

Designing an Integrated Supply Chain Management System to Optimize Raw Materials at Café Mon Coffee, Sukoharjo

Taufik Hantoro¹, Siti Nurlaela², Yoghi Ajitama³, Oma Nuryanto⁴, Hetining Setyowati⁵, Eko Agustini⁶

Postgraduate Program in Management Science, Faculty of Economics, Universitas Islam Batik Surakarta, Indonesia^{1,3,4,5,6}

Department of Accounting, Faculty of Economics, Universitas Islam Batik Surakarta, Indonesia²

Corresponding Author: Taufik Hantoro (hantoro.taufik@gmail.com)

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ABSTRACT

This study designs an integrated supply chain management (SCM) system for a small café business that handles heterogeneous raw materials with different shelf lives, storage requirements, and turnover rates. This study used a design-oriented qualitative single-case approach to examine Café Mon Coffee, Sukoharjo. The evidence base comprised non-participant observation of procurement, receiving, storage, preparation, and service activities; review of available product, supplier, ordering, and stock records; and role-based validation of process steps with the owner/manager, purchasing function, and barista. Data were reduced, coded, mapped into the current-state process, and compared with recent SCM, SME inventory, supplier integration, and perishable-food planning literature. The findings indicate that daily material needs are recorded and ordered manually, while supplier, stock, usage, and demand information remain fragmented. This condition creates exposure to stock imbalance, expiry, inconsistent replenishment, and slow managerial response. The proposed system follows an input-process-output architecture that integrates supplier and raw-material master data, recipe-based usage, stock and sales history, supplier evaluation, simple demand forecasting, minimum-maximum replenishment, first-expired-first-out control, purchase ordering, receiving checks, and role-based dashboards. The design produces purchase plans, low-stock and expiry alerts, supplier scorecards, and usage and waste reports. The study contributes a low-complexity, context-specific SCM design for café MSMEs. Because the system has not yet been implemented, the reported benefits are design expectations rather than measured performance effects.

Keywords: Supply Chain Management; Café MSME; Inventory Visibility; Perishable Era Materials; Demand Forecasting



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INTRODUCTION

Digital technology has transformed supply chain management from a set of isolated logistics activities into a coordinated information and material system. Shared data can improve visibility, support faster decisions, and connect procurement, inventory, production, and distribution activities (Ivanov & Dolgui, 2021; Liu et al., 2022). These capabilities are particularly relevant for small and medium-sized enterprises (SMEs), which typically operate with limited managerial resources and therefore need simple mechanisms that convert operational data into useful supply chain decisions. Recent evidence shows that digitalization yields greater operational value when combined with supply chain capability, integration, and organizational capacity to use data, rather than being treated as a stand-alone technology investment (Hautala-Kankaanpää, 2022, 2023). The operational challenge is more complex in food and beverage businesses because product variety creates a corresponding variety of raw-material characteristics. Coffee beans, milk, tea, syrup, soda, fruit, and sweeteners differ in shelf life, storage conditions, usage patterns, procurement lead time, and quality sensitivity. Inventory practices that ignore these differences may produce excessive stock, stockouts, expiry, waste, or inconsistent product quality. A recent systematic review emphasizes that inventory know-how, technology, and behavioral discipline jointly affect SME performance (Panigrahi et al., 2024). In perishable-food supply chains, data-driven planning is also expected to incorporate perishability and demand-sensing information rather than relying only on historical averages (Birkmaier et al., 2024).

Café Mon Coffee is located on Jl. Mangesti Raya, Mayang, Gatak, Sukoharjo, and offers latte and flavored coffee, coffee-based drinks, mocktails and margaritas, sparkling beverages, tea-based drinks, and milk-based drinks. This variety is attractive to customers but generates operational complexity. The business relies on several supplier groups for coffee beans, syrup and soda, milk and tea, and fresh fruit. Current operations record daily material needs, communicate orders through the purchasing function, receive routine deliveries, and move materials to storage and barista preparation. This flow supports day-to-day service, but the information required to coordinate suppliers, stock, usage, shelf life, and demand is not yet integrated into a single decision system. Recent SCM studies provide strong evidence about the importance of supply chain integration, inventory discipline, supplier selection, and digital capability. Supplier and internal integration support agility, flexibility, and operational responsiveness (Shukor et al., 2021; Siagian et al., 2021). Supplier selection research for SMEs recommends explicit criteria rather than informal reliance on price alone (Tong et al., 202; Mantos et al., 202). Digital supply chain research also highlights visibility and collaboration as important mechanisms for resilience and control (Zouari et al., 2021). However, much of this literature examines manufacturing firms, larger organizations, or broad samples of SMEs. There is still limited design-oriented evidence that translates these concepts into a practical, low-complexity SCM architecture for a small café with both coffee and non-coffee products, multiple supplier categories, and highly perishable materials.

