



Towards an integrative model of the contribution of information systems to logistics performance: Theoretical framework

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Abstract: In a context of accelerated digital transformation and increasingly complex supply chains, information systems (IS) are a major strategic lever for logistics performance. However, the literature remains fragmented in terms of the mechanisms explaining their effective contribution, favoring a technology-centric approach and neglecting the role of intermediate organizational capabilities.

This article proposes an integrative theoretical framework based on the Resource-Based View (RBV) and dynamic capabilities theory. It argues that the impact of IS on logistics performance is fundamentally indirect, mediated by the development of three specific organizational capabilities: the integration capability, the flexibility capability, and the analytical capability of information systems. These capabilities respectively improve internal and interorganizational coordination, strengthen adaptability to environmental changes, and optimize the strategic use of logistics data.

Keywords: information systems, logistics performance, dynamic capabilities, Resource-Based View, IS capabilities

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1 Introduction

Logistics performance is now a key determinant of business competitiveness, particularly in highly competitive sectors such as retail, e-commerce, automotive, and pharmaceuticals. In a globalized, hyperconnected, and volatile economic environment, the ability of organizations to effectively manage physical and information flows represents a competitive advantage that is difficult to imitate and a major source of value creation (Christopher, 2016; Gunasekaran et al., 2017). Growing consumer demands for fast delivery, personalization, and traceability are forcing companies to radically transform their logistics models.

In this context, information systems play a strategic role in facilitating the coordination of internal and external flows, the integration of logistics processes, and decision support at the strategic, tactical, and operational levels (Trkman et al., 2010). Recent technological advances—big data, artificial intelligence, the Internet of Things, blockchain, and cloud computing—have enhanced the ability of IS to improve forecast accuracy, optimize routes, and secure interorganizational transactions (Dubey et al., 2019).

However, despite the abundance of research on IS and logistics performance, the relationship between these two areas remains insufficiently clarified. Three major gaps structure this observation. First, a technology-centric approach dominates, analyzing the direct effect of technologies on performance without considering the organizational capabilities and appropriation processes necessary for real value creation (Melville et al., 2004; Bharadwaj, 2000). This approach often leads to the "productivity paradox," where significant investments in technology do not translate into proportional gains (Brynjolfsson & Hitt, 1998). Second, theoretical fragmentation prevents a holistic understanding of the IS-logistics performance relationship, with few studies simultaneously drawing on RBV, dynamic capabilities theory, and IS success models. Third, the concept of IS capabilities remains vague, with heterogeneous definitions and measurement instruments that limit the consolidation of knowledge.

In light of these findings, this article poses the following central question: how do information systems contribute to logistics performance through the development of specific organizational capabilities? The objective is to propose an integrative theoretical framework combining the Resource-Based View and dynamic capabilities theory, enabling a systematic understanding of the mechanisms through which IS influence logistics performance. The article follows a logical structure: after laying the theoretical foundations, it presents logistics performance and its dimensions, offers a critical review of the literature, then sets out the integrative theoretical model before concluding with managerial contributions and implications.

2 Theoretical foundations of the contribution of information systems

2.1 From an instrumental vision to a strategic perspective

In the early decades of organizational computing, information systems (IS) were essentially approached from an instrumental and technical perspective. Their primary purpose was to automate administrative tasks, improve the reliability of data processing, and increase operational efficiency. This approach was part of an economic rationale dominated by the reduction of transaction costs (Williamson, 1975) and the optimization of internal processes. IS were then perceived as standard tools, relatively homogeneous and interchangeable, whose adoption would automatically generate productivity gains. From this perspective, technology was considered an exogenous and neutral factor, independent of organizational specificities or internal skills.

However, this approach was quickly confronted with the "productivity paradox" highlighted by Robert Solow (1987), according to which increased IT investment did not systematically translate into measurable performance gains. This observation led to a profound rethinking of the deterministic view of information technology. Research has gradually shown that the effects of IS depend heavily on organizational, managerial, and human factors (Brynjolfsson, 1993). In other words, technology does not create value on its own; it must be combined with the right skills, processes, and practices to produce sustainable competitive advantages.

