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Effect of Supply Chain Complexity on Knowledge Transfer in Catering Service in Batangas: Analyzing the Role of Sustainable Chain Collaborations and Technological Supply Chain Advancements

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ABSTRACT

This study examined the effect of supply chain complexity on knowledge transfer among licensed catering service enterprises in Batangas Province, while analyzing the roles of sustainable supply chain collaboration and technological supply chain advancements. A quantitative descriptive-correlational design was employed. Using stratified random sampling, the study gathered one response from each of 113 catering enterprises selected from a population of 158 establishments. Owners, managers, and supervisors directly involved in supply chain planning and coordination served as respondents. A validated survey questionnaire with excellent internal consistency across the study constructs (Cronbach's alpha = .941-.991) was administered, and the data were analyzed using frequency counts, percentages, weighted means, regression analysis, one-way analysis of variance, and Structural Equation Modeling. Results showed that effective knowledge transfer was rated very effective (M = 6.22). The respondents also experienced very high levels of process complexity (M = 6.29), consumer complexity (M = 6.16), decision-making complexity (M = 6.15), and product complexity (M = 6.13). Sustainable supply chain collaboration was practiced to a very great extent (M = 6.14), while technological advancements were also implemented to a very great extent (M = 5.81). Process complexity significantly predicted effective knowledge transfer (B = 0.6964, $p < .001$), whereas the other complexity dimensions were not significant predictors. The selected moderated context-complexity model demonstrated excellent fit, with supply chain complexity positively influencing effective knowledge transfer (beta = 0.4004, p = .007) and technological advancement negatively moderating this relationship (beta = -0.3268, p = .003). The findings indicate that catering enterprises maintain effective coordination under pressure, but their dependence on informal and fragmented systems may limit scalability and resilience. A phased operational improvement plan is proposed to formalize knowledge transfer, strengthen supplier collaboration, and align accessible digital tools with operational needs.

Keywords: *catering services, knowledge transfer, operational improvement plan, supply chain complexity, sustainable supply chain collaboration, technological advancements*

INTRODUCTION

Catering services form an important segment of the hospitality and food-service industry because they coordinate the preparation, transport, and delivery of food and beverages for private, institutional, and community events. Unlike routine food-service operations, catering enterprises must respond to event-specific schedules, changing client expectations, perishable inventories, food-safety requirements, and multiple suppliers within

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of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

compressed timeframes. Supply chain management therefore requires the careful synchronization of procurement, production, logistics, and service execution (Chopra & Meindl, 2016; Mastos & Gotzamani, 2022).

The operational environment becomes more difficult when catering businesses expand their supplier networks, manage simultaneous events, handle customized menus, and make urgent decisions about ingredient availability, staffing, and delivery. Supply chain complexity refers to the difficulty of coordinating interconnected structures and activities under conditions of uncertainty and variability. Prior studies have shown that unmanaged complexity can increase waste, delay service delivery, and expose organizations to operational risks (Bozarth et al., 2009; Gunasekaran et al., 2017).

Knowledge transfer is a central response to these operational pressures. It involves the sharing, retention, and application of information, skills, and experience across individuals and organizational units. In catering enterprises, effective transfer is needed to communicate event requirements, document lessons from previous engagements, coordinate suppliers, and maintain service consistency. Informal communication may support flexibility in small and medium enterprises, but dependence on tacit knowledge can create vulnerabilities when key personnel are unavailable or when multiple operations occur at the same time (Argote & Ingram, 2000; Szulanski, 1996).

Sustainable supply chain collaboration and technological advancements may help catering enterprises manage complexity. Collaborative practices encourage joint planning, responsible sourcing, waste reduction, and long-term supplier relationships, while digital tools can improve information visibility, documentation, and responsiveness. Technology adoption among smaller enterprises, however, may remain uneven because resource constraints and user readiness influence whether available tools become integrated operating systems or fragmented workarounds (Seuring & Muller, 2008; Thong, 1999).

In Batangas Province, catering services operate across urban and municipal areas and are shaped by tourism activity, celebrations, institutional functions, and seasonal demand. Many establishments are small enterprises that depend on experience-based routines and informal communication. This context creates a need to examine whether perceived knowledge transfer remains effective as complexity increases and whether collaboration and technology strengthen or constrain the relationship. Accordingly, the study assessed the profile of catering businesses; evaluated effective knowledge transfer, supply chain complexity, sustainable collaboration, and technological advancement; tested relationships and group differences; formulated a Structural Equation Model; and developed an operational improvement plan for the industry.