This gap is both theoretical and practical. Theoretically, the value of data and digitalization depends on their integration with supply chain processes; nevertheless, the operational mechanisms required in a café MSME remain under-specified. Practically, a small café requires a design that is more structured than manual notes but less complex than an enterprise-wide planning platform. The novelty of this study lies in combining a qualitative current-state diagnosis with an input-process-output SCM system design that explicitly connects supplier integration, procurement control, perishability-based inventory, recipe-based usage, and demand information in the context of a small café. Accordingly, this study addresses three research questions: (1) How is the current supply chain for raw materials implemented at Café Mon Coffee? (2) What operational weaknesses arise from the current procurement, inventory, and information practices? (3) How can an integrated SCM system be designed to support raw-material availability, quality consistency, waste control, and timely decision-making? The objective is not to claim a measured performance improvement before

implementation, but to produce an evidence-based system design and an implementation framework that can be tested in subsequent research.

THEORETICAL FRAMEWORK AND HYPOTHESES

Supply Chain Integration in SMEs

Supply chain integration refers to the coordinated management of internal activities and external relationships so that material, information, and decision flows support a common operational objective. In small businesses, integration does not necessarily require sophisticated enterprise software. It begins with consistent master data, clear roles, shared transaction records, and agreed decision rules. Empirical evidence indicates that supplier, customer, and internal integration improve supply chain agility and organizational flexibility (Shukor et al., 2021), while integration also enables resilience and innovation capabilities that support business performance (Siagian et al., 2021). The SME context is important because limited personnel often perform multiple functions. A manager may simultaneously oversee purchasing, inventory, finance, and service. Under these conditions, fragmented spreadsheets or handwritten notes create coordination gaps. Hautala-Kankaanpää (2023) shows that data capability becomes operationally valuable when it is complemented by supply chain capability. Therefore, the central design question is not merely whether the café should digitalize, but how digital information should be embedded in supplier, procurement, inventory, and production routines.

Inventory Visibility and Perishability Control

Inventory visibility is the ability to identify what material is available, where it is stored, how long it can be used, and how quickly it is consumed. Panigrahi et al. (2024) emphasize that SME inventory performance depends on technical, technological, and behavioral know-how. For a café, these dimensions include accurate receiving, unit consistency, storage classification, expiry recording, periodic reconciliation, and a disciplined link between menu recipes and material usage. Perishability requires differentiated control. Milk and fresh fruit need short review cycles, first-expired-first-out (FEFO) handling, and expiry alerts. Coffee beans require batch and quality control, while syrup, soda, tea, and sweeteners may be managed through minimum-maximum levels and periodic review. Birkmaier et al. (2024) demonstrate that perishability should be explicitly incorporated into data-driven planning and waste-prevention measures. A single inventory rule for all materials is therefore unsuitable.

Supplier Selection and Relationship Management

Supplier performance affects availability, quality, price stability, lead time, and the café's capacity to respond to demand changes. Supplier selection in SMEs is often constrained by limited data and bargaining power, which makes a concise but explicit scorecard useful. Recent studies recommend multi-criteria supplier assessment that considers quality, delivery, cost, reliability, and sustainability instead of relying on price as the dominant criterion (Tong et al., 2022; Mantos et al., 2023). In the proposed design, supplier integration is operationalized through a supplier master, agreed lead times, purchase-order records, receiving results, delivery timeliness, and non-conformity history. These data are not intended to create administrative burden; they are intended to support consistent sourcing decisions and reduce dependence on individual memory.

