

## *The logistics information system: A performance enhancer for the Supply Chain*

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*Received: 01/02/2025*

*Accepted: 25/10/2025*

*Published: 25/12/2025*

### **Abstract:**

In the context of a constantly evolving environment, logistics information systems play a key role in optimizing the supply chain. The objective of this study is to examine how the logistics information system influences the overall performance of the supply chain of a pharmaceutical company in Algeria (IMC). A qualitative approach was used, combining semi-structured interviews, participant observation, and document analysis. The findings show that the logistics information system enhances the supply chain's responsiveness by improving information flow and enabling quick adaptation to demand changes. It increases logistical efficiency by reducing waste, improving traceability, and optimizing inventory management. The system also boosts agility by facilitating better planning and scenario simulations, enhancing operational flexibility. Lastly, it supports organizational intelligence, providing reliable data for informed decision-making and real-time corrective actions.

**Keywords:** logistics, logistics information system, performance, supply chain.

**Jel Classification Codes:** D24, L86, M15, O33.

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## **1. Introduction**

Today, the economic situation is characterized by strong globalization of trade, rapid technological development, a shortening of product life cycles, and increasingly demanding customers. In such a context, companies have continually been led to seek innovative strategies that allow them to gain a sustainable competitive advantage.

Logistics is at the heart of this differentiation strategy for companies. It is no longer considered a support activity focused on the operational management of physical flows, but as a strategic activity of both physical and informational flows. Such a development was made possible thanks to the work of pioneers like (Porter, *Competitive advantage: Creating and sustaining superior performance*, 1985) and (Porter & Millar, 1985) who emphasize the central importance of coordinating and synchronizing between the different links in the supply chain, in order to increase the value created for the customer in terms of quality, costs, and lead times. The coordination between the links in the supply chain has been made possible thanks to a variety of methodologies and tools proposed by leading companies in the field.

Logistics information systems represent, in this context, the essential tools for optimizing supply chain processes within companies. They enable the collection, processing, and dissemination of real-time information, thereby facilitating the management of product, raw material, and information flows between the various actors in the supply chain. Technological advancements have profoundly changed the way companies manage their operations, highlighting the central role of information systems in coordinating logistical activities. It plays an important role in the performance of the upstream supply chain (Zhou, X., Li, Y., & Zhang, Y, 2024) and downstream (Morvan, 2005); (Zeroual & Zerouali, 2017), in market adaptation (Arcis , 1999), and in the coordination between supply chain actors (Perano, Cammarano, Del Regno, & Michelino , 2023); (Si-Mohamed, 2006); (Thi Le Hoa & Bironneau, 2011); (Cassivi, 2004);

As for Algerian companies, their mastery of supply chain management has been slow to develop due to the monopoly exercised by large national companies to the detriment of private enterprises. In terms of academic research, there is a predominance of "monographic" studies that focus on the management of the supply chain of large agri-food companies (Boudahri, 2013); (Berraki, 2014).

Our current research aims to understand the role of the logistics information system as a lever for the performance of the supply chain of a company based in Algeria. We will study how the logistics information system interacts with the various processes of the latter.

Based on the context presented below and in order to achieve the objectives established in our study, we have posed the following question:

“How does the logistics information system contribute to the improvement of the overall performance of the supply chain at Industries médico-chirurgicales IMC?”

To address this question, we formulated the following hypotheses:

- Hypothesis 01: The logistics information system improves supply chain responsiveness;
- Hypothesis 02: The logistics information system increases supply chain efficiency;
- Hypothesis 03: The logistics information system strengthens the agility of the supply chain;
- Hypothesis 04: The logistics information system improves the decision-making intelligence of the supply chain.

The objective here is to understand how the information system can help optimize logistics operations, ranging from the purchase of raw materials to the delivery of the final product to customers.

The importance of this study lies in its contribution to both academic knowledge and managerial practice. Academically, it fills a gap regarding the impact of logistics information systems within Algerian companies, which have been relatively underexplored. From a managerial perspective, understanding the role of these systems helps guide strategic investments and process improvements. In a highly competitive and volatile economic environment, mastering logistics information systems is a key lever for ensuring company competitiveness, flexibility, and sustainability.

In order to provide answers to our research question, we conducted a qualitative study based on semi-structured interviews with managers from IMC Pharmaceutical, a leading company in pharmaceutical products in Algeria. This methodological approach enable an in-depth exploration of managerial perceptions and practices concerning the use of logistics information systems within the supply chain.

## **2. LITERATURE REVIEW**

### **2.1 Generalities on logistics**

The definition of logistics has evolved significantly over time, reflecting its increasingly crucial role within the company. It is now considered a key process for the production, storage, and distribution of products. Its main objectives are the management of physical and informational flows of goods, from their procurement to their delivery to the final customer.