Literature Review

Supply Chain Complexity in Catering Services

Supply chain complexity arises from the number of actors, the variety of activities, and the uncertainty that organizations must manage. Choi and Krause (2006) explained that an expanded supply base can create both resource advantages and coordination burdens. In catering services, the challenge is intensified because food production, logistics, and service delivery are interdependent and time-sensitive. Small disruptions can cascade across the system, affecting preparation schedules, staffing, and the customer experience.

The study examined four dimensions of complexity. Process complexity concerns the synchronization of procurement, food preparation, transport, venue setup, and service delivery. Decision-making complexity reflects the need to make rapid choices under time pressure and incomplete information. Product complexity concerns menu variety, specialized ingredients, dietary requirements, and presentation standards. Consumer complexity arises from fluctuating demand, customized requests, and unpredictable changes in client expectations. These dimensions interact rather than operate independently, making coordination and information exchange essential (Serdar-Asan, 2013; Ivanov & Dolgui, 2020).

Knowledge Transfer and Operational Reliability

Knowledge transfer allows organizations to create, retain, and apply operational knowledge across individuals and teams. Argote and Ingram (2000) described knowledge transfer as an important basis for

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

competitive advantage because organizations improve when lessons and practices move effectively across units. In service operations, transfer may occur formally through manuals, checklists, training materials, and digital records, or informally through briefings, verbal instructions, mentoring, and repeated experience.

Catering enterprises often rely on tacit knowledge because their operations require quick adjustments and interpersonal coordination. This approach can support daily flexibility, but it also creates dependence on experienced staff. Formal mechanisms remain important for maintaining food safety, consistent service standards, and continuity across multiple events. Knowledge creation and transfer become more sustainable when organizations combine experiential practices with documented procedures and shared repositories (Nonaka & Toyama, 2005; Moon et al., 2021).

Sustainable Collaboration and Technological Advancements

Sustainable supply chain collaboration involves coordinated efforts among partners to align operations with long-term environmental and operational goals. In food-related supply chains, collaboration may include responsible sourcing, waste reduction, reusable packaging, supplier monitoring, and shared planning. These practices encourage transparency and joint problem-solving, helping partners respond to uncertainty while reducing unnecessary resource use (Khan & Zhang, 2020; Mastos & Gotzamani, 2022).

Technological supply chain advancements can support knowledge transfer by improving the speed, accuracy, and accessibility of information. For smaller enterprises, practical technologies may include inventory software, mobile order-management applications, cloud-based communication platforms, digital client records, and real-time logistics updates. These tools can reduce reliance on memory and fragmented communication. Their benefits depend on integration, training, and alignment with user needs; technologies that are poorly coordinated may add complexity instead of resolving it (Jagtap et al., 2021; Thong, 1999).

Research Gap and Framework

Existing literature establishes that complexity, collaboration, and technology influence supply chain performance. Nevertheless, fewer studies focus on how these variables shape knowledge transfer within provincial, SME-dominated catering environments. Catering enterprises are distinctive because they combine perishability, event-based demand, customized service, and informal operating routines. Examining this context can clarify whether operational pressure stimulates useful knowledge sharing or exposes weaknesses in formal systems.

The study treated effective knowledge transfer as the principal outcome. Supply chain complexity was examined through process, decision-making, product, and consumer dimensions. Sustainable supply chain collaboration and technological supply chain advancements were analyzed as contextual factors that shape how complexity affects knowledge transfer. This approach supports the development of an operational improvement plan grounded in the actual strengths and vulnerabilities of catering enterprises in Batangas Province.

METHODS

Research Design

The study employed a quantitative descriptive-correlational research design. This design was appropriate because it enabled the systematic description of the study variables and the examination of their relationships without manipulating the operating environment. Field interactions were used only to provide context for interpreting the survey findings; the statistical results were derived from the quantitative dataset.

Research Locale

The study was conducted among licensed catering service businesses operating across Batangas Province. The province offered a relevant setting because catering enterprises serve urban and municipal markets shaped by tourism, celebrations, institutional functions, and varying event schedules. The sampled establishments included businesses located in Batangas City, Calaca City, Lipa City, Sto. Tomas City, Tanauan City, and other municipalities in the province.

