

Organizational Agility and Logistical Sustainability in SMEs: A Case Study in the Distribution of Organic Products

Agilidad organizacional y sostenibilidad logística en pymes: estudio de caso en distribución de productos orgánicos

Lilian Alejandra Guerrero Bernal*
 Liseth Johanna Rojas Vargas
 Rafael Guillermo Arzuaga Mejía

ABSTRACT

To analyze the relationship between the implementation of agile methodologies and the efficiency of the logistics process in small and medium-sized enterprises (SMEs) in the food sector, particularly in the distribution of organic products, providing evidence of their contribution to logistics sustainability and organizational competitiveness. Methods: A quantitative, non-experimental, cross-sectional study with a correlational-explanatory scope was conducted. Data were collected using a structured Likert-scale questionnaire administered to 30 employees involved in logistics processes. The instrument demonstrated adequate reliability ($\alpha = 0.87$). The analysis included descriptive statistics, Pearson's correlation, and simple linear regression to examine the association and explanatory power among the variables. Results: A positive, strong, and statistically significant relationship was found between the implementation of agile methodologies and logistics efficiency ($r = 0.71$; $p < 0.001$). Furthermore, the regression model indicated that agile methodologies account for 50% of the variability in logistics process efficiency ($R^2 = 0.50$), with operational adaptability, work

* Agricultural administrator, student pursuing a specialization in Project Management at the Minuto de Dios University Corporation – UNIMINUTO.lilian.guerrero@uniminuto.edu.co . ORCID: <https://orcid.org/0009-0009-7495-6658>

* Public Administrator, student pursuing a Specialization in Project Management at Minuto de Dios University Corporation – UNIMINUTO.liseth.rojas-v@uniminuto.edu.co . ORCID: <https://orcid.org/0009-0000-8902-4700>

*Corresponding Author

* Ph.D. Candidate in Science, Technology, and Innovation; Research Professor at Minuto de Dios University Corporation – UNIMINUTO.rafael.arzuaga@uniminuto.edu . ORCID: <https://orcid.org/0000-0002-3020-0295>

JOURNAL OF BUSINESS
and entrepreneurial
studies

ISSN: 2576-0971



Atribución/Reconocimiento-NoComercial- CompartirIgual 4.0 Licencia Pública Internacional — CC

BY-NC-SA 4.0

<https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode.es>

Journal of Business and Entrepreneurship
January–March, Vol. 10, No. 1, 2026
<http://journalbusinesses.com/index.php/revista>
e-ISSN: 2576-0971

journalbusinessentrepreneurial@gmail.com

Received: October 18, 2025

Approved: December 29, 2025

Pages 40-60

structuring, and internal coordination playing key roles, although opportunities for improvement remain in workflow visualization and information organization. Conclusion: Agile methodologies constitute a management approach that enhances the efficiency, logistics sustainability, and competitiveness of SMEs by promoting work organization, operational coordination, and information-based decision-making, while also expanding the evidence base regarding their application in logistics processes within the food sector.

Keywords: logistics efficiency; agile methodologies; SMEs; organic products; logistics sustainability.

RESUMEN

Analizar la relación entre la implementación de metodologías ágiles y la eficiencia del proceso logístico en pequeñas y medianas empresas (pymes) del sector alimentario, particularmente en la distribución de productos orgánicos, aportando evidencia sobre su contribución a la sostenibilidad logística y la competitividad organizacional. Métodos: Se desarrolló un estudio cuantitativo, no experimental, de corte transversal y alcance correlacional-explicativo. La recolección de datos se realizó mediante un cuestionario estructurado tipo Likert aplicado a 30 colaboradores vinculados a procesos logísticos. El instrumento presentó adecuada confiabilidad ($\alpha = 0.87$). El análisis incluyó estadística descriptiva, correlación de Pearson y regresión lineal simple para analizar la asociación y la capacidad explicativa entre las variables. Resultados: Se evidenció una relación positiva, alta y estadísticamente significativa entre la implementación de metodologías ágiles y la eficiencia logística ($r = 0.71$; $p < 0.001$). Asimismo, el modelo de regresión indicó que las metodologías ágiles explican el 50 % de la variabilidad de la eficiencia del proceso logístico ($R^2 = 0.50$), destacándose el aporte de la adaptabilidad operativa, la estructuración del trabajo y la coordinación interna, aunque persisten oportunidades de mejora en la visualización del flujo de trabajo y la organización de la información. Conclusión: Las metodologías ágiles constituyen un enfoque de gestión que

fortalece la eficiencia, la sostenibilidad logística y la competitividad de las pymes, al favorecer la organización del trabajo, la coordinación operativa y la toma de decisiones basada en información, ampliando además la evidencia sobre su aplicación en procesos logísticos del sector alimentario.

Palabras clave: eficiencia logística; metodologías ágiles; pymes; productos orgánicos; sostenibilidad logística.

INTRODUCTION

In the current context of production and logistics systems, it is evident that small and medium-sized enterprises in the food sector face increasingly demanding challenges related to operational efficiency, demand variability, and the need to ensure product delivery quality—especially when dealing with perishable goods such as organic products; furthermore, it is established that market globalization, the pressure to meet increasingly demanding delivery times, and rising consumer expectations have made logistics a key strategic factor for business competitiveness. In this context, distribution is not merely an operational activity but a key element in value creation, as it directly impacts customer satisfaction, loss reduction, and business sustainability (Soto-Silva et al., 2016; Dubey et al., 2020).