For the (Frensh Association of Logistics , 2024)(ASLOG), Logistics is the set of activities aimed at establishing, at the lowest cost, a quantity of product, at the place and at the time when there is a demand. Logistics, therefore, concerns all operations determining the movement of products, such as the location of factories and warehouses, supplies, physical management of work-in-progress, packaging, storage and inventory management, handling and order preparation, transport and delivery routes. This definition emphasizes the key elements that constitute the logistics chain.

In simpler terms, logistics encompasses a comprehensive set of activities dedicated to the transformation and distribution of goods, from sourcing raw materials to distributing finished products in the market, as well as the associated information flows (Hesse & Rodrigue, 2002). Logistics is therefore the set of activities aimed at managing and optimizing the physical and informational flows of a company in order to provide a product or service in the most efficient way possible. Planning, implementation, and control of supply chain operations are all included in this category. Logistics is essential for managing inventory, reducing costs, and improving service quality. Logistics can be considered a strategic function for organizations as it allows for the integration of external constraints while ensuring consistency between internal processes and market expectations. By providing a product at the right time, in the right place, at the lowest cost, and with the best possible quality.

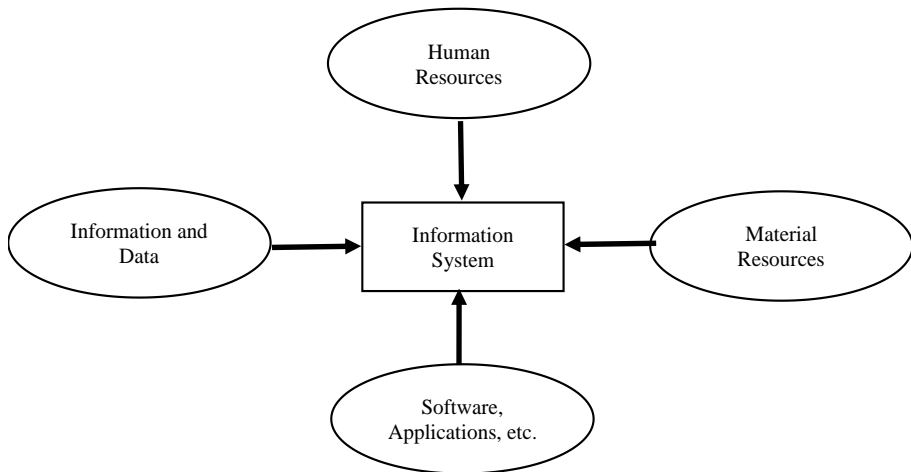
## **2.2 The information system:**

The concept of information systems emerged from the work of the systems approach, but its evolution has its origins in the development of computing and the advent of information and communication technologies. These advances have made it possible to design information systems that are both efficient and innovative, thanks to their technical dimension, the quality of the tools they integrate, as well as the organizational changes they generate.

Research in information systems has continuously evolved with all the changes that have occurred in this discipline, generating general interest over time (Zouine , Hilmi , & Ait Taleb , 2020). As a result, researchers have examined various aspects and proposed various definitions. The majority of them emphasize the components of IS (hardware, software, personnel, data, procedures) as well as its essential functions, such as the collection, processing, storage, and dissemination of information. From a systemic perspective, the company's information system is "*considered as a complex network of structured relationships where people, machines, and procedures*

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*intervene, with the goal of generating ordered flows of relevant information, coming from both internal and external sources of the company, meant to serve as a basis for decisions" ( (Lambien, 1999, p. 26), As indicated in the definition, the information system brings together a set of resources, namely (figure no 01):*

**Figure No. 01: The components of an information system.**



**Source:** (J.J. Lambien, 1990, p.26).

- Human resources: This refers to the interactions between users and the system to accomplish the daily tasks of the business.
- Material resources: These mainly include the company's computer hardware, such as computers and information storage devices.
- Software resources: These are all the applications and programs necessary to process data and ensure the smooth conduct of the company's processes.
- Information and data: They constitute the engine of the information system. This includes raw data used as raw material for processing, as well as processed data, such as results, which are saved in the form of automatable models for future reuse.

The information system can therefore be compared to the circulatory system of the human body. At its center, a "suction-discharge" pump ensures the collection of contaminated blood and, after treatment by the lungs, redistributes the blood to all the organs of the body; this exchange takes place thanks to a network of pipelines (arteries, veins...) (Angot, 2006). This challenges the boundaries of the company and must cover not only the internal functions of the company but also external ones.

### **2.3. The information system supporting the supply chain.**

The pursuit of ongoing customer satisfaction drives the company to expand its network and to intensify the volume of its information exchanges with its partners (carriers, suppliers, public authorities, customers...). To manage their supply chain, companies must make changes at the organizational level (Stadler & Kilger, 2000); (Pichot, 2006):

- Adopt a process-oriented reasoning.
- Integrate and involve human resources in the change.
- Call upon logistics information systems.

Thus, in a supply chain, we can distinguish three categories of technologies that are generally complementary (Bayraktar, Demirbag, Koh, Tatoglu, & Zaim, 2009) (Table No.01):

- Tools for the extended enterprise;
- Integrating tools;
- Facilitating tools.