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

Participants and Sampling Technique

The study population consisted of 158 licensed catering establishments identified through official business directories and records from the Batangas Tourism and Cultural Affairs Office. The Raosoft Sample Size Calculator produced a required sample of 113 respondents at a 95% confidence level and a 5% margin of error. Stratified random sampling was used to represent the geographic distribution of the enterprises. One respondent was retained from each selected catering business to prevent duplicate organizational responses. Preferred respondents were owners, managers, or supervisors directly involved in supply chain planning, coordination, and decision-making.

Table 1. *Distribution of Respondents by Sampling Area*

Sampling Area	Population	Sample
Batangas City	20	15
Calaca City	13	6
Lipa City	17	13
Sto. Tomas City	13	6
Tanauan City	16	12
Other municipalities	79	61
Total	158	113

Research Instrument

The researcher used a structured survey questionnaire developed from related literature and relevant empirical models. The instrument contained sections on enterprise profile, effective knowledge transfer, supply chain complexity, sustainable supply chain collaboration, and technological supply chain advancements. The complexity section measured process, decision-making, product, and consumer complexity. Perceptual items were assessed using a seven-point scale. The instrument underwent content validation by four specialists with expertise in supply chain management, hospitality operations, and research methodology. A pilot test was conducted among 32 respondents from catering enterprises in Cavite Province who were not included in the main study.

Reliability was assessed using Cronbach's alpha. The alpha coefficients ranged from .941 to .991, exceeding the accepted threshold of .70 and indicating excellent internal consistency across the constructs.

Table 2. *Reliability Testing Results*

Construct	Cronbach's Alpha	Interpretation
Effective knowledge transfer	.981	Excellent
Process complexity	.985	Excellent
Decision-making complexity	.983	Excellent
Product complexity	.972	Excellent
Consumer complexity	.941	Excellent
Sustainable supply chain collaboration	.988	Excellent
Technological advancements	.991	Excellent

Data Gathering Procedure

The researcher secured the required permissions from the Batangas State University Graduate School and the Batangas Tourism and Cultural Affairs Office. Eligible catering enterprise owners and managers received formal invitations. The survey was administered primarily through Google Forms, with field visits across selected cities and municipalities to support coordination and facilitate participation. Data collection was scheduled largely during weekdays to reduce disruption to business operations. Respondents received an informed-consent statement and data-privacy notice before answering the questionnaire. Follow-up contact was conducted when needed, and completed responses were checked, organized, and cleaned before analysis.

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

Data Analysis

Frequency counts and percentages were used to describe the enterprise profiles. Weighted means summarized respondents' assessments of effective knowledge transfer, supply chain complexity, sustainable collaboration, and technological advancements. Regression analysis was used to identify the complexity dimensions that predicted effective knowledge transfer. One-way analysis of variance tested whether assessments differed across business-profile groups. Structural Equation Modeling was employed to test the contextual relationships among supply chain complexity, sustainable collaboration, technological advancement, and effective knowledge transfer. A significance level of .05 was used in the inferential analyses.

Ethical Consideration

Participation was voluntary and based on informed consent. Respondents were informed of the study objectives, data-gathering procedures, and their right to withdraw without penalty. No personally identifying information was required in the analysis dataset. Responses were treated confidentially and used only for academic purposes. Data handling followed the safeguards required by the Data Privacy Act of 2012.

RESULTS AND DISCUSSION

Profile of the Catering Enterprises

The sample included 113 licensed catering enterprises. Small enterprises constituted the substantial majority of the respondents (91.2%), while medium enterprises accounted for 3.5% and large enterprises accounted for 5.3%. More than half of the businesses had operated for more than 10 years (51.3%). The profile indicates an industry dominated by small but relatively established enterprises. These conditions are important because smaller businesses may possess rich experiential knowledge while maintaining limited formal documentation and technology infrastructure.

Table 3. *Profile of the Catering Enterprises (N = 113)*

Profile Variable	Category	Frequency	Percentage
Business size	Small enterprise (10-99 employees)	103	91.2%
	Medium enterprise (100-199 employees)	4	3.5%
	Large enterprise (200+ employees)	6	5.3%
Years of operation	Less than 3 years	12	10.6%
	3-5 years	19	16.8%
	6-10 years	24	21.2%
	More than 10 years	58	51.3%

Effective Knowledge Transfer

Effective knowledge transfer obtained a composite mean of 6.22, interpreted as very effective. The highest-rated practice was the use of digital platforms to communicate catering updates (M = 6.71), followed by coordination with catering suppliers to align service expectations (M = 6.67) and the transfer of knowledge between teams handling different events (M = 6.60). The lowest-rated practices were detailed pre-event briefings (M = 5.76) and post-event evaluations (M = 5.76), although both remained within the very effective range.