Digital Data Capability and Operational Decision-Making

Digitalization can support real-time visibility and coordination, but technology alone does not guarantee improved performance. Liu et al. (2022) find that digitalization and external supply chain integration jointly influence performance, while Hautala-Kankaanpää (2022) shows that digital culture and supply chain capability shape the operational effect of digitalization. Zouari et al. (2021) similarly connect supply chain digitalization with visibility, anticipation, and collaboration. These findings support a process-first design: the system must be built around operational decisions, and

each field of data must have a defined managerial use. For Café Mon Coffee, the minimum useful data set includes supplier identity and lead time, material category and shelf-life class, current stock, incoming purchase orders, recipe usage, sales or production history, and stock adjustments. The system should transform these inputs into actionable outputs such as reorder alerts, expiry alerts, purchase plans, supplier scorecards, and usage variance reports.

Conceptual Framework and Propositions

The analytical framework links supplier integration to procurement discipline, inventory visibility and perishability control, production continuity, and operational outcomes. Data capability is treated as a cross-cutting mechanism that connects all stages rather than as a separate end product.



Figure 1. Conceptual Framework for the Proposed Café SCM System

- Proposition 1: Reactive procurement without integrated inventory and demand information increases exposure to stock imbalance, expiry, and emergency purchasing.
- Proposition 2: Supplier integration and standardized procurement records improve the reliability of raw-material availability and quality control.
- Proposition 3: Perishability-specific inventory rules, recipe-based usage, and demand-informed replenishment reduce the risk of overstocking and stockouts.
- Proposition 4: A role-based digital system strengthens the café's data capability and supports faster, more consistent operational decisions.

METHODS

This research used a design-oriented qualitative single-case study. The case approach was selected because the study sought to understand how raw-material supply chain activities are currently performed in their natural operational setting and to convert that understanding into a context-specific system design. The unit of analysis was the end-to-end raw-material process at Café Mon Coffee, comprising supplier coordination, purchasing, receiving, storage, material issuance, beverage preparation, and the associated information flow. The case evidence refers to operating conditions documented in 2025. The study is exploratory and prescriptive. The exploratory component maps the current process and diagnoses weaknesses. The prescriptive component translates the diagnosis and recent SCM literature into a proposed input-process-output architecture. The proposed system is therefore a design output, not a tested software implementation.

Data Collection and Evidence Base

Evidence was assembled from multiple operational sources to improve traceability and reduce dependence on a single account. The original field documentation recorded operational roles rather than a fixed formal interview sample. Consequently, this article does not provide a numerical count of informants. We used role-based clarifications to validate process steps and did not treat them as a separate interview corpus.

Table 1. Data Sources and Analytical Use

Evidence source	Coverage	Use in analysis
Non-participant observation	Procurement requests, receiving, storage,	Current-state process and control points

Operational documents and records	preparation, and service flow Product/menu list, supplier categories, available ordering notes, and stock records	Material categories, ordering logic, and information gaps
Role-based process validation	Owner/manager, purchasing function, and barista role categories	Confirmation of responsibilities, sequence, and user needs
Recent international literature	SCM integration, SME inventory, digital capability, supplier selection, and perishable-food planning	Analytical criteria and system-design requirements

Data Analysis

Analysis was conducted in five stages. First, the evidence was reduced and coded into six process categories: suppliers, procurement, inventory, production, distribution/service, and information. Second, the coded evidence was displayed in a current-state process map. Third, weaknesses were identified through gap analysis between current practices and recent SCM concepts. Fourth, the requirements were synthesized into an input-process-output model and a role-based user architecture. Fifth, conclusions were checked against the original operational evidence to ensure that each proposed feature addressed an identified problem. The coding and interpretation followed quality principles for transparent thematic analysis (Braun & Clarke, 2021) and the data-reduction, display, and conclusion-drawing logic described by Miles et al. (2020). Analytical claims were deliberately bounded. The study reports observed process characteristics, a literature-informed diagnosis, and an expected contribution of the design. It does not report cost savings, waste reduction, service improvement, or other causal effects because no post-implementation data were available.