These systems used in the management and optimization of various logistical flows can be summarized in the following table (Bayraktar, Demirbag, Koh, Tatoglu, & Zaim, 2009):

**Table No.01: Categories of Logistics Information Systems.**

<b>Category</b>	<b>Logistics Information System</b>
<b>1st category: Extended enterprise information systems</b>	Composed mainly of (ERP) "Enterprise Resource Planning"
<b>2nd category: Integrator Information Systems</b>	Composed mainly of: <ul style="list-style-type: none"> <li>• Supply Chain Planning tools « Advanced Planning System «</li> <li>• All software referred to as Supply Chain Execution (SCE)</li> <li>• Order Management Tools (OMT) « Advanced Order Management »</li> <li>• Warehouse management systems (WMS) and transportation management systems (TMS) “Warehouse and transportation management system “</li> <li>• As well as customer relationship management tools (CRM), "Customer Relationship Management"</li> </ul> And supplier relationship management (SRM) tools, « Supplier Relationship Management »
<b>3rd category: Facilitator Information Systems</b>	Composed mainly of: <ul style="list-style-type: none"> <li>• The technology (EDI) "Computerized Data Exchange"</li> </ul> And the means of automatic identification (barcodes, radio frequency tags...)

**Source:** (Bayraktar & al, 2009).

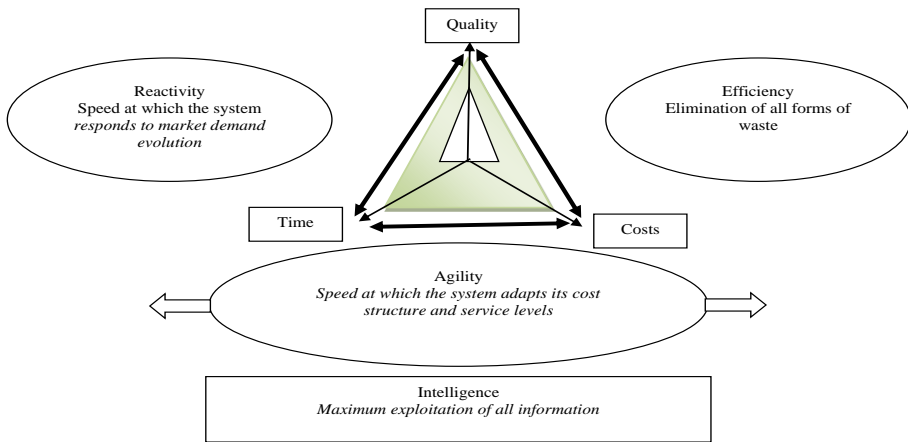
**2.4. Logistics information systems and supply chain performance.**

Logistics information systems have always occupied an important part of research in supply chain management regarding the contribution of information sharing to logistical performance (Peiyun, 2024). They are even considered the backbone of the supply chain (L. Scharwt, 1999; (Wood, Reiners, & Pahl, 2015) and (Chafik & Boubker, 2016a) 2016), allowing for the exchange and processing of a gigantic volume of data, which consolidates relationships between the links in the chain and grants it a differentiating effect both in terms of costs (efficiency) and in terms of the satisfaction of the end customer (effectiveness). The common point among previous works lies, which mostly rely on quantitative approaches, in their objective of determining the role played by digitalization in the performance of the upstream supply chain (Zhou, X., Li, Y., & Zhang, Y, 2024) and

downstream (Morvan, 2005) and (Zeroual & Zerouali, 2017), in market adaptation (Arcis , 1999), and in coordination among supply chain actors (Perano, Cammarano, Del Regno, & Michelino , 2023) (Si-Mohamed, 2006) and (Thi Le Hoa & Bironneau, 2011) (Bayraktar, Demirbag, Koh, Tatoglu, & Zaim, 2009) (Wood, Reiners, & Pahl, 2015).

Algerian research has shown that logistics information systems positively impact supply chain performance. (Ferhat , 2021) adopts a quantitative comparative approach, measuring performance indicators before and after LIS implementation, highlighting their contribution to improved inventory management, coordination, and competitiveness. Similarly (Bouzida., 2022) emphasizes the role of LIS in supply chain optimization through the integration of ERP, TMS, WMS, and CRM systems, fostering cost reduction and operational efficiency. Furthermore, (Difallah, Guerdouba , & Khenniche, 2018) highlight the importance of LIS in controlling logistics flows and reducing lead times, particularly in the Algerian industrial sector. However, these studies generally examine performance globally, without breaking down the variable into sub-dimensions such as responsiveness, efficiency, agility, and intelligence. This calls for turning to the model of (Mesnard & Dupont, 1999), who summarize the benefits of logistics technologies at three levels: improving the responsiveness of the supply chain, optimizing efficiency, enhancing the agility of the logistics chain, and consolidating organizational intelligence (Figure n°02). For our part, and within the framework of this research work, we will focus on these four aspects of supply chain performance.

