not as compliance obligations but as strategic levers for innovation and stakeholder engagement. Finally, continuous improvement must be institutionalized through cross-functional collaboration, performance monitoring, and the cultivation of a learning-oriented organizational culture.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

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