Trustworthiness and Ethical Considerations

Trustworthiness was supported through source triangulation, a chain of evidence from process observation to design requirement, and a consistency check between the proposed features and the diagnosed weaknesses. Personal identifiers and confidential commercial values were not included. The analysis focuses on processes and role categories. The absence of a fixed interview count and the non-implementation of the system are disclosed as methodological limitations rather than being filled with unsupported assumptions.

RESULTS AND DISCUSSION

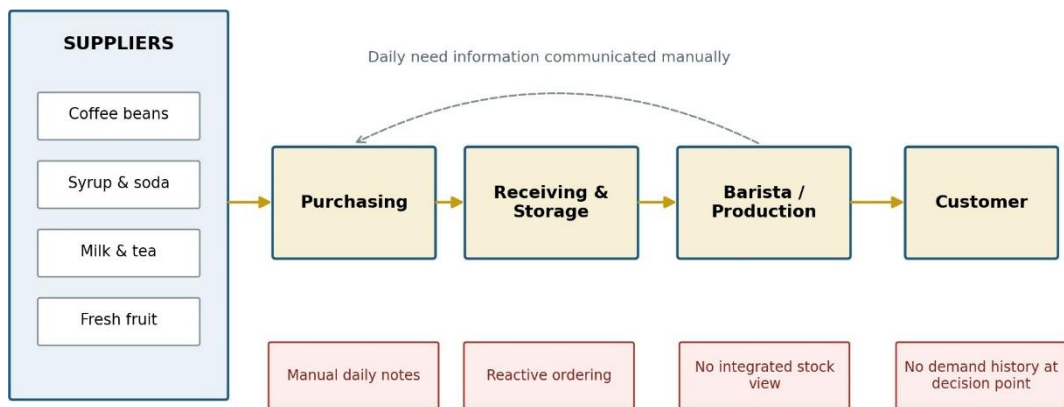
Product and Raw-Material Complexity

Café Mon Coffee serves six broad beverage groups: latte and flavored coffee, coffee-based drinks, mocktails and margaritas, sparkling beverages, tea-based drinks, and milk-based drinks. Each group consumes a different combination of materials. Coffee-based drinks rely on coffee beans with specific quality and consistency requirements. Mocktails, margaritas, and sparkling beverages require syrup, soda, fresh fruit, and other supporting ingredients. Tea-based and milk-based drinks require tea, liquid milk, sweeteners, and flavoring ingredients. The operational consequence is that inventory cannot be managed as one homogeneous category. The materials have different shelf-life, quality, storage, and turnover profiles. Table 2 presents a proposed control segmentation derived from the observed material categories. The table does not assign unsupported numerical shelf lives; it identifies the control rule that should be configured after the café confirms its product specifications and supplier lead times.

Table 2. Raw-Material Segmentation and Proposed Inventory Controls

Material Group	Operational Characteristic	Proposed Control Rule
Coffee beans	Quality-sensitive; moderate shelf life; core product input	Batch traceability, minimum-maximum stock, quality check, usage variance
Milk and fresh fruit	Highly perishable; frequent use; storage-sensitive	FEFO, expiry date, short review cycle, low-stock and expiry alerts
Syrup and soda	Moderate shelf life; multiple variants	Minimum-maximum level, variant-level stock, periodic review
Tea, sweeteners, and dry ingredients	Relatively stable; recipe-dependent	Periodic review, recipe-based usage, safety stock by criticality

The existing supply chain involves several supplier groups. The purchasing function orders coffee beans, syrup, soda, milk, tea, and fruit based on current operational needs. Daily needs are recorded and communicated to purchasing. Deliveries are routine and may occur daily for high-turnover or short-life materials such as milk and fresh fruit. After receipt, materials are stored and distributed to the barista for beverage preparation. Storage, processing, and presentation are managed at the café. This process establishes a functioning material flow, but the information flow is fragmented. Ordering is driven primarily by immediate need, while supplier data, current stock, shelf life, recipe consumption, and demand history are not consolidated in a common control view. Figure 2 summarizes the current state and the main information weaknesses identified during analysis.



Current-state diagnosis: material flow exists, but information flow is fragmented and largely reactive.

Diagnosed Weaknesses

The weaknesses do not indicate that the current operation is non-functional; rather, they show where operational control depends heavily on individual memory and daily coordination. The diagnosis is summarized in Table 3.