**Figure No. 02: The Magic Pyramid of SCM**



**Source:** (Mesnard & Dupont, 1999, p.54).

**a. Improve supply chain responsiveness:**

This translates to the SC's ability to respond more quickly and proactively to the expressed or latent needs of customers, even before competitors can react. (Saisridhar, Thürer, & Avittathur, 2024) Emphasizes that responsiveness is essential for maintaining a competitive logistics chain in a dynamic and complex environment. In this context, the implementation of information systems and associated technologies (ERP systems and inventory management software) greatly contributes to the flexibility and customization of logistics services, thereby meeting specific customer expectations (Hamouda, 2023). These tools help avoid any potential issues that may arise in the supply chain. According to (Ellram, 2000), these systems provide real-time alerts to signal potential delays or problems, thus allowing for proactive adjustments in logistics chains.

**b. Optimize efficiency:**

The SC must be capable of eliminating all forms of waste while seeking to reduce costs across the entire logistics chain processes, thus ensuring optimal resource management ( Oglá & Qassem, 2023). This efficiency manifests at several levels. In terms of collecting and

disseminating information, the logistics information system enables, according to (Zeroual & Zerouali, 2017), the collection, processing, and dissemination of logistics information in real time, which reduces delays in operational flows. This increased visibility fosters coordination among logistics partners and reduces inefficiencies related to data duplication or human errors. Regarding processes, the logistics information system contributes, according to (Hamouda, 2023), to cost reduction by optimizing transport routes, minimizing inventory needs, and improving warehouse management. These productivity gains allow for better allocation of resources and increase the competitiveness of companies in the market.

**c. Strengthen the agility of SC:**

As highlighted by (Swafford, Ghosh, & Murthy, 2006), agility relies on operational and strategic flexibility to quickly adapt to uncertain and unpredictable situations. In this context, logistics information systems provide complete visibility of product and information flows throughout the supply chain. This enables companies to react swiftly to disruptions and adapt to demand fluctuations. According to (Verny, Oulmakki, & Durand, 2023), this transparency is essential for making informed decisions and adjusting operations in real-time, thereby enhancing the overall agility of the company. (Wagner & Fearne , 2015)) also emphasized the transparency provided by logistics information systems, which fosters better collaboration among partners, thereby increasing the adaptability of the supply chain.

The ISLs also allow for real-time tracking of inventory and customer demands, thereby facilitating quick adjustments in production and distribution processes. (Hamouda, 2023) highlights that this ability to adjust operations according to market needs enhances the flexibility of the supply chain, which is fundamental for remaining competitive in a dynamic environment. The risk management tools integrated into the logistics information system, such as data-driven forecasting systems, help anticipate potential disruptions (such as stockouts or transportation delays). (Zeroual & Zerouali, 2017) state that this

anticipatory capability not only enables rapid response but also allows for the implementation of strategies to avoid major crises, further increasing the agility of the chain.

**d. Fostering organizational intelligence :**

Organizational intelligence refers, according to (Ouzizi, Anciaux,, Portmann, & Vernadat, 2006), to the capacity to integrate and exploit information to improve decision-making processes. The logistics information system contributes to this process by facilitating the collection and analysis of logistical data, thereby creating an environment conducive to organizational learning. (Verny, Oulmakki, & Durand, 2023) emphasize that the integration of information from different sources, made possible by the logistics information system, allows the organization to draw continuous lessons that enhance decision-making processes and strategies. For their part, (Zeroual & Zerouali, 2017) highlight that data integration allows for anticipating potential disruptions and implementing strategies to avoid inefficiencies.

**2.5. Critical discussion on previous studies (research gap).**

Logistics information systems have been widely studied for their role in improving supply chain efficiency, responsiveness, and coordination. Most existing research relies on quantitative approaches, which help identify general trends and correlations between systems use and logistics performance. However, these studies often lack contextual depth, especially in developing economies where technological maturity and organizational dynamics may differ significantly.

The pharmaceutical sector, despite its complex and strictly regulated logistics requirements, remains underexplored in the literature. Challenges such as product traceability, sensitive inventory management, and regulatory compliance require specific approaches that are rarely addressed in general studies. Therefore, there is a clear need for targeted empirical analyses that consider sector-specific and contextual particularities.

This study aims to fill these gaps by examining the role of a logistics information system in the logistics performance of an Algerian

pharmaceutical company, considering both operational and strategic dimensions. To this end, we adopted a qualitative approach based on semi-structured interviews in order to gain a deeper understanding of the practical realities on the ground.

### **3. METHODS.**

In order to provide answers to our research question regarding the contribution of the logistics information system to supply chain performance, we conducted a qualitative survey through semi-structured interviews with managers from I.M.C Pharmaceutical, a leader in pharmaceutical products in Algeria.

The study was carried out within a large Algerian pharmaceutical company, specialized in the manufacturing and marketing of medical and surgical consumables. A sample of six participants was selected, including senior managers, supply chain managers, and information systems technicians, as indicated in Table No. The participants were chosen based on their experience and direct knowledge of the logistics information system and supply chain processes.