A major turning point came with the work of Michael Porter, and Victor Millar (1985), who conceptualized information technology as a strategic lever capable of transforming the value chain. According to these authors, IS are not limited to supporting existing activities; they can redefine sector boundaries, alter competitive relationships, and create new sources of differentiation. By influencing primary and support activities, IS thus become instruments of strategic reconfiguration, enabling improved internal coordination, greater integration with partners, and the offering of new value-added services.

Continuing this line of thinking, N. Venkatraman (1994) introduced the concept of strategic alignment, emphasizing that organizational performance depends on the degree of consistency between corporate strategy, organizational structure, and IS architecture. Alignment is not limited to simple technical adequacy; it involves dynamic integration between strategic orientations and technological capabilities. This relational perspective was enriched by the strategic alignment model proposed by John Henderson and N. Venkatraman (1993), which highlights the interdependence between the strategic and operational domains, both from a business and a technological perspective. Furthermore, Peter Weill and Marianne Broadbent (1998) have shown that IS infrastructure constitutes an enabling platform that promotes innovation, flexibility, and organizational

responsiveness. According to these authors, the value of IS lies less in isolated applications than in the consistency and robustness of the overall infrastructure, which allows resources to be pooled, facilitates cross-functional integration, and supports strategic initiatives. This approach highlights the cumulative and systemic nature of technological investments.

The shift towards a strategic perspective has also been fueled by contributions from resource-based view (RBV) theory. Jay Barney (1991) argues that sustainable competitive advantages come from rare, inimitable, and non-substitutable resources. From this perspective, IS can be a strategic resource when integrated with specific organizational competencies and routines that are difficult to imitate. The work of Margrethe Wade and John Hulland (2004) confirms that IS performance depends on their combination with complementary resources, such as organizational culture, human capital, and managerial capabilities.

Finally, the theory of dynamic capabilities, developed in particular by David Teece, Gary Pisano, and Amy Shuen (1997), extends this analysis by emphasizing that the strategic value of IS lies in their ability to support the continuous adaptation of the company in the face of turbulent environments. IS then become catalysts for organizational reconfiguration, facilitating learning, knowledge integration, and process transformation.

Thus, the shift from an instrumental vision to a strategic perspective reflects a profound change in the understanding of the role of information systems. From automation tools, they have become strategic resources integrated into organizational capabilities, contributing to the creation, consolidation, and renewal of competitive advantages. This conceptual evolution provides an essential foundation for analyzing their impact on operational performance, particularly in complex contexts such as mass distribution, where logistical coordination, information flow management, and responsiveness are major determinants of competitiveness.

2.2 The Resource-Based View and information systems

The Resource-Based View (RBV), introduced by Birger Wernerfelt (1984) and formalized by Jay Barney (1991), posits that the differentiated performance of companies can be explained by the heterogeneity and imperfect immobility of their strategic resources. Heterogeneity refers to the fact that companies, even those operating in the same competitive sector, have distinct resource portfolios, shaped by their historical trajectory, strategic choices, and organizational learning processes. Imperfect immobility means that certain resources cannot be easily transferred, copied, or acquired on the market, particularly due to mechanisms of causal ambiguity, social complexity, or path dependency.

From this perspective, sustainable competitive advantage depends on possessing resources that meet the VRIN criteria, later reformulated as VRIO by Barney (1991): a resource must be valuable, rare, inimitable, and appropriately organized to generate a sustainable advantage. Organization plays a central role here, because even a valuable and rare resource will not produce superior performance if the company does not have the structures, processes, and governance mechanisms to exploit it effectively.

Applied to information systems, RBV encourages us to move beyond a purely technological view of IS and consider them as an integrated set of complementary resources. Anandhi Bharadwaj (2000) distinguishes three interdependent categories of information resources:

- Technical resources, including hardware and software infrastructure, databases, networks, and application architectures;
- Human resources, including technical skills, managerial capabilities, business expertise, and organizational learning ability;
- Intangible resources, such as digital culture, the quality of relationships with technology partners, organizational reputation, and tacit knowledge related to the optimal use of technologies.