In Latin America, and particularly in Colombia, many SMEs in the food sector continue to operate under traditional models characterized by poorly formalized processes, the use of informal tools, and limited information integration. These conditions create difficulties in route planning, order management, and delivery tracking, leading to operational inefficiencies, rework, and a loss of competitiveness; furthermore, recent studies have indicated that the lack of visibility in logistics processes and the fragmentation of information are critical factors that limit organizations' ability to respond to dynamic environments (Mogrovejo Andrade et al., 2024; Mejía et al., 2024). These limitations not only affect the internal performance of organizations but also have an impact on the competitiveness of local production systems, the consolidation of sustainable supply chains, and the ability of regions to strengthen food markets with higher value added; therefore, it is evident that logistics efficiency extends beyond the business sphere and becomes a highly relevant aspect for territorial development and for ensuring economic sustainability at the regional level.

Logistics and Distribution of Perishable Goods

Distribution logistics in perishable goods supply chains are characterized by their high complexity, due to the need to coordinate multiple variables such as delivery time, storage conditions, and synchronization among the different actors in the chain. The literature has shown that inefficient management of these processes can lead to significant losses both economically and in terms of product quality, which directly affects

the customer experience (Guo et al., 2025; Birkmaier et al., 2024). In this regard, it is evident that distribution should not be understood solely as the physical movement of goods but rather as an integrated management system that coordinates information, resources, and real-time decision-making.

Furthermore, recent research has shown that one of the main problems in perishable food logistics stems from the lack of mechanisms that provide a comprehensive view of the status of processes; consequently, the absence of structured tracking systems makes it difficult to identify bottlenecks and limits the capacity for continuous improvement, especially in SMEs, where processes often rely heavily on individual experience and informal communication (Barrios Muñoz et al., 2022). Consequently, the need to implement approaches that allow for better structuring and management of the workflow becomes a critical factor in achieving logistics optimization.

Agile Methodologies and Organizational Agility in Operational Contexts

Agile methodologies have become an alternative for addressing organizational complexity in environments characterized by uncertainty and the need for constant adaptation. Organizational agility is understood as a company's ability to respond quickly and effectively to changes in the environment by implementing practices based on collaboration, flexibility, and continuous improvement (Arteaga Loor & Guzmán Macías, 2024; Arzuaga Mejía, 2025). This approach has moved beyond its initial application in software development, extending to areas such as operations management and logistics. Various studies have shown that the adoption of agile methodologies in organizational contexts plays a very important role, as it helps improve team coordination, increase process visibility, and make decision-making more efficient (Flores-Cerna et al., 2022); furthermore, in the case of SMEs, these methodologies become particularly relevant because they can be more easily adapted to organizational structures that tend to be less formal. Recent research indicates that the implementation of agile practices makes it possible to transform informal work dynamics into organized systems, without incurring high costs or complex structural changes (De la Cruz Medina, 2024).

Agile Methodologies in Workflow Management

Within the set of agile methodologies, there are various frameworks that enable the management and organization of the flow of activities in operational environments, among which Scrum, Kanban, and hybrid approaches stand out. These methodologies share a series of fundamental principles such as adaptability, continuous improvement, and collaboration; however, they differ in how work is structured and in the level of formalization required (Mogrovejo Andrade et al., 2024), since while some approaches are based on defined work cycles and specific roles, others focus on the continuous visualization of the process and a more flexible approach to task management.

In logistics contexts, it is established that the application of agile methodologies must be tailored to the specific characteristics of each process and the organization's operational needs; therefore, it is argued that recent studies have indicated that the implementation of such methodologies in SMEs requires an adaptive approach that allows for maintaining operational flexibility while introducing mechanisms to control and monitor the work (García Luna & Toscano Moctezuma, 2026), thus, it is determined that selecting the most appropriate methodology depends on analyzing the organizational context, the existing workflow, and the need to improve coordination and real-time decision-making.

Logistics Sustainability in SMEs

Logistics sustainability has evolved into a comprehensive approach that includes not only the environmental dimension but also aspects related to operational efficiency, organizational resilience, and the ability to adapt to changes in the environment. In this context, sustainability is directly related to organizations' ability to maintain processes that are efficient and stable over time while minimizing losses and optimizing the use of resources (De la Rosa Leal, 2021; Martins et al., 2019). However, in the case of SMEs in the food sector, this perspective is particularly relevant due to the sensitivity of the products and the need to ensure service quality.

Recent research has shown that integrating agile approaches into logistics management can contribute significantly to organizational sustainability, as it improves responsiveness, reduces inefficiencies, and strengthens internal coordination (Lombeida Nieve & Conforme Montesdeoca, 2025); furthermore, these benefits are not limited solely to the operational sphere but extend beyond it, as more efficient logistics promote the consolidation of resilient supply chains, enable the optimal use of resources, and contribute to strengthening the competitiveness of small and medium-sized enterprises within regional production systems (Martins et al., 2019; De la Rosa Leal, 2021).

In the context of organic product distribution, these capabilities become particularly relevant because they help preserve product quality, improve coordination among supply chain stakeholders, and enable a more effective response to the demands of increasingly dynamic markets (Guo et al., 2025; Birkmaier et al., 2024). Furthermore, from this perspective, it is argued that the integration of organizational agility and logistics sustainability becomes a relevant approach that helps strengthen not only the operational performance of SMEs but also their ability to contribute to regional economic development through supply chains that are more efficient, resilient, and sustainable.

Knowledge Gap and Contribution of the Study

Recent scientific evidence shows that there is growing interest in analyzing how agile methodologies are incorporated into different organizational contexts, as well as in better understanding the factors that determine the efficiency of logistics processes and influence the sustainability of supply chains (Flores-Cerna et al., 2022; Mogrovejo

Andrade et al., 2024; García Luna and Toscano Moctezuma, 2026). In addition, various studies are being conducted in parallel that delve into the logistics management of perishable goods and the need to strengthen organizations' resilience and responsiveness in the face of increasingly dynamic scenarios (Guo et al., 2025; Birkmaier et al., 2024). However, these lines of research are primarily conducted independently, resulting in limited empirical evidence that comprehensively examines the relationship between the implementation of agile methodologies and logistics sustainability in small and medium-sized enterprises in the food sector.