The results show that respondents perceived information sharing as a strong operational capability. At the same time, the lower ratings for structured briefings and evaluations suggest that the enterprises may depend more heavily on active coordination during operations than on systematic pre-event and post-event learning. This distinction is relevant because knowledge transfer becomes more sustainable when tacit experience is complemented by formal mechanisms for retention and reuse (Argote & Ingram, 2000; Nonaka & Toyama, 2005).

Table 4. *Selected Indicators of Effective Knowledge Transfer*

Indicator	Mean	Interpretation
Using digital platforms to communicate catering updates	6.71	Highly effective
Coordinating with catering suppliers to align service expectations	6.67	Highly effective
Transferring knowledge between teams handling different events	6.60	Highly effective

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

Documenting lessons learned from previous catering events	6.45	Very effective
Conducting detailed pre-event briefings for catering staff	5.76	Very effective
Holding post-event evaluations to gather operational insights	5.76	Very effective
Composite mean	6.22	Very effective

Supply Chain Complexity

All four dimensions of supply chain complexity received high composite ratings. Process complexity had the highest mean (M = 6.29), followed by consumer complexity (M = 6.16), decision-making complexity (M = 6.15), and product complexity (M = 6.13). Within process complexity, balancing time constraints in food preparation and event delivery received the highest rating (M = 6.66), while tracking numerous catering tasks under tight schedules also registered an extremely complex assessment (M = 6.57).

These results demonstrate that catering operations require continuous synchronization across multiple activities. The prominence of process complexity reflects the event-based nature of the industry, where delays or communication breakdowns can cascade across procurement, preparation, logistics, and service execution. Complexity is not necessarily harmful when organizations have mechanisms to respond effectively; however, it increases the need for timely knowledge exchange and clear handoff procedures (Gunasekaran et al., 2017; Ivanov & Dolgui, 2020).

Table 5. *Summary of Supply Chain Complexity Dimensions*

Dimension	Composite Mean	Interpretation	Highest-Rated Indicator	Indicator Mean
Process complexity	6.29	Very complex	Balancing time constraints in food preparation and event delivery	6.66
Consumer complexity	6.16	Very complex	Responding to evolving dietary preferences	6.35
Decision-making complexity	6.15	Very complex	Adjusting staffing levels for last-minute changes	6.33
Product complexity	6.13	Very complex	Organizing supplies for multiple menu variations	6.29

Sustainable Collaboration and Technological Advancements

Sustainable supply chain collaboration was practiced to a very great extent (M = 6.14). The highest-rated practice was partnering with suppliers that use eco-friendly approaches (M = 6.27), followed by prioritizing long-term relationships with sustainable suppliers (M = 6.24). Technological supply chain advancements also received a very great extent rating (M = 5.81). Digital client-management platforms had the highest technological rating (M = 6.19), while inventory software for ingredient tracking had the lowest rating (M = 5.42), although it still reflected a great extent of implementation.

The findings suggest that enterprises recognize the operational value of collaboration and accessible technologies. Nevertheless, the lower rating for inventory software indicates an opportunity to improve integration across the supply chain. Collaboration and technology contribute most effectively when they support shared routines, accurate records, and coordinated decisions rather than isolated practices (Kumar et al., 2020; Jagtap et al., 2021).

Table 6. *Sustainable Supply Chain Collaboration and Technological Advancements*

Construct	Composite Mean	Interpretation	Highest-Rated Indicator	Mean	Lowest-Rated Indicator	Mean
Sustainable supply chain collaboration	6.14	Very great extent	Partnering with suppliers using eco-friendly practices	6.27	Sharing sustainability goals with supply partners	5.98
Technological supply chain advancements	5.81	Very great extent	Managing client interactions through digital platforms	6.19	Using inventory software to track ingredients	5.42

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

Complexity Drivers Predicting Effective Knowledge Transfer

The regression model was statistically significant ($F = 26.10$, $p < .001$) and explained 46.6% of the variance in effective knowledge transfer (adjusted R-squared = .466). Process complexity significantly and positively predicted effective knowledge transfer ($B = 0.6964$, $p < .001$). Decision-making complexity, product complexity, and consumer complexity were not significant predictors.