This typology highlights that technology itself is rarely a source of sustainable advantage, as it is generally available on the market and therefore potentially imitable. On the other hand, it is the specific and idiosyncratic combination of these resources, particularly the integration of IS into key processes and organizational routines, that can generate superior performance. In this logic, IS become enabling resources, facilitating coordination, information flow, and knowledge exploitation.

The work of Margrethe Wade, and John Hulland (2004) confirms that the strategic value of IS lies in their articulation with complementary resources. They demonstrate that IS capabilities influence performance when they are integrated into coherent organizational processes and supported by appropriate human skills. Thus, in a

logistics context, the effectiveness of a flow management system or ERP will depend less on the technical sophistication of the tool than on its ability to fit into planning, coordination, and control routines.

RBV allows information systems to be conceptualized not as isolated assets, but as sets of strategic resources whose value depends on their scarcity, inimitability, and organizational integration. This approach provides a solid foundation for understanding why some companies are able to derive greater value from their technology investments than others.

2.3 Dynamic capabilities theory and information systems

While the RBV provides a relevant explanation of competitive advantage at a given moment, it remains relatively static in environments characterized by uncertainty, technological turbulence, and intensifying competition. To overcome this limitation, the theory of dynamic capabilities, developed by David Teece, Gary Pisano, and Amy Shuen (1997), emphasizes the ability of organizations to integrate, reconfigure, and renew their resources in response to rapid changes in the environment.

In his conceptual elaboration, David Teece (2007) identifies three micro-foundations that constitute dynamic capabilities:

- Sensing: the ability to detect and interpret emerging opportunities and threats;
- Seizing: the ability to mobilize and allocate the resources needed to exploit these opportunities;
- Transforming: the ability to continuously reconfigure assets and organizational structures.

In the field of logistics, information systems play a decisive role in the development of these capabilities. The increased visibility of physical and information flows, made possible by technologies such as the IoT, RFID systems, and collaborative cloud platforms, enhances the ability to sense disruptions and variations in demand. Electronic data interchange (EDI) systems, API interfaces, and B2B platforms facilitate interorganizational coordination, thereby supporting the ability to seize opportunities through better synchronization of operations. In addition, the use of historical data, combined with predictive analytics tools, promotes organizational learning and continuous improvement of logistics routines, contributing to the transformation process. (transforming) process. From this perspective, IS are not a direct source of performance; they act as catalysts for the development of adaptive organizational capabilities. The work of Eisenhardt, and Jeffrey Martin (2000) emphasizes that dynamic capabilities are rooted in identifiable organizational processes, such as coordination, learning, and resource reconfiguration.

The contribution of information systems to logistics performance appears to be essentially indirect and mediated by the development of dynamic capabilities, which enable companies to anticipate, absorb, and transform environmental shocks.

2.4 Summary of the theoretical position

The articulation of RBV and dynamic capabilities theory provides an integrated and particularly relevant conceptual framework for analyzing the strategic contribution of information systems to logistics performance. RBV explains why some companies develop superior IS capabilities, due to the heterogeneity, inimitability, and causal ambiguity of their resources. Dynamic capabilities theory, on the other hand, sheds light on how these resources can be continuously renewed and adapted in uncertain environments.

However, criticism from Richard Priem, and John Butler (2001) highlights the need to clarify the explanatory mechanisms linking resources and performance. The integration of dynamic capabilities partially meets this requirement by explaining the processes through which information resources are mobilized and transformed.

In the field of logistics, this integrated framework allows information systems to be conceptualized as strategic resources whose value depends both on their internal configuration (RBV) and their ability to support continuous organizational adaptation (dynamic capabilities). It thus provides a robust theoretical basis for analyzing the systemic mechanisms through which IS influence logistics performance, particularly in terms of flexibility, responsiveness, reliability, and interorganizational coordination.