This situation is considered particularly relevant in the Colombian and Latin American context, as SMEs play a strategic role in food supply, job creation, and the strengthening of regional economies, yet they continue to face constraints related to the low level of formalization in their logistics processes, the fragmentation of information, and their limited capacity to respond efficiently to changes in the environment (Arzuaga-Mejía et al., 2025; Mogrovejo Andrade et al., 2024), which adversely affects their operational performance. However, although the literature recognizes that agile methodologies promote coordination, adaptability, and continuous improvement (Arteaga Loo & Guzmán Macías, 2024; Arzuaga Mejía, 2025), there remains a gap regarding their specific contribution to optimizing organic product distribution processes and strengthening the organizational capabilities associated with logistics sustainability.

Furthermore, most of the available research has evaluated sustainability from a primarily operational perspective, emphasizing process efficiency or the reduction of losses (Martins et al., 2019; De la Rosa Leal, 2021), whereas studies analyzing how organizational agility can serve as a mechanism to strengthen business resilience, improve the competitiveness of SMEs, and contribute to the sustainable performance of regional production systems are less common, therefore, there remains a need to generate empirical evidence that helps us understand how the incorporation of agile practices simultaneously promotes logistics efficiency and organizational sustainability in business contexts with limited resources.

In light of this gap, this study analyzes the relationship between the implementation of agile methodologies and the efficiency of the logistics process in SMEs engaged in the distribution of organic products in Colombia. It provides empirical evidence on a context that has been largely unexplored in recent literature and broadens our understanding of the role that organizational agility plays as a strategy that helps strengthen logistics sustainability, business competitiveness, and the organizational capabilities required to address the challenges of production systems in emerging economies.

MATERIALS AND METHODS

This research was conducted using an applied quantitative approach, which was aimed at analyzing the relationship between the implementation of agile methodologies and efficiency in logistics processes within small and medium-sized enterprises (SMEs) in the food sector. This approach allows for the objective measurement of organizational

variables and the establishment of statistical relationships among them, thereby providing empirical evidence on the phenomenon under study.

The design adopted was non-experimental, cross-sectional, and had a correlational–explanatory scope. The non-experimental nature of the design is based on the fact that the variables are observed in their natural context without direct manipulation by the researcher, making it appropriate for analyzing real organizational dynamics. In turn, the cross-sectional design makes it possible to collect data at a single point in time, thereby capturing the current state of logistics processes and management practices in the participating organizations. Furthermore, the correlational–explanatory scope allows for the identification of the relationship between the use of agile methodologies and logistics performance, and also enables an exploration of their explanatory power in optimizing distribution processes.

Study Context and Unit of Analysis

The study was conducted among small and medium-sized enterprises (SMEs) in the food sector engaged in the distribution of perishable goods, particularly organic products. The participating organizations were selected because they engage in ongoing activities such as warehousing, order management, route planning, and distribution—processes that require high levels of operational coordination due to the perishable nature of the products and the variability of demand. The inclusion criteria for selecting the companies were that they carry out their own logistics distribution processes and voluntarily authorize their employees' participation in the research.

The unit of analysis was the logistics distribution process, defined as the integrated set of activities related to order receipt and processing, route planning, coordination of shipping operations, delivery tracking, and final product distribution. This process was selected due to its direct impact on operational efficiency, supply chain continuity, and the quality of service provided to customers, as well as its role as a strategic component for the sustainability and competitiveness of SMEs in the food sector.

The study population consisted of employees from small and medium-sized enterprises (SMEs) in the food sector who were directly involved in logistics distribution processes, including workers who performed both operational and administrative functions related to order receipt and management, route planning, logistics coordination, dispatch, and delivery tracking, as it was observed that they actively participated in each of the activities under analysis.

Participants were selected through non-probabilistic convenience sampling, taking into account the availability of access to the organizations and the fact that employees participated voluntarily in the research; furthermore, the sample consisted of 30 participants ($n = 30$) from different SMEs with similar operational characteristics. This type of sampling is considered appropriate for applied and exploratory research, since the main purpose was to analyze the relationships between variables in specific

organizational contexts, rather than to make inferences about a broad statistical population.

Although the sample size limits the generalizability of the results, it is considered adequate for exploratory correlational studies aimed at identifying preliminary associations between variables and generating empirical evidence in business contexts where access to the study population is restricted, therefore the findings are interpreted within the specific context of the participating organizations and serve as a foundation for future research with larger samples and probabilistic designs.

Study Variables and Operationalization

The study variables were defined based on the specialized literature on agile methodologies and logistics management and were operationalized through dimensions and indicators that allowed them to be measured using a structured Likert-type questionnaire with five response categories (1 = strongly disagree; 5 = strongly agree). For the purposes of statistical analysis, the scores obtained for the different items were grouped by dimension and then by variable, thereby generating composite indices that were used in the descriptive and inferential analyses. Table I presents a description of the variables, their classification, measurement scale, dimensions, and indicators considered in the study.

Table I. *Description of Variables*

Variable	Variable Type	Measurement Scale	Dimensions	Indicators
Implementation of Agile Methodologies	Independent	Ordinal (5-point Likert scale)	Work organization	Level of task organization
			Use of agile tools	Application of management tools
			Process visualization	Workflow Tracking
			Operational Flexibility	Operational responsiveness
Logistics Process Efficiency	Dependent	Ordinal (5-point Likert scale)	Compliance	On-time deliveries
			Order Organization	Information management
			Logistics Coordination	Operational Communication
			Decision-making	Operational Response

Source: Prepared by the author

Data Collection Tool

Data collection was conducted using a structured questionnaire with a five-point Likert scale (1 = strongly disagree; 5 = strongly agree), which consisted of 20 items distributed across each of the dimensions corresponding to the variables of agile methodology implementation and logistics process efficiency. Thus, the instrument was designed based on the operationalization of the variables and a review of the specialized literature, ensuring alignment between the research objectives, the dimensions analyzed, and the indicators evaluated.