To ensure the quality and relevance of the data collected, the principle of saturation was applied: interviews were conducted until the information obtained became redundant, meaning that no new data or significant insights were provided by additional participants. This method guarantees that the sample is sufficient to fully understand the phenomenon studied without requiring the inclusion of an excessive number of participants. Saturation thus constitutes an essential criterion in qualitative research to validate the richness and depth of the results.

**Table No.02: Information related to the interviewed persons**

N°	Position held	Years of Experience	Interview duration
1	Supply Chain Director	15 years	1 hour
2	Procurement Director	10 years	45 minutes
3	Stock Manager	8 years	1 hour
4	Information System Director	12 years	1 hour
5	Developer-Designer	6 years	45 minutes
6	Technical Architect	5 years	45 minutes

**Source:** Developed by the authors.

We developed an interview guide based on the works of Mesnard and Dupont (1999). We utilized a set of open-ended questions that allow the interviewer to facilitate the exchange with the respondent. This method enabled us to obtain in-depth and detailed responses while allowing for discussion on subjects not covered in the interview guide.

**Table No.03: Sections of the interview guide**

No.	Sections	Description
1	<b>Introduction</b>	<ul style="list-style-type: none"> <li>• Introduction of the interviewer.</li> <li>• General presentation of the study topic.</li> <li>• Conditions of the interview: confidentiality and duration.</li> </ul>
2	<b>General Theme</b>	<ul style="list-style-type: none"> <li>• Presentation of the interviewee.</li> </ul>
3	<b>Theme: The contribution of the IS in supply chain performance</b>	<ul style="list-style-type: none"> <li>• Questions about the contribution of the logistics information system to the reactivity of the supply chain.</li> <li>• Questions about the contribution of the logistics information system to the efficiency of the supply chain.</li> <li>• Questions about the contribution of the logistics information system to the agility of the supply chain.</li> <li>• Questions about the contribution of the logistics information system to organizational intelligence.</li> </ul>
4	<b>Theme: Closing and end of the interview</b>	<ul style="list-style-type: none"> <li>• Thank you, and closing of the interview.</li> </ul>

**Source:** Developed by the authors.

Field observations were also conducted to better understand the daily use of the logistics information system. The transcripts of the interviews were read several times to identify recurring themes related to the contribution of the logistics information system to supply chain performance. We utilized document analysis to complement the data collected during the interviews. These documents provide information about the company and the logistics information system. For the analysis of the data collected during the interviews and document analysis, we conducted a content analysis following the three stages of qualitative data analysis as defined by (Miles & Huberman, *Qualitative data analysis: A sourcebook of new methods*, 1991), namely: data reduction, data condensation, and finally data presentation. For data reduction, and after transcribing the conducted interviews, we followed the recommendations of (Miles & Huberman, 2003) by preparing a summary sheet for each transcription, summarizing the key information obtained: general data from the interview (job position of the interviewee, date, place, and time of the interview), the main themes addressed, and points requiring additional information. The consulted documents and observations made in the field were also summarized in sheets. This approach allowed for the effective structuring of the collected data.

Once the synthesis sheets were prepared, we proceeded to their analysis by performing a condensation or coding of the data using a halfway approach that, according to (Miles & Huberman, 2003), involves initially determining, based on the theoretical framework, a predefined list of themes that will subsequently be condensed by others derived from the study field. The analysis was conducted using NVivo software to facilitate data management. A triangulation of the data was carried out by comparing the responses from the different interviewees and by cross-referencing the results of the interviews with the documentary analysis and the field observations of the study. To present how the logistics information system contributes to the performance of the logistics chain of the company IMC, we focused on the analysis of the word clouds generated using NVIVO software

as well as the interpretation of the various statements collected during the interviews.

#### **4. RESULTS AND DISCUSSIONS.**

In this section, we will present the analysis of the interviews conducted with the various directors involved in the case study of the company IMC. The analysis addresses questions related to the importance of info-logistics tools in optimizing physical and informational logistics flows between the links of the supply chain and their contribution to achieving better performance of the logistics chain.

##### **4.1. The logistics information system of the company IMC.**

To manage its activity, IMC acquired a SaaS-type ERP in 2006, but the evolution of its activity, financial capacity, and the number of its employees required it to invest in a new management software package in 2017.

Its information system consists of a variety of sophisticated technological tools, as shown in the table below.

**Table No.04: Logistics Information System of the company IMC.**

Tools	Description
SQUALP	Management of the company's internal supply chain activities.
EWB	An internally developed solution by the company IMC, enabling dynamic production planning, integrated with SQUALP.
WMS	Interfaced with the SQUALP software for warehouse management.
SQUALP CRM	SQUALP CRM for managing the relationship between the company and its customers.
EDI	Secure data exchange between the IMC company and its business partners, including suppliers, distributors, and customers.

**Source:** Prepared by the authors based on the company's internal documents.

SQUALP is a third-generation software solution developed by Isoar Microsoft. According to the designer-developer of the company: "This software is based on systemic methods governing the functional chain in order to provide an architecture suitable for the pharmaceutical and para-pharmaceutical sector of IMC, while remaining in accordance with its environment."