3 Logistics performance : Concept, Dimensions, and Issues

3.1 Definition and conceptualization

Logistics performance is now a central construct in the literature on supply chain management. It cannot be reduced to a simple optimization of physical flows; it refers to an organization's systemic capacity to simultaneously orchestrate the flows of products, information, and financial resources in a logic of integrated value creation.

According to et al. (2001), the supply chain must be understood as a coordinated interorganizational system whose ultimate goal is end-customer satisfaction. From this perspective, logistics performance is no longer an intra-company issue but a network performance issue, dependent on the quality of coordination between actors.

The work of Angappa Gunasekaran et al. (2004) emphasizes the multidimensional and multilevel nature of the concept. Logistics performance is expressed:

- At the operational level (day-to-day flow management),
- At the tactical level (planning and resource allocation),
- At the strategic level (creation of sustainable competitive advantage).

This conceptualization requires a clear distinction between effectiveness and efficiency. Effectiveness refers to the achievement of objectives (meeting deadlines, service rates), while efficiency concerns the optimization of the resources used to achieve these objectives. An organization can be effective without being efficient, and vice versa. True logistics performance requires simultaneous mastery of both dimensions.

Furthermore, the contemporary approach breaks with a static view of performance. In environments characterized by volatile demand, market fragmentation, and technological acceleration, logistics performance becomes a dynamic capability. It reflects an organization's ability to continuously adjust its processes, absorb shocks, and maintain an optimal balance between costs, deadlines, and quality.

3.2 The five dimensions of logistics performance

Cost performance is a fundamental indicator. It encompasses transportation, storage, handling, inventory management, and administrative costs. The challenge is to reduce these costs while maintaining the required level of service, thus balancing efficiency and quality (Chopra & Meindl, 2016).

Time performance relates to the speed and punctuality of operations. Key indicators include delivery time, lead time, inventory turnover, and on-time delivery rate. In the context of booming e-commerce, this dimension has become a key competitive factor (Gunasekaran et al., 2001).

Logistical reliability assesses the regularity, predictability, and compliance of operations. It is measured by order fulfillment rate, inventory accuracy, delivery time stability, and breakage rate. High reliability reduces uncertainty for all partners in the supply chain.

The quality of logistics service is a subjective dimension that measures customer satisfaction. It includes product availability, the quality of information provided, flexibility in responding to specific requests, and efficiency in handling incidents (Mentzer et al., 2001). This dimension is strongly correlated with customer loyalty and commercial success.

Logistics flexibility refers to the ability to adapt to variations in volume, changes in product mix, and environmental disruptions. It represents a major competitive advantage in uncertain environments and, in this sense, is a dimension of performance in its own right, rather than a simple operational attribute (Christopher, 2016).

3.3 The tensions inherent in logistics performance

These five dimensions are complementary, but they also create structural tensions. Reducing costs can lead to lower inventory levels and increase the risk of shortages; improving delivery times often requires costly modes of transport; and increasing flexibility requires additional investment (Chopra & Meindl, 2016). Managing these trade-offs is precisely one of the strategic contributions of IS, which enable real-time decision-making and the identification of optimal balances through advanced analytics.

4 Critical review of the literature

4.1 Empirical convergence on the positive impact of IS

The empirical literature largely converges in documenting a positive effect of IS on logistics performance. Advanced information systems enable cost reduction, improved lead times and reliability, and better coordination

of flows within supply chains (Rai et al., 2006). Sanders (2007) confirms that the integration of technologies significantly improves overall organizational performance. Information sharing facilitated by digital platforms improves data accuracy and timeliness, reducing the bullwhip effect and synchronizing planning decisions (Lee et al., 1997; Sahin & Robinson, 2002).

These studies converge in emphasizing that the effect of IS is not direct but mediated by organizational capabilities. The integration of intra- and inter-organizational processes is a central mechanism (Flynn et al., 2010). The model developed by DeLone & McLean (2003) illustrates this mediation logic by linking system and information quality, effective use, and organizational benefits through a complex causal chain.