Content validity was established through expert judgment by individuals with experience in logistics management, agile methodologies, and applied research, who were responsible for evaluating the relevance, clarity, coherence, and adequacy of the proposed items; based on this, recommendations were formulated and incorporated into the final version of the questionnaire. In addition, a pilot test was subsequently conducted with a small group of participants from organizations with characteristics similar to those included in the study, in order to verify understanding of the questions, identify potential difficulties in their interpretation, and make the necessary adjustments prior to the final administration.

The internal consistency of the instrument was determined using Cronbach's alpha coefficient, yielding a value of $\alpha = 0.87$. This indicates a high level of reliability and adequate homogeneity among the items comprising the questionnaire, demonstrating that the measurements are stable and the instrument is suitable for assessing the variables under study.

The research was conducted in three stages. In the first stage, contact was established with the participating organizations, the purpose of the study was presented, authorization to administer the instrument was obtained, and assurances were provided that the information would remain confidential and that participation would be voluntary; In addition, during this phase, compliance with the inclusion criteria established for participant selection was verified.

In the second stage, the questionnaire was administered digitally, which allowed for the standardized collection of information at a single point in time; furthermore, during this process, participants were given instructions to complete the questionnaire independently, and it was verified that all responses were fully recorded.

In the third stage, the data were consolidated into a database to enable data cleaning and statistical analysis. During this process, the consistency of each record was reviewed, missing data and potential outliers were identified, and composite variables were subsequently generated for use in descriptive and inferential analyses.

The data were analyzed using descriptive and inferential statistical techniques. Initially, a data cleaning process was conducted, and the consistency of the database was verified to identify potential inconsistencies and ensure the quality of the data for subsequent

analyses. Subsequently, the reliability of the instrument was assessed using Cronbach's alpha coefficient, yielding a value of $\alpha = 0.87$, which is considered an indicator of adequate internal consistency.

In a second phase, measures of central tendency—such as the mean—and measures of dispersion—such as the standard deviation—were calculated, which allowed for a better description of how the evaluated dimensions behaved; in addition, a correlation matrix was constructed using Pearson's correlation coefficient to determine both the strength and direction of the relationship between the implementation of agile methodologies and the efficiency of the logistics process; and finally, a simple linear regression model was estimated to analyze the explanatory power of the implementation of agile methodologies on logistics process efficiency, with the results interpreted using a statistical significance level of 0.05.

The research was conducted in accordance with the ethical principles applicable to studies involving human participants, thereby ensuring respect for autonomy, confidentiality, and anonymity; furthermore, it was ensured that the information collected would be used exclusively for academic purposes. Furthermore, all participants were informed in advance of the research objectives and the voluntary nature of their participation, and they were told that they could withdraw from the study at any time without any consequences.

The information obtained was treated confidentially and used solely for scientific purposes. To protect the participants' identities, no information that would allow for their individual identification was collected, and the data were stored in a restricted-access database, preventing the disclosure of sensitive information.

RESULTS

The results are presented by integrating statistical analysis with theoretical discussion, with the aim of showing not only how the measured variables behave but also their significance in relation to recent literature on organizational agility, perishable goods logistics, digitalization, and sustainability in SMEs; Furthermore, this integration is considered relevant because, in applied studies, the relevance of findings does not depend solely on their statistical significance but also on their ability to explain specific organizational dynamics and provide evidence useful for decision-making in real-world contexts; therefore, following this logic, we sequentially analyze the sample composition, the descriptive characteristics of the dimensions evaluated, and the relationship between the implementation of agile methodologies and logistical efficiency.

The characterization of the sample serves as the starting point for interpreting the results, as it allows for the contextualization of the organizational conditions under which the study variables are analyzed, thereby providing a clearer understanding of the context. In the case of applied research in logistics settings, the sample composition not only serves a descriptive function but also directly influences the contextual validity of

the findings, especially when dealing with SMEs that have heterogeneous operational structures.

Table 2. *Sample Characterization*

Variable	Category	Frequency	Percentage
Position	Operational	16	53.3
	Administrative	14	46.7
	1–3 years	9	30.0
Logistics experience	4–6 years	13	43.3
	>6 years	8	26.7
Company size	Microenterprise	18	60.0
	Small business	12	40.0

Source: Author's own analysis.

From an analytical perspective, it can be observed that the distribution reflects a balanced composition between operational and administrative profiles, which makes it possible to capture both the strategic dimension and the execution of the logistics process, and this aspect is considered relevant since various studies have shown that supply chain management efficiency depends largely on achieving proper alignment across organizational levels, especially in environments where internal coordination is recognized as critical to operational performance (Xu et al., 2020).

In terms of experience, there is a concentration in the intermediate range of 4 to 6 years, suggesting the presence of operational knowledge that is well-established but still in the process of being formalized; this type of profile is characteristic of SMEs, where organizational learning is built on practical experience rather than formal management structures. Additionally, recent research has indicated that while this type of tacit knowledge although valuable, can limit the scalability of processes if it is not properly integrated with structured mechanisms for management and monitoring (Lejarza et al., 2021).

Likewise, the predominance of microenterprises in the sample introduces a key element when interpreting the results, since these types of organizations typically operate with limited resources and low levels of digitization; in this context, it is observed that the implementation of agile methodologies takes on a unique character, since the goal is not to replicate complex models but rather to adapt management principles that improve work organization without significantly increasing the operational burden; Furthermore,

recent studies have shown that the adoption of agile practices in SMEs depends largely on factors such as simplicity, flexibility, and compatibility with organizational structures that are not highly formalized (Dbouk et al., 2020).