The significant effect of process complexity indicates that greater operational interdependence compels catering enterprises to communicate more frequently and transfer knowledge more actively. The absence of significant effects for the other dimensions suggests that enterprises may address urgent decisions, menu variations, and client changes through localized expertise and informal coping practices. These strategies can sustain short-term operations but may not provide the same degree of documented learning and scalability.

Table 7. *Complexity Drivers Predicting Effective Knowledge Transfer*

Predictor	Estimate (B)	SE	t	p-value	Decision	Interpretation
Intercept	2.3985	0.3860	6.214	< .001	Reject H0	Significant
Process complexity	0.6964	0.1022	6.812	< .001	Reject H0	Significant
Decision-making complexity	0.1176	0.1143	1.029	.306	Fail to reject H0	Not significant
Product complexity	-0.0382	0.0807	-0.474	.637	Fail to reject H0	Not significant
Consumer complexity	-0.1699	0.1061	-1.602	.112	Fail to reject H0	Not significant

Note. $F = 26.10$, $p < .001$; adjusted R-squared = .466.

Structural Equation Model for Effective Knowledge Transfer

The moderated context-complexity model (Model E) was selected as the best-fitting structural model. The fit statistics indicated excellent alignment between the model and the observed data: chi-square = 0.101, df = 1, $p = .751$; RMSEA = 0.000; SRMR = 0.004; and CFI = 1.000. These values support the adequacy of the model for interpreting the relationships among supply chain complexity, sustainable supply chain collaboration, technological advancement, and effective knowledge transfer.

Table 8. *Model Fit Assessment for the Selected Structural Model*

Fit Index	Criterion for Good Fit	Model E Result	Assessment
Chi-square	p > .05	0.101, df = 1, p = .751	Excellent fit
RMSEA	<= .06	0.000	Excellent fit
SRMR	<= .08	0.004	Excellent fit
CFI	>= .95	1.000	Excellent fit

The standardized path estimates further clarified the findings. Supply chain complexity significantly influenced effective knowledge transfer (beta = 0.4004, $p = .007$). Supply chain complexity also significantly influenced sustainable collaboration (beta = 0.7848, $p < .001$). Sustainable collaboration did not directly predict effective knowledge transfer (beta = -0.0890, $p = .459$). The interaction between supply chain complexity and technological advancement was significant and negative (beta = -0.3268, $p = .003$).

The negative interaction should be interpreted cautiously. It does not indicate that technology is inherently harmful. Instead, it suggests that the available technologies may not yet be sufficiently integrated to convert operational complexity into stronger knowledge transfer. Fragmented tools, inconsistent use, or uneven user capability may reduce their coordinating value. Accessible systems should therefore be adopted incrementally and connected to clear operating procedures.

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

Table 9. *Standardized Path Estimates for Model E*

Dependent Variable	Predictor	Estimate	SE	Standardized Beta	z	p-value	Interpretation
Effective knowledge transfer	Sustainable collaboration	-0.0669	0.0903	-0.0890	-0.741	.459	Not significant
Effective knowledge transfer	Supply chain complexity	0.3326	0.1226	0.4004	2.713	.007	Significant
Effective knowledge transfer	Complexity x technology	-0.1103	0.0376	-0.3268	-2.931	.003	Significant
Sustainable collaboration	Supply chain complexity	0.8674	0.0648	0.7848	13.393	< .001	Significant

Differences According to Enterprise Profile

The one-way analysis of variance showed no significant differences in effective knowledge transfer or the four complexity dimensions when enterprises were grouped according to their profile characteristics. Effective knowledge transfer obtained F = 0.521 and p = .669. The p-values for process complexity, decision-making complexity, product complexity, and consumer complexity were likewise greater than .05. These results suggest that enterprises across the profile groups experienced broadly similar operating pressures and coordination demands.

Table 10. *Tests of Differences According to Enterprise Profile*

Variable	F-value	p-value	Decision	Interpretation
Effective knowledge transfer	0.521	.669	Fail to reject H0	Not significant
Process complexity	1.897	.134	Fail to reject H0	Not significant
Decision-making complexity	0.391	.760	Fail to reject H0	Not significant
Product complexity	0.810	.491	Fail to reject H0	Not significant
Consumer complexity	1.206	.311	Fail to reject H0	Not significant

Operational Improvement Plan

The descriptive and structural findings reveal a performance-perception gap: respondents rated knowledge transfer positively, but the high levels of complexity and the significant negative interaction involving technology indicate the need to strengthen formal systems. The proposed plan therefore focuses on stabilizing communication, decentralizing selected decisions, documenting operational knowledge, formalizing client and supplier information, and integrating accessible technologies. The plan is intended to complement existing experience-based practices rather than replace them abruptly.