4.2 Limitations and gaps in the literature

Despite these contributions, four major limitations structure the shortcomings of the existing literature. First, the heterogeneity of concepts and measures is a major obstacle to academic synthesis: studies differ greatly in their definitions of IS capabilities and logistics performance, with some focusing on technical infrastructure and others on human skills or processes. Second, the predominance of cross-sectional studies poses a problem of causal validity: the impact of IS on performance develops longitudinally, yet temporal studies remain rare. Geographical bias, with approximately 75% of studies focusing on developed countries, limits the generalizability of the results. Finally, the absence of integrative models linking all dimensions of IS capabilities and their paths of influence on logistics performance leaves a significant theoretical gap that this research aims to fill.

5 An integrative theoretical model

5.1 General architecture of the model

The proposed model is based on a three-level mediation logic. The first level is that of technological, human, and intangible IS resources, which constitute the necessary but not sufficient foundation for the creation of informational value. The second level is that of IS capabilities, representing the organizational mobilization of these resources in specific value-generating processes. The third level is that of multidimensional logistical performance. In accordance with the theoretical framework adopted, the effect of IS resources on performance is fundamentally indirect: it passes through the organizational capabilities developed from these resources.

5.2 IS resources as a strategic substrate

IS resources form the foundation of the model. Their strategic value does not lie in their intrinsic technical sophistication, but in their coherent combination and integration into organizational processes. Advanced technical infrastructures without adequate human skills remain underutilized; human skills developed without the appropriate infrastructure cannot be fully deployed. It is their coherent articulation, supported by an organizational culture conducive to innovation and collaboration, that enables the emergence of distinctive and difficult-to-imitate IS capabilities (Bharadwaj, 2000; Wade & Hulland, 2004).

5.3 IS integration capability

IS integration capability refers to an organization's ability to interconnect its internal and external information systems, ensuring the smooth flow of information throughout the supply chain. It is based on system interoperability, integration architecture skills, and an organizational culture that promotes cross-functional collaboration.

Its contribution to logistics performance is multidimensional. In terms of costs, integration reduces redundancies and data entry errors. In terms of lead times, it synchronizes decisions and shortens cycles. In terms of reliability, it ensures consistency of information across the links in the chain. In terms of service quality, it improves visibility and responsiveness to customer requests. These converging effects are rooted in the logic of dynamic capabilities: by facilitating early detection of disruptions and real-time coordination, integration capability gives the organization a superior ability to manage complex flows (Rai et al., 2006).

5.4 IS flexibility capacity

The flexibility capacity of IS refers to the organization's ability to quickly reconfigure its information systems to adapt to changes in the logistics environment. It is based on the modularity of technical architectures, the versatility of IS teams, and governance that promotes organizational agility.

From a dynamic capabilities perspective, IS flexibility is a mechanism for seizing and transforming: it enables the mobilization of information resources in response to opportunities and threats detected in the environment. It contributes to logistics performance by reducing the costs associated with late adjustments, improving response times to changes in demand, strengthening resilience to disruptions, and increasing customer satisfaction through better adaptation to specific requirements (Christopher, 2016).

5.5 The analytical capacity of IS

The analytical capacity of IS refers to an organization's ability to collect, process, and strategically use logistics data for planning, forecasting, and decision-making purposes. It relies on the availability of reliable data, advanced analytical tools, and internal analytical skills, as well as an organizational culture geared toward data-driven decision-making.

Its contribution to logistics performance operates through several mechanisms. First, it enables optimal resource allocation, reducing immobilization and transportation costs. Second, it improves lead times through predictive planning, which anticipates variations in demand and optimizes supplies. Finally, it enhances reliability and service quality by enabling proactive management of logistics operations (Waller & Fawcett, 2013). In the context of dynamic capabilities, analytical capability is the main driver of organizational sensing: it transforms raw data into actionable logistics intelligence.