Based on this discussion, these results make it possible to conclude that the sample is not only relevant for analyzing the phenomenon but also represents a context in which agile methodologies can have a significant impact, since it combines operational experience with flexible organizational structures and limited process formalization—a scenario that is conducive to evaluating the relationship between organizational agility and logistical efficiency. In this regard, it is observed that the characterization of the sample should not be interpreted solely as an initial description; rather, it becomes an explanatory element that influences how agile practices can be adopted and how these translate into operational improvements within the distribution process.

Descriptive Analysis of the Evaluated Dimensions

The descriptive analysis of the dimensions allows us to identify the level of development of practices associated with the implementation of agile methodologies and their correlation with the efficiency of the logistics process. This level of analysis is fundamental, as it provides an initial empirical assessment of the state of the variables, enabling the identification of operational strengths and structural gaps within the organizations studied.

Table 3. *Descriptive statistics by dimension*

Variable	Dimension	Mean	Standard Deviation
Implementation of agile methodologies	Work organization	3.97	0.62
	Use of agile tools	3.73	0.71
	Process visualization	3.61	0.76
	Operational adaptability	4.08	0.58
	Delivery Compliance	3.89	0.67
Logistics process efficiency	Order Organization	3.54	0.81
	Logistics Coordination	3.92	0.64
	Timely decision-making	3.87	0.69

Source: Author's own work

The behavior of the means reveals a pattern that is relevant from an organizational perspective, where the dimension with the highest rating is operational adaptability ($M = 4.08$). This indicates that companies possess a high capacity to respond to changes in operations and, consequently, maintain a timely response to shifts in the business environment. This result is consistent with recent literature, which notes that SMEs, due to their lower structural rigidity, tend to develop adaptive capabilities that are superior to those of more formalized organizations (Morales Betancourt et al., 2025), thus confirming that this type of structure facilitates agile and continuous adjustments. However, this strength does not always translate into structured process management, as evidenced by the lower performance observed in dimensions related to organization and workflow visualization.

In contrast, order organization ($M = 3.54$) and process visualization ($M = 3.61$) are the aspects with the lowest scores, indicating weaknesses in information management and the traceability of the logistics process, and this is critical since various studies have shown that workflow visibility is a determining factor in the efficiency of supply chains, especially in environments characterized by high uncertainty (Hwang et al., 2019), in addition, it is evident that the lack of mechanisms to view order status in real time limits the ability to anticipate issues and makes it difficult to identify bottlenecks, directly affecting operational efficiency.

On the other hand, the dimensions related to logistics coordination ($M = 3.92$) and delivery compliance ($M = 3.89$) show relatively high values, indicating that acceptable levels of performance are maintained in the execution of the process; however, this result should be interpreted with caution, as it may be associated with work dynamics that rely more on staff experience than on structured management systems. In this regard, recent research has pointed out that while operational efficiency is perceived, structural inefficiencies may be masked when processes rely on tacit knowledge rather than formal control mechanisms (Ciro-Atehortúa et al., 2023).

From an integrative perspective, the results reveal a gap between operational responsiveness and the level of structuring of the logistics process, while companies demonstrate high adaptability and acceptable functional coordination; this leads to limitations in information organization and workflow visibility, and this imbalance aligns with findings from recent studies on digitization and logistics in SMEs, which highlight that the lack of information integration has become one of the main barriers to continuous improvement and process optimization (Senyo et al., 2021).

In terms of the discussion, the idea is reinforced that the implementation of agile methodologies should not be understood solely as the adoption of tools, but rather as a process of organizational transformation aimed at structuring workflows and improving information management. Empirical evidence shows that in contexts where adaptive capacity already exists, the main value of agility lies in the ability to transform this flexibility into processes that are more visible, coordinated, and traceable; thus, the challenge is not simply to increase responsiveness, but rather to integrate it with

mechanisms that enable the systematization of operations and strengthen information-based decision-making.

Relationship Between Agile Methodologies and Logistics Process Efficiency

The purpose of the inferential analysis was to determine the relationship between the implementation of agile methodologies and logistics process efficiency in the participating small and medium-sized enterprises. This analysis made it possible to evaluate the strength and direction of the association between the two variables, providing empirical evidence on the impact of agile practices on the operational performance of distribution processes (Table 4).

Table 4. *Correlation matrix between the study variables*

Variable	1	2
1. Implementation of agile methodologies	1.000	0.710**
2. Logistics process efficiency	0.710**	1.000

Note: ** $p < 0.001$.

Source: Author's own work.

The results show that there is a positive, strong, and statistically significant correlation between the implementation of agile methodologies and logistics process efficiency ($r = 0.71$; $p < 0.001$). Based on the magnitude of the correlation coefficient, it is evident that organizations reporting higher levels of agile practice adoption also demonstrated better levels of logistics performance, particularly in areas such as activity coordination, order organization, operational planning, and the ability to respond in a timely manner to the demands of the distribution process.