He intervenes across the entire logistics chain of the company:

- The planning of production requirements encompasses various essential activities: receiving customer orders via EDI, analyzing sales forecasts, evaluating production capacities, and calculating net needs based on available stock. It also includes the establishment of production plans to be sent to the relevant departments, as well as the communication of shipping plans to the shipping or export service, detailing product references, quantities, loading levels, and expected delivery dates;

Thus, according to the technical architect (IT) "The planning of production requirements is the heart of an effective information system, seamlessly linking customer orders, sales forecasts, and production capacities, to ensure optimal inventory management and on-time delivery of products." - Technical Architect Information System.

- The management of procurement and inventory relies on several key processes: purchasers place orders via EDI or, in the case of stock shortages, seek suppliers to negotiate favorable terms. Orders are received and checked by warehouse staff, who record raw materials in the system, generating an identity label for each batch (lot number, quantity, supplier, arrival date, location, etc.).

The management software optimizes supplies and inventory using methods such as replenishment rules, PARETO, FIFO/LIFO, and ensures tracking of rotations, coverage, and expirations, while providing detailed information on the different types of inventory (safety, active, reserved, available, scrap, etc.). To summarize the function of the inventory and supply management module, the

supply chain director describes it as "it's the module of where? and what?" (DSI).

- Production flow management is based on available resources (equipment, specialized labor, raw materials, semi-finished products, etc.) to organize manufacturing. The ERP ensures scheduling and production tracking. After manufacturing, distribution and transport management takes over. Based on the shipping plan established by planning, orders are prepared using the WMS interfaced with the ERP, optimizing storage space and reducing preparation errors. Products are palletized, and their status is updated via barcodes. The export department coordinates transportation means, prepares the necessary documents, and ensures optimal delivery of goods, in collaboration with the transportation department, which organizes reservations. The company still outsources its transportation activities.

- Customer relationship management (CRM) is essential for effective interaction with clients. By integrating with other company systems, the CRM allows for the centralization of customer information in a database that is accessible at any time. It automates repetitive messages and tasks, analyzes customer behavior, records complaints, identifies prospects ready to buy, and optimizes marketing campaigns. This strategic tool supports the sales and marketing team while strengthening the customer relationship at every step of the process.

According to the designer-developer (IS) "CRM is a key tool that allows for the automation of repetitive tasks and centralized customer data, while providing valuable insights to personalize interactions and optimize marketing campaigns, thereby facilitating proactive and strategic management of customer relationships."

We have found that info-logistics technologies are present throughout the logistics chain; they contribute to the proper functioning of logistics processes. This functioning is ensured, thanks to their role in synchronizing the physical and



between the various operational stages. By reducing transfer times, these tools allow for increased responsiveness within the company, thereby improving its capacity to respond quickly to market needs and unforeseen events" (purchasing director). This representation of the logistics information system reflects a shared belief among strategic decision-makers that information flow is not only operationally useful, but constitutes a core capability to enhance organizational agility. The underlying logic goes beyond simple process acceleration: it highlights the strategic role of digital tools as levers for synchronized time-sensitive decisions across the supply chain.

For their part, the inventory manager and the company's information system director emphasize the technologies that comprise the logistics information system, while stressing their crucial role in precise and real-time knowledge of stock levels, which enables effective responses to customer demand while avoiding shortages or surpluses. The stock manager reports the possible risks or delays, allowing various logistics managers to act before these problems arise. According to him, "The logistics information system provides visibility for tracking goods. As soon as a problem occurs, such as a delivery delay or stock shortage, we can react before it even affects the customer" (Stock Manager). For the information systems director, "The logistics information system is a sort of proactive alert; its integration into our supply chain has completely transformed our ability to adjust our operations in real time. Thanks to these systems, we can not only monitor stock levels in real time but also anticipate customer needs, allowing us to respond more quickly" (Information Systems Director). Their statements suggest that logistics information system is viewed as an anticipatory system- more than just reactive, it enables proactive responses. For these actors, responsiveness is closely linked to real-time visibility and the ability to foresee disruptions.

In this sense, logistics technologies streamline processes to reduce bottlenecks and delays. Thus, our findings suggest that the logistics



optimize each step of the operational processes.” These statements reflect the role of the logistics information system in improving the visibility of product and information flows throughout the logistics chain. This thus allows companies to identify areas of waste or inefficiencies in their processes, thereby facilitating their elimination. Beyond the technical function, the logistics information systems appears here as a management tool for operational rationalization, allowing actors to make informed decisions about resource allocation. Efficiency is not only seen as cost-saving, but also as a logic of continuous improvement driven by enhanced process transparency. For the three individuals interviewed in the supply chain management, traceability plays a crucial role in managing a pharmaceutical logistics chain, and the logistics information system is essential to ensure its existence. According to the Supply Chain Director, "The Logistics Information System plays a key role in enhancing our relationships with customers and suppliers. Thanks to its advanced traceability, we can efficiently respond to customer requests regarding product tracking by batch, expiration date (DLC), pallet, support, etc."