Table 3. Current-State Weaknesses and Operational Implications

Current Weakness	Observed or Inferred Condition	Operational Implication
Manual and fragmented records	Stock, orders, and usage are not viewed in one place.	Slow reconciliation, inconsistent data, and limited visibility.
Reactive procurement	Orders are initiated mainly from immediate daily needs.	Emergency purchasing, stockout exposure, and

No differentiated perishability rule	Materials with different shelf lives are handled without an integrated alert structure.	unstable order frequency. Expiry and waste risk, especially for milk and fruit.
Limited supplier performance history	Delivery, quality, and lead-time results are not systematically scored.	Supplier decisions depend on memory and informal judgment.
No recipe-to-stock linkage	Material consumption is not automatically derived from standard recipes or production records.	Unexplained variance and inaccurate stock balance.
No demand-based replenishment	Historical sales and usage are not converted into a purchase plan.	Difficulty anticipating demand changes and promotional effects.

Proposed Integrated SCM System

The proposed system is designed as a low-complexity mobile and web-enabled application rather than a full enterprise resource planning platform. It connects three primary user groups: suppliers, the manager/purchasing function, and baristas. Access is role-based so that each user sees only the transactions and information relevant to the assigned responsibility. The manager acts as system administrator and approves master data, purchasing rules, suppliers, and exceptional adjustments. The architecture follows an input-process-output structure. Inputs create the data foundation; processes convert data into operational controls; and outputs present decisions and exceptions. Figure 3 shows the proposed architecture.

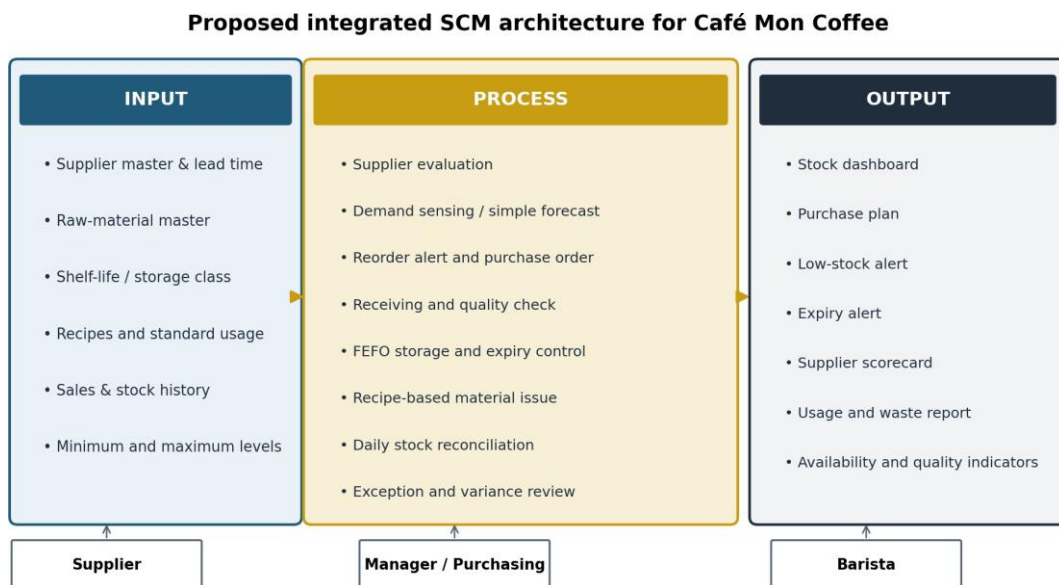


Figure 3. Input-Process-Output Architecture of the Proposed Integrated SCM System

The system begins with supplier and raw-material master data. Each material is assigned a unit of measure, supplier, lead time, storage class, shelf-life category, minimum level, maximum level, and recipe usage where applicable. Stock increases through approved receiving transactions and decreases through recipe-based material issue, recorded spoilage, or authorized adjustment. This structure creates a traceable balance between physical stock and information stock. Demand planning is intentionally simple. The initial implementation can use recent sales or material-usage history, day-of-week patterns, planned events, and manager adjustments to create a short-horizon purchase suggestion. More sophisticated forecasting should only be introduced after sufficient clean

data are available. This staged approach is consistent with the principle that data capability must serve a defined operational purpose.