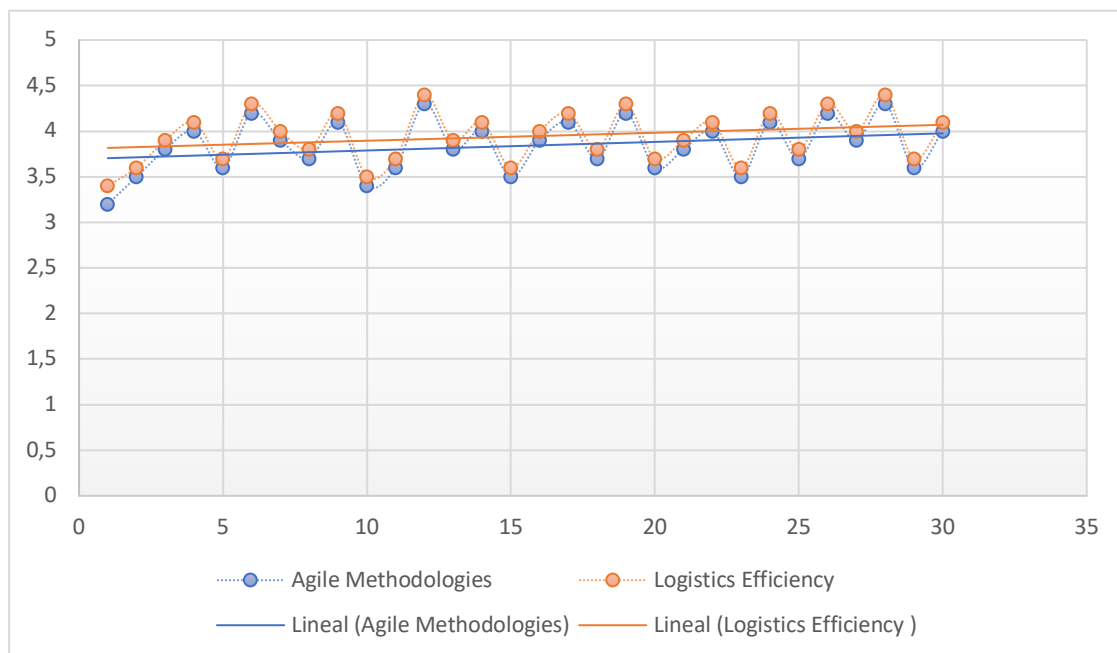
The strength of the observed association indicates that agile methodologies have become an important component of logistics management in the SMEs analyzed, and these results are consistent with the findings of Polo et al. (2025), who note that the adoption of agile principles strengthens the synchronization of activities within the supply chain and enhances the ability to adapt to scenarios characterized by high uncertainty and variability in demand.

Although it is acknowledged that the identified correlation does not imply a causal relationship, a consistent association between the two variables is observed, which supports the hypothesis that the adoption of agile methodologies fosters organizational conditions that contribute to improved logistics performance. In this sense, organizational agility is understood as a management approach that facilitates process coordination, improves the flow of information, and strengthens organizations' responsiveness—beyond the mere implementation of specific tools.

In the context of small and medium-sized enterprises in the food sector, these results take on special importance because the optimization of logistics processes tends to depend more on reorganizing work and strengthening internal coordination than on making significant investments in infrastructure or technology, therefore, from this perspective, the adoption of agile methodologies becomes a viable alternative that allows for increased operational efficiency, promotes logistical sustainability, and strengthens the competitiveness of organizations operating in environments characterized by limited resources and high operational dynamics.

To facilitate the interpretation of the results, Figure 1 provides a graphical representation of the relationship between the analyzed variables.

Figure 1. Relationship between agile methodologies and logistics efficiency



Source: Author's own work.

The graph shows a positive trend between the two variables, indicating that higher levels of agile methodology implementation this is associated with better logistics process performance. Furthermore, the distribution of the observations around the trend line reveals a pattern consistent with the correlation obtained, which reinforces the interpretation that organizational agility is a key factor in strengthening coordination, improving adaptability, and making distribution processes more efficient in the SMEs studied.

Explanatory Power of Agile Methodologies on Logistics Efficiency

To examine in greater detail the relationship identified between the implementation of agile methodologies and logistics process efficiency, a simple linear regression model was estimated, with the implementation of agile methodologies as the independent variable and logistics process efficiency as the dependent variable. This analysis made it possible to determine the extent to which these practices help explain logistics performance in the participating SMEs.

Table 5. *Linear Regression Model*

Parameter	Value
R	0.71
R²	0.50
Adjusted R²	0.48
Standard error	0.41
F	28.14
p (model)	<0.001

Source: Author's own calculations.

The results show that the model has a statistically significant fit ($F = 28.14$; $p < 0.001$), confirming that the implementation of agile methodologies is a relevant variable for explaining logistics process efficiency. Furthermore, the coefficient of determination ($R^2 = 0.50$) indicates that approximately 50% of the variability in logistics efficiency is explained; and this percentage is considered relevant in organizational research, since process behavior is typically influenced by multiple factors, both internal and external. Although the model demonstrates significant explanatory power, the remaining 50% of the variability suggests that logistics efficiency is also influenced by other factors not considered in this study, such as the level of digitization, logistics infrastructure, technological availability, human talent competencies, and the specific conditions of each organization, and furthermore, this result clearly demonstrates that logistics processes are multifactorial in nature and opens the possibility for future research to incorporate models with a greater number of explanatory variables. To complement the interpretation of the model, the regression coefficients are presented below.

Table 6. *Regression Model Coefficients*

Variable	Standardized Beta	t	p
Agile methodologies	0.71	5.30	<0.001

Source: Author's own calculations.

The standardized beta coefficient ($\beta = 0.71$) shows that there is a strong positive relationship between the implementation of agile methodologies and logistics process efficiency, indicating that as the level of adoption of agile practices increases, there are proportional increases in the logistics performance of the organizations analyzed. furthermore, the statistical significance of the model confirms that this relationship is unlikely to be due to chance.

These results are consistent with various studies that primarily highlight that organizational agility plays a very important role in strengthening process coordination, improving adaptability, and promoting information integration within the supply chain (Rosi & Jammerneegg, 2013; Apolinario Quintana et al., 2025). This supports the idea that the contribution of agile methodologies does not depend solely on the adoption of specific tools but rather centers on their ability to transform work organization and strengthen decision-making based on timely information.

In the specific case of small and medium-sized enterprises in the food sector, this finding takes on great significance, as it demonstrates that significant improvements in logistics efficiency can be achieved through process reorganization, workflow standardization, and strengthened internal coordination, without the need for substantial investments in infrastructure or technology; therefore, from this perspective, agile methodologies become a strategic alternative that helps increase organizational competitiveness and enables the strengthening of logistical sustainability for companies operating in contexts where resources are limited.