Here, the logistics information systems is not just a backend support system- it is portrayed as a relational interface between the company and its partners. The emphasis on traceability reveals a broader concern with compliance, risk reduction, and accountability, especially in a sector like pharmaceuticals where precision is critical.

The logistics information system also has an important role to play in reducing costs and lead times throughout the logistics chain through optimization of inventory and transport routes. According to the inventory manager, "The Logistics Information Systems directly contribute to cost reduction by enabling optimal resource management. By optimizing inventory and transport routes, companies can achieve significant savings while increasing their competitiveness." Thus, we can say that the logistics information system is essential for improving the efficiency of the logistics chain





demonstrates that the logistics information system is an essential tool for enhancing the intelligence of the supply chain. It provides reliable data to continuously improve logistics processes, to make decisions more quickly and accurately, and to adapt and learn to meet the dynamic challenges of the supply chain.

IMC is a company operating in a field where the logistics process plays a vital role, hence the importance highlighted by the interviewed individuals of the logistics information system to ensure the intelligence of the supply chain. The company's information systems director indicates in this regard that, "the performance of our supply chain is measured by our ability to meet our customers' needs and outperform competitors, through correct planning, and of course by remaining capable of delivering the right product, to the right person, at the right time, all while minimizing logistics costs... [...] All of this occurs after mastering the logistics information system..."

This statement reveals that logistics information systems is not only a technical foundation, but also a strategic pillar enabling competitiveness through real-time planning and execution. Intelligence is understood here as the ability to transform data into high-performance logistics action.

The Supply Chain Manager, in turn, reinforces the CIO's statement by emphasizing that: "without a doubt, the use of sophisticated technologies such as EDI, SQUALP, WMS and CRM enables the company to develop a global vision of internal logistics processes, from upstream in the supply chain to downstream, in order to develop a cross-functional vision that meets the needs of the company's internal and external customers".

Here, intelligence is linked to integration and visibility. The logistics information system that breaks silos and supports coordinated decision-making across the entire value chain. It is not limited to internal efficiency but extends to customer responsiveness.

The comments made by interviewees from the supply chain department all point to the fact that the logistics information system has the capacity to anticipate problems before they arise. When fluctuations in demand are detected, or when delays are forecast, the system alerts them immediately, enabling them to take corrective action.

This reinforces the idea that the logistics information system enhances supply chain by enabling proactive management. Intelligence here is tied to foresight and speed of execution, made possible by early detection and timely alerts.

These comments confirm the existence of a close relationship between logistics information system and supply chain intelligence. This confirms the findings of (Verny, Oulmakki, & Durand, 2023) that the logistics information system enables companies to draw continuous lessons that improve decision-making processes and strategies.

If we analyze the coverage percentage for each interviewee (table n°5), based on the four analytical axes related to the relationship between the information system and the supply chain (SC): reactivity, efficiency, agility and intelligence. These percentages reflect the proportion of each respondent's discourse devoted to a given theme, regardless of overlaps with other axes.

**Table No.05: coverage rate of the axes of the interview guide**

	<b>Axis 01: Reactivity of the SC</b>	<b>Axis 02: Efficiency of SC</b>	<b>Axis 03: Agility of SC</b>	<b>Axis 04: Intelligence of SC</b>
<b>Supply Chain Director</b>	26.4%	28.7%	31.5%	22.8%
<b>Procurement Director</b>	23.9%	27.1%	24.5%	21.6%
<b>Stock Manager</b>	20.5%	24.3%	22.7%	18.2%
<b>Information System Director</b>	29.2%	33.6%	30.4%	27.9%
<b>Developer- Designer</b>	18.8%	21.0%	27.5%	29.1%
<b>Technical Architect</b>	22.1%	25.8%	26.2%	28.4%

**Source:** Prepared by the authors based on results from Nvivo Software.

The results show that Axis 3- Agility of the SC is the most widely covered by respondents. This is particularly notable among the supply chain director (31.%), the Information System Director (30.4%), but also strongly emphasized by the Developer-Designer (27.5%) and the Technical Architect (26.2%). The Procurement Director (24.5%) and Stock Manager (22.7%) also expressed a significant focus on this dimension. These findings reflect a shared understanding across strategic, technical and operational roles that agility is a key performance factor enabled by information systems, allowing organizations to better adapt to change and uncertainty.

Axis 2- efficiency of the SC is also extensively discussed, especially by the Information System Director (33.6%) and the Supply Chain Director (28.7%). Their emphasis highlights how digital tools contribute to process optimization, resource utilization and cost control within the supply chain. The Procurement Director (27.1%) and Stock Manager (24.3%) also acknowledged the importance of efficiency, especially in terms of inventory management and procurement coordination.