Table 4. Proposed System Features and Managerial Use

System Feature	Core Data or Rule	Expected Managerial Use
Supplier master and scorecard	Supplier identity, material coverage, lead time, delivery timeliness, quality acceptance, price history	Improves sourcing consistency and supports supplier review
Raw-material and recipe master	Unit, category, shelf-life class, storage rule, standard recipe usage	Creates consistent stock and consumption data
Inventory monitoring	Opening, receiving, issue, expiry, spoilage, adjustment, closing stock	Provides current balance and transaction traceability
Replenishment engine	Minimum-maximum rules, forecast input, open purchase orders, lead time	Generates purchase suggestions and low-stock alerts
Perishability control	Batch/expiry record and FEFO recommendation	Reduces expiry exposure and prioritizes older stock
Receiving and quality check	Quantity, condition, temperature/storage check where relevant, rejection reason	Prevents non-conforming materials from entering usable stock
Dashboard and reports	Stock status, expiry risk, supplier performance, usage variance, waste	Supports daily and periodic managerial decisions

User Roles and Control Points

Table 5. Role-Based Access and Control Boundaries

Role	Main responsibility	Control boundary
Supplier	View approved purchase orders; confirm quantity and delivery schedule; update fulfillment status.	Cannot modify café stock or master data
Manager/purchasing	Maintain master data; approve suppliers and orders; set stock rules; review dashboard and exceptions.	Approves adjustments, supplier changes, and purchase commitments
Role Barista	Main responsibility View available materials and recipe needs; record production/issue, spoilage, and operational shortage.	Control boundary Cannot change supplier, price, or approval rules
System administrator (manager role)	User access, backup, audit trail, configuration, and technical coordination	Maintains access control and traceability

Implementation Roadmap and Indicators

Implementation should be staged to avoid transferring poor-quality manual data into a digital system. A practical roadmap is shown in Table 6. The indicators are process indicators for implementation monitoring; they are not claimed as achieved results.

Table 6. Staged Implementation Roadmap and Evaluation Indicators

Stage	Key Activity	Suggested Indicator
Data preparation	Standardize material names, units, suppliers, recipes, stock rules, and user roles.	Master-data completeness; duplicate material rate
Basic transaction control	Activate receiving, issue, adjustment, and current-stock dashboard	Transaction completion rate; stock-record accuracy
Procurement integration	Activate purchase requests, approvals, purchase orders, and supplier confirmations.	Order lead time; emergency order frequency; on-time delivery
Perishability and forecasting	Activate expiry/FEFO controls and short-horizon purchase suggestions	Expired stock; spoilage; stockout events; forecast error
Review and improvement	Review supplier scorecards, usage variance, and user feedback	Supplier acceptance rate; usage variance; system adoption

Interpretation of the Current-State Findings

The current supply chain demonstrates operational continuity but limited integration. Material movement from suppliers to purchasing, storage, barista preparation, and customers is clear; however, the accompanying information is not consolidated. This finding supports Proposition 1. Reactive daily ordering can keep operations running in the short term. Still, it restricts the café's ability to anticipate demand, compare stock with open orders, and distinguish ordinary variation from exceptional shortage. Panigrahi et al. (2024) similarly emphasize that inventory performance in SMEs depends on the combination of technical practices, technology, and managerial know-how. The supplier structure also supports Proposition 2. Café Mon Coffee does not rely on a single homogeneous input source; it coordinates several supplier categories with different materials and delivery requirements. Without a supplier master and performance history, reliability and quality are evaluated informally. The proposed scorecard translates recent SME supplier-selection research into a concise operational tool. It does not replicate complex multi-criteria mathematical models; instead, it retains their practical principle that supplier decisions should consider quality, delivery, cost, and reliability (Tong et al., 2022; Mantos et al., 2023).