In this regard, the regression model shows that the implementation of agile methodologies is a highly significant explanatory factor in logistics efficiency and also provides empirical evidence that helps bridge the gap identified in the literature regarding the role of organizational agility in the logistics sustainability of SMEs engaged in the distribution of organic products; these results are considered to broaden our understanding of the relationship between these two variables and support the view that agile methodologies have the potential to serve as a strategy that strengthens the competitiveness and resilience of supply chains in emerging economies.

CONCLUSIONS

This research provided a clear analysis of the relationship between the implementation of agile methodologies and the efficiency of the logistics process in small and medium-

sized enterprises in the food sector that distribute organic products. A positive and statistically significant association was observed between these two variables, as well as a significant explanatory power of agile methodologies regarding logistics performance. In addition, it was determined that work structuring, operational adaptability, and internal coordination are key components that strengthen the efficiency of distribution processes, confirming that organizational agility is a strategic element for logistics management in these types of organizations.

One of the study's main contributions is to demonstrate that improvements in logistics performance do not depend solely on the adoption of technologies or investments in infrastructure, but are also related to the ability to reorganize work, strengthen coordination among different stakeholders, and ensure more efficient management of the flow of information. In this regard, the weaknesses identified in order organization and in how processes are visualized indicate that the primary opportunity for improvement for SMEs lies in formalizing practices that increase traceability, improve coordination, and strengthen responsiveness to dynamic operational environments.

From a theoretical perspective, this research contributes to bridging the gap identified in the literature by providing empirical evidence on the relationship between organizational agility and logistics sustainability in a largely unexplored context: the distribution of organic products by Colombian SMEs. Thus, the findings demonstrate that agile methodologies can be applied beyond software development, proving their utility as a management approach that helps optimize logistics processes, strengthen organizational resilience, and improve the competitiveness of companies operating in emerging economies.

In practical terms, the results confirm that the implementation of agile methodologies constitutes a viable, low-cost organizational strategy that helps increase logistics efficiency, especially in companies facing resource constraints and high levels of operational uncertainty; Additionally, it is observed that the incorporation of mechanisms that promote collaborative planning, workflow visualization, continuous monitoring, and data-driven decision-making contributes to strengthening logistics sustainability, and the ability of organizations to adapt to changes in the environment.

Among the main limitations identified in the study are factors such as sample size, the use of non-probability sampling, and the cross-sectional nature of the research design, which limits the ability to generalize the results to other organizational contexts; therefore, it is suggested that future research could conduct longitudinal studies, incorporate larger samples, and consider additional variables such as the level of digitization, technological integration, organizational culture, or dynamic capabilities, with the aim of broadening the understanding of the factors that influence the logistics efficiency of SMEs.

The evidence obtained confirms that agile methodologies are much more than a set of tools used for operational management, since their adoption transforms the way organizations structure, coordinate, and manage their logistics processes, thereby

simultaneously strengthening efficiency, sustainability, and business competitiveness. Thus, the study provides empirical evidence supporting the incorporation of agile approaches as a strategic alternative to foster the development of more resilient and efficient supply chains within the context of small and medium-sized enterprises in the food sector.

REFERENCES

- Apolinario Quintana, R. E., Zambrano Farías, F. J., Martínez Mayorga, R. X., Rodríguez Donoso, M. G., & Apolinario Quintana, C. E. (2025). Structural model of innovation, knowledge management, and cloud-based supply chains in Ecuadorian port SMEs. *European Public & Social Innovation Review*, 11, 1–22. <https://doi.org/10.31637/epsir-2026-2239>
- Arteaga Loor, V. del R., & Guzmán Macías, M. del C. (2024). Innovation and Organizational Agility: Strategies for Competitiveness in the Digital Age. *REDEL. Granmense Journal of Local Development*, 9(1), 40–51. <https://revistas.udg.co.cu/index.php/redel/article/view/4753>
- Arzuaga Mejía, R. G. (2025). Agile methodologies as a tool for business transformation and competitiveness in dynamic environments. *European Public & Social Innovation Review*, 11, 1–17. <https://doi.org/10.31637/epsir-2026-2241>
- Arzuaga-Mejía, R. G., Rivero-Gutiérrez, E., & Cadavid-Osorio, C. A. (2025). Optimization of business processes using agile methodologies: An empirical study of Colombian companies. *AiBi Journal of Research, Administration, and Engineering*, 13(3), 1–11. <https://doi.org/10.15649/2346030X.5285>
- Barrios Muñoz, D. S., Barrios Guerrero, W. P., Cerinza Barrero, A. A., & Hernández Calvo, G. (2022). Proposal for improving the storage process of perishable goods in the food bank program. *Bulletin of Innovation, Logistics, and Operations*, 4(2). <https://doi.org/10.17981/bilo.4.2.2022.08>
- Birkmaier, A., Imeri, A., & Reiner, G. (2024). Improving supply chain planning for perishable food: Data-driven implications for waste prevention. *Journal of Business Economics*, 94, 1–36. <https://doi.org/10.1007/s11573-024-01191-x>
- Ciro-Atehortúa, J. M., Bermúdez-Hernández, J., & Valencia-Arias, J. (2023). Knowledge management models as tools for efficiency in organizational processes. *Revista Virtual Universidad Católica del Norte*, (70), 260–296. <https://doi.org/10.35575/rvucn.n70a10>
- Dbouk, W., Moussawi-Haidar, L., & Jaber, M. Y. (2020). The effect of economic uncertainty on inventory and working capital for manufacturing firms. *International Journal of Production Economics*, 230, 107888. <https://doi.org/10.1016/j.ijpe.2020.107888>
- De la Cruz Medina, S. (2024). Implementation of agile methodologies in higher-level educational technology projects. *LATAM: Latin American Journal of Social*