5.6 The mediating effect of IS capabilities

The core of the model lies in the logic of mediation: IS resources only have an effect on logistics performance through the development of specific organizational capabilities. This mediation is not mechanical; it is conditioned by the quality of the alignment between available resources, developed capabilities, and strategic requirements for logistics performance. The distinctive value of this model lies precisely in highlighting these paths of influence, reflecting the complexity of the organizational processes through which IS creates value (Melville et al., 2004).

6 Theoretical contributions and managerial implications

6.1 Theoretical contributions

This article makes three contributions to the literature. First, it proposes an integrative conceptualization that goes beyond the dominant techno-centric view by placing organizational capabilities at the center of the process of creating value from IS resources. Second, it offers a three-dimensional structure of IS capabilities: integration, flexibility, and analytics, which coherently articulates constructs often treated in isolation in the literature, enriching the seminal work of Bharadwaj (2000). Finally, it provides an original application of the RBV–dynamic capabilities framework to logistics performance, an area that has not yet been sufficiently explored in the literature on information systems.

6.2 Managerial implications

From a managerial perspective, this theoretical framework invites organizations to reorient their approach to IS investment. Rather than evaluating technologies solely on the basis of their sophistication or cost, managers must assess their potential to generate distinctive organizational capabilities. IS governance must therefore be geared towards capacity development: coordination between IS and logistics functions, involvement of business users in system design, and continuous development of analytical and integration management skills. In the retail sector, which is characterized by high logistical complexity and intense competition on delivery times and costs, the three IS capabilities identified are major levers for building a sustainable logistical advantage.

7 Conclusion

In a context marked by accelerated digitalization, intensified competition, and increasing volatility in logistics environments, understanding the mechanisms by which information systems contribute to logistics performance is a central theoretical and managerial issue. Beyond simple technological adoption, the fundamental question lies in the ability of organizations to transform information resources into effective levers of operational performance. In this regard, this article has proposed an integrative theoretical model drawing on the Resource-Based View (RBV) and dynamic capabilities theory to explain how information systems become sources of sustainable competitive advantage in logistics. By identifying three key organizational capabilities—systems integration, organizational flexibility, and the analytical capacity of IS—as mediating mechanisms between technological

resources and operational performance, this work highlights the profoundly organizational nature of value creation from IS. Technologies do not automatically generate performance; they do so through processes of integration, reconfiguration, and strategic use of data.

This conceptual framework thus makes it possible to move beyond the technocentric and fragmented approaches that have long dominated the literature. Indeed, much of the previous work has focused either on the technical characteristics of systems (ERP, SCM, AI) or on isolated performance indicators, without analyzing the intermediate mechanisms linking resources and results. The proposed approach reflects the complexity of organizational processes and emphasizes that logistics performance stems from the dynamic orchestration of information resources. In line with RBV, it reaffirms that IS are only a strategic resource when they are integrated into specific organizational routines that are difficult to imitate and aligned with the company's strategy.

From a managerial perspective, this research suggests that technological investments must be accompanied by sustained efforts in process structuring, analytical skills development, and cross-functional coordination. Managers should not view information systems as standalone solutions, but as enabling platforms whose value depends on the organizational capacity to exploit them. The integration of information flows, the ability to adapt quickly to logistical disruptions, and advanced data exploitation appear to be strategic priorities in an environment characterized by uncertainty and complexity.

Finally, this work opens up several promising avenues for further research. First, the dynamic and evolving nature of organizational capabilities calls for longitudinal investigations to analyze their development and maturation over time. Second, examining these mechanisms in a variety of geographic and sectoral contexts would allow for an assessment of their robustness and sensitivity to institutional and cultural factors. Third, the interaction between information capabilities and other strategic capabilities, such as organizational learning, digital innovation, and strategic agility, is a fertile field of exploration for enriching our understanding of digital transformation trajectories.

This contribution reinforces the idea that logistics performance in the digital age depends not only on technological sophistication, but also on the ability of organizations to mobilize, combine, and renew their information resources in a strategic and dynamic manner. Information systems thus appear not as an end in themselves, but as a catalyst for organizational transformation and sustainable value creation.

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