Axis 01-Reactivity was mostly emphasized by the information system director (29.2%) and the supply chain director (26.4%), indicating a strong belief in the role of real-time data and systems integration in improving the SC's responsiveness to disruptions and customer demands. Operational profiles such as the Procurement Director (23.9%) and the Technical Architect (22.1%) also demonstrated awareness of how information system enhance rapid decision-making.

Axis 04- Intelligence of the SC was particularly highlighted by technical stakeholders, notably the Developer-Designer (29.1%) and the Technical Architect (26.2%), suggesting a focus on analytics, forecasting and decision- support systems. The Information System Director (27.9%) reinforced this view, linking business intelligence to strategic performance. Although less prominent, functional roles such

as the Procurement Director and Stock Manager (18.2%) also recognized the value of intelligence systems in operational planning.

Overall, the data reveals a strong convergence across strategic, functional and technical profiles around the critical role of information systems in supporting all four performance dimensions. The highest emphasis on agility and efficiency, paired with substantial attention to reactivity and intelligence, suggest that digital transformation is broadly perceived as a key enabler of a resilient, adaptive and optimized supply chain.

#### **4.3. Synthesis and testing of hypotheses.**

Based on the various results obtained, we can draw conclusions that allow us to test the defined hypotheses.

First of all, Reactivity is a major concern emphasized primarily by strategic profiles, who highlight the importance of real-time data and system integration in enhancing the supply chain's ability to respond to disruptions and customer demands. Operational profiles also recognize the essential role of information systems in accelerating decision-making. Thus, the logistics information system plays a central role in managing information flows in real time improving stock visibility, facilitating anticipation of customer needs, and enabling rapid and coordinated decisions. It acts as a strategic lever of agility, strengthening the overall responsiveness of the supply chain. These findings support the hypothesis that the logistics information system significantly contributes to supply chain's reactivity.

The logistics information system significantly enhances also the efficiency of IMC's supply chain by reducing waste, costs and lead times. It improves stock management, information flow and transport planning, while also strengthening traceability and relationships with partners. Both strategic and operational profiles emphasized its role in process optimization and logistical. These findings confirm the hypothesis that the logistics information system increases supply chain efficiency by improving overall performance and resource control.

The logistics information system plays a key role in enhancing supply chain agility by enabling optimized planning and scenario simulation, which improve flexibility across production, storage, transport and distribution activities. It also fosters agility by strengthening both operational performance and collaboration with suppliers, distributors and customers. This axis was the most widely addressed by respondents, with strong emphasis from strategic, technical and operational profiles alike. Their responses reflect a shared recognition that agility is a critical performance driver- made possible through the integration of information system – allowing the organization to better adapt to change and uncertainty. These results confirm the hypothesis that the logistics information system enhances supply chain agility by supporting responsiveness, adaptability and collaboration across the logistics network.

The logistics information system enhances supply chain intelligence by enabling data-driven decision-making and real-time anticipation of disruptions, such as demand fluctuations or delivery delays. This allows the company to take timely corrective actions, improving both operational planning and strategic logistics decisions. This dimension was especially emphasized by technical stakeholders, reflecting a strong focus on analytics, forecasting and decision-support capabilities. Strategic profiles also underlined the role of business intelligence in performance management, while operational actors acknowledged its usefulness for planning and coordination. These findings support the hypothesis that the logistics information system strengthens supply chain intelligence., by providing predictive insights and reliable information to guide proactive and strategic decision-making.

## **5. Conclusion**

Logistics information systems have become indispensable for companies, especially those managing complex supply chains. It is a major lever for achieving savings and improving organizational efficiency.

This article has attempted to determine how the SQUALP system implemented by IMC influences supply chain performance. Through

the various interviews conducted at company level, we were able to see that the logistics information system is significantly transforming its supply chain management through improved responsiveness to demand fluctuations, increased operational efficiency, greater agility in adapting to change and enhanced decision-making through real time reliable data. These transformations contribute to better coordination with partners, optimized use of resources and reduced delays and costs.

Based on these findings, here are key recommendations to enhance the performance of the logistics system:

- Strengthen data integration for improved visibility and responsiveness;
- Invest in forecasting and simulation tools to support agility;
- Optimize traceability to reduce costs and waste;
- Provide continuous training on decision-support technologies;
- Conduct regular audits and updates to maintain system effectiveness and scalability.

Although our research results have demonstrated how the logistics information system greatly improves supply chain performance... However, it would be appropriate to complement this analysis with further research to address some of the limitations that can be identified in our research:

-Carrying out a questionnaire survey on a sample of companies to determine whether or not it is possible to generalize our research results;

- A comparative study between different logistics information systems (SQUALP, WMS, ERP, etc.) would enable us to identify best practices and the technologies best suited to the specific needs of companies of different sizes and sectors. This research could help determine whether certain systems offer specific competitive advantages over others.
- It would be relevant to explore how emerging technologies such as artificial intelligence and the Internet of Things (IoT)

can further improve the responsiveness, agility and efficiency of supply chains. Research into the integration of these technologies into logistics information systems could open up new perspectives for supply chain management.

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