- Sciences and Humanities, 5(5), 3942–3952.
<https://doi.org/10.56712/latam.v5i5.2902>
- De la Rosa Leal, M. E. (2021). The sustainability approach in organizational theories. *Trascender, Accounting and Management*, 6(17), 87–102.
<https://doi.org/10.36791/tcg.v0i17.102>
- Dubey, R., Gunasekaran, A., Bryde, D. J., Dwivedi, Y. K., & Papadopoulos, T. (2020). Blockchain technology for enhancing swift trust, collaboration, and resilience within a humanitarian supply chain setting. *International Journal of Production Research*, 58(11), 3381–3398. <https://doi.org/10.1080/00207543.2020.1722860>
- Flores-Cerna, F., Sanhueza-Salazar, V. M., Valdés-González, H. M., & Reyes-Bozo, L. (2022). Agile methodologies: An analysis of the organizational challenges for their implementation. *Revista Científica*, 43(1), 38–49.
<https://doi.org/10.14483/23448350.18332>
- García-Fallú, K. M., & Castelo-Salazar, A. G. (2023). Supply chain management in changing contexts through a literature review. *Innova Science Journal*, 1(4), 1–12.
<https://doi.org/10.63618/omd/isj/v1/n4/22>
- García Luna, S. V., & Toscano Moctezuma, J. A. (2026). Traditional and Agile Project Management Methodologies and Their Application in the Industrial Sector. *Ciencia Latina: Multidisciplinary Scientific Journal*, 9(6), 6148–6164.
https://doi.org/10.37811/cl_rcm.v9i6.21753
- Guo, Y., Liu, F., Song, J.-S., & Wang, S. (2025). Resilience of the supply chain: A review from the perspective of inventory management. *Fundamental Research*, 5(2), 450–463. <https://doi.org/10.1016/j.fmre.2024.08.002>
- Hwang, S., Kim, H., Hur, D., & Schoenherr, T. (2019). Interorganizational information processing and the contingency effects of buyer-incurred uncertainty in a supplier's component development project. *International Journal of Production Economics*, 210, 169–183. <https://doi.org/10.1016/j.ijpe.2019.01.019>
- Lejarza, F., Pistikopoulos, I., & Baldea, M. (2021). A scalable real-time solution strategy for supply chain management of fresh produce: A Mexico-to-United States cross-border study. *International Journal of Production Economics*, 240, 108212.
<https://doi.org/10.1016/j.ijpe.2021.108212>
- Lombeida Nieve, V. E., & Conforme Montesdeoca, J. V. (2025). The influence of logistics planning on customer service quality in the supply chain: La Casa del Toldo, Santo Domingo, 2024. *Código Científico Revista de Investigación*, 6(E1), 1716–1746.
<https://doi.org/10.55813/gaea/ccri/v6/nE1/792>
- Martins, V. W. B., Anholon, R., Rampasso, I. S., & Quelhas, O. L. G. (2019). Sustainable operations management: A structured literature review. *Journal of Cleaner Production*, 213, 474–489. <https://doi.org/10.1016/j.jclepro.2018.10.229>
- Mejía, M., Sanchez, J., De la Cruz, C., Bermejo, Y., & Rojas-Millán, R. (2024). Challenges Faced by Companies in Terms of Infrastructure, Technologies, and Human

- Resources to Improve Their Logistics Management. *Bulletin of Innovation, Logistics, and Operations*, 6(2), 6–14. <https://doi.org/10.17981/bilo.6.2.2024.02>
- Mogrovejo Andrade, J. M., Lasso Melo, N. D., & Camargo Caicedo, A. L. (2024). Analysis of supply chain diversification in Colombia. *Visión Internacional (Cúcuta)*, 12(1). <https://doi.org/10.22463/27111121.5329>
- Morales Betancourt, C. V., Villamizar Bottia, J. D., & Gutiérrez Navas, E. B. (2025). Barriers to the Competitiveness of Micro, Small, and Medium-Sized Enterprises: A Comparison of Perspectives from Academia and Manufacturing Companies in Bucaramanga (Colombia). *En-Contexto Journal*, 13(23), 39–75. <https://doi.org/10.53995/23463279.1909>
- Polo, A., Morillo-Torres, D., & Escobar, J. W. (2025). Toward adaptive and immune-inspired viable supply chains: A PRISMA systematic review of mathematical modeling trends. *Mathematics*, 13(14), 2225. <https://doi.org/10.3390/math13142225>
- Rosi, H., & Jammerneegg, W. (2013). The economic and environmental performance of dual sourcing: A newsvendor approach. *International Journal of Production Economics*, 143(1), 109–119. <https://doi.org/10.1016/j.ijpe.2012.12.007>
- Ruiz, Z. C., Carrillo, S., Cабrales, P. G. G., Jiménez, O. G. R., Hernández, F. M., & López, S. B. (2026). Organizational resilience and supply chain management in micro and small enterprises. *Revista DELOS*, 19(77), e8618. <https://doi.org/10.55905/rdelosv19.n77-051>
- Senyo, P. K., Effah, J., & Osabutey, E. L. C. (2021). Digital platformization as a public sector transformation strategy: A case study of Ghana's paperless port. *Technological Forecasting and Social Change*, 162, 120387. <https://doi.org/10.1016/j.techfore.2020.120387>
- Soto-Silva, W. E., Nadal-Roig, E., González-Araya, M. C., & Pla-Aragones, L. M. (2016). Operational research models applied to the fresh food supply chain. *European Journal of Operational Research*, 251(2), 345–355. <https://doi.org/10.1016/j.ejor.2015.08.046>
- Xu, L., Peng, X., Pavur, R., & Prybutok, V. (2020). Quality management theory development via meta-analysis. *International Journal of Production Economics*, 229, 107759. <https://doi.org/10.1016/j.ijpe.2020.107759>