Table 11. *Diagnostic Operational Improvement Plan*

Area of Concern	Diagnostic Basis	Priority Actions	Expected Outcome
Process complexity	Highest complexity dimension (M = 6.29); significant complexity-to-knowledge-transfer path	Use standardized event handoff protocols; assign event coordinators; map multi-event workflows; maintain pre-approved supplier pools	Clearer ownership, reduced information loss, and continuity during peak operations
Decision-making complexity	High assessment (M = 6.15); non-significant direct predictor	Define decision-authority thresholds; create escalation tiers; conduct scenario-based supervisor simulations	Faster field decisions and fewer owner-centered bottlenecks
Product complexity	High menu variety (M = 6.13); non-significant direct predictor	Develop modular menus; maintain a shared digital recipe and allergen repository; standardize ingredient coding	Consistent preparation and reduced dependence on individual memory

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

Consumer complexity	Demand volatility and customized requests (M = 6.16)	Use client discovery meetings; record preferences in a basic CRM; establish change cut-off policies	More predictable planning and fewer client-driven disruptions
Sustainable collaboration	Very great extent (M = 6.14) but no direct effect on knowledge transfer	Formalize supplier expectations; conduct joint planning; use supplier scorecards and co-training	Collaboration becomes an explicit learning and accountability mechanism
Technological advancements	Very great extent (M = 5.81) with negative moderating interaction	Integrate basic inventory, client, and recipe records; provide role-specific digital training; establish simple data-governance rules	Technology shifts from fragmented tools to a reliable coordination platform

Implementation may proceed in four phases: orientation and process diagnosis; gradual digital integration with role-specific training; institutionalization of previously informal routines; and continuous improvement using simple operational dashboards. This phased approach allows SME catering enterprises to improve coordination while respecting their resource limitations and existing work practices.

CONCLUSION

The study demonstrates that catering service enterprises in Batangas Province operate within a highly complex and time-sensitive supply chain environment. Respondents perceived knowledge transfer as very effective, indicating that enterprises maintain active communication and coordination across staff members, suppliers, and operational teams. Nevertheless, the high ratings for process, decision-making, product, and consumer complexity show that these businesses continually manage substantial pressure arising from simultaneous activities, urgent decisions, customized offerings, and changing client requirements.

Process complexity emerged as the principal driver of effective knowledge transfer. As operational interdependence increases, catering enterprises communicate more frequently to maintain service continuity. The selected Structural Equation Model further showed that supply chain complexity positively influenced effective knowledge transfer and sustainable collaboration. Technological advancement significantly moderated the relationship in a negative direction, suggesting that the current technology environment may remain fragmented or insufficiently integrated. Sustainable collaboration was widely practiced but did not directly predict effective knowledge transfer.

The findings emphasize the importance of converting successful informal coordination into scalable organizational knowledge. Catering enterprises do not need to abandon the experience-based practices that support flexibility. Instead, they should reinforce these practices with clear handoff procedures, shared records, decision protocols, structured supplier relationships, and accessible digital tools aligned with the capabilities of their workforce. The proposed operational improvement plan provides a practical pathway for strengthening resilience, consistency, and knowledge continuity in the catering industry.

Recommendations

Catering service owners and managers should formalize recurring knowledge-transfer practices through standard operating procedures, event handoff protocols, digital document repositories, and post-event reviews. Decision authority should be distributed through clearly defined escalation levels so that supervisors can respond quickly to urgent operating conditions while maintaining accountability.

Enterprises should adopt practical and affordable digital tools incrementally. Basic inventory records, client-preference databases, shared recipes, supplier directories, and logistics updates should be integrated into a coherent information environment. Role-specific training should accompany the introduction of these tools to reduce resistance, prevent fragmented use, and improve data quality.

Supplier collaboration should be strengthened through joint planning sessions, quality and sustainability expectations, supplier scorecards, and shared learning activities. Local government units, business associations,

and educational institutions may support SMEs through digital-skills training, supply-chain-management seminars, shared logistics initiatives, and sustainability-oriented recognition programs.

Future researchers may employ qualitative, longitudinal, and comparative designs to examine how interpersonal relationships, organizational culture, technology readiness, and leadership practices influence knowledge transfer. Further studies may also test the proposed improvement plan across different service industries and geographic settings.

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