Perishability, Inventory Control, and Demand Information

Proposition 3 is supported by the mismatch between material diversity and a largely uniform manual control process. Milk and fruit require different control from syrup, tea, or coffee beans. The proposed segmentation embeds FEFO and expiry alerts for highly perishable items while applying minimum-maximum review to more stable materials. This is consistent with Birkmaier et al. (2024), who identify perishability as a central expectation in data-driven food supply planning. Recipe-based usage is equally important. A café's inventory is transformed through menu production rather than sold only as unchanged units. Linking recipes to material issue creates a standard expected usage that can be compared with physical stock and actual adjustments. This comparison can reveal inconsistencies in portions, unrecorded spoilage, data-entry errors, or recipe changes. The design therefore integrates inventory control with production rather than treating stock as a separate administrative record.

Digital Integration and Data Capability

The proposed architecture supports Proposition 4 by specifying how data become operationally useful. The design does not equate digitalization with performance. It connects each data item to a decision: stock and lead time to replenishment, expiry to FEFO, receiving results to supplier evaluation, recipes to material usage, and history to purchase planning. This process orientation is consistent with evidence that digitalization creates value when combined with supply chain

capability and integration (Hautala-Kankaanpää, 2022, 2023; Liu et al., 2022). The role-based design also addresses the café's limited staffing structure. Suppliers confirm orders, baristas record operational use, and the manager controls master data and approvals. This distribution of responsibilities reduces duplicate entry and creates an audit trail without requiring every user to access all functions. It also strengthens visibility, anticipation, and collaboration, which are recurring mechanisms in digital supply chain research (Zouari et al., 2021).

Managerial Implications

First, the café should prioritize data discipline before advanced forecasting. Material names, units, recipes, stock levels, supplier lead times, and expiry classes must be consistent. Second, the system should begin with high-risk materials, particularly milk and fresh fruit. Because these materials combine high perishability with frequent operational use, third, supplier evaluation should be simple enough to maintain on a routine basis. A monthly scorecard based on delivery timeliness, acceptance quality, quantity accuracy, and price stability is more useful than an elaborate, unupdated model. Fourth, management should establish responsibility for stock adjustments and master-data changes. Without approval rules, a digital system may merely accelerate the processing of inconsistent transactions. Fifth, performance evaluation should distinguish implementation indicators from business outcomes. Stock-record accuracy and transaction completion can be monitored immediately, while waste reduction, lower emergency orders, and improved service continuity require a before-and-after observation period.

Theoretical Contribution, Limitations, and Future Research

The study contributes a context-specific bridge between recent SCM concepts and the operational reality of a café MSME. Its main theoretical contribution is the integration of supplier capability, perishability control, recipe-based inventory, and data capability into a single low-complexity framework. The framework demonstrates that the value of the digital supply chain in a small service-production business depends on the alignment of material and information flows, as well as roles and responsibilities. The study has several limitations. It examines one café and therefore does not claim statistical generalization. The available field documentation did not contain a fixed formal interview sample, so process validation is reported by role category rather than an invented informant number. Detailed numerical data on demand, waste, lead time, and stock accuracy were not available, and the proposed system has not yet been implemented. Future research should develop and pilot the application, collect baseline and post-implementation indicators, test forecast methods by material category, evaluate user acceptance, and compare the design across cafés with different menu complexity and supplier structures.

CONCLUSION

Café Mon Coffee manages a diverse raw-material supply chain that connects several supplier categories with purchasing, receiving, storage, barista production, and customer service. The current process maintains daily operations, but manual records and reactive ordering limit integrated visibility of stock, shelf life, usage, supplier performance, and demand. These conditions expose the café to stock imbalance, expiry, emergency purchasing, and inconsistent decision-making. The proposed SCM system addresses these weaknesses through an input-process-output architecture. It integrates supplier and material master data, recipe-based usage, current stock, sales and usage history, supplier evaluation, minimum-maximum replenishment, FEFO, receiving checks, and role-based access. Its outputs include stock dashboards, purchase plans, low-stock and expiry alerts, supplier scorecards, and usage and waste reports. The design provides a practical pathway from fragmented daily coordination to structured, data-informed supply chain management for a café MSME. Because implementation and post-implementation measurement have not yet been conducted, the system's effects remain propositions to be tested. The immediate managerial priority

is therefore to standardize master data, implement basic transaction control, and establish baseline indicators before evaluating operational improvement.

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