

# The impact of information systems on the logistics industry.

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**Abstract**— Effective logistics management focuses on information, but with technology, a promotional influence can be applied for competitive logistics strategy. Integrating information technology (IT) into business involves using information technology to introduce, enhance, complement and extend skills. Information technology has made it easier for managers to focus on tactical issues and core skills, while enhancing the use of logistics intermediate businesses, such as distribution, by automating many tedious logistics operations. This study aimed to evaluate/highlight through a literature review the impact of information technology on the performance of logistics companies.

**Keywords**—logistics, informational systems, supply chain, management (key words)

## I. INTRODUCTION

The current era, as is well known, is characterized by technological developments and a constantly changing business environment at all levels. The complexity of the modern supply chain, as well as the need for informed business decision-making, create the condition for receiving and processing the available information as efficiently as possible.

These new conditions and continuous innovations push businesses to restructure the way they operate and redesign their internal business processes to adapt. The use of modern integrated information systems is necessary in order to effect this change.

The effect of these systems on the operation of the companies that use them is decisive in order for them to survive and grow. The introduction of information systems (IS) in supply chain management was initially limited to the automation of office functions. Information systems were seen as providing infrastructural support to the value chain and had an indirect impact on the competitiveness of a product. Companies have been able to save costs through information systems, but their use has not been largely felt by customers. With the intensification of competition, companies began to use

information systems to directly influence the processes that make up the value chain [23].

By leveraging such information systems, companies have been able to integrate similar functions across different sectors as well as reduce redundant activities, thereby enhancing their ability to meet complex customer needs and meet product quality standards [1].

Today Information Systems are used not only by large companies but also by medium and small ones. Their goal is to optimize the processes of acquisition, processing, storage, retrieval and distribution of available information. It is no coincidence that now Information Systems are not only used by businesses, but also find application in the public sector, in health structures, in the military and in many other sectors.

As it is easy to see, the reduction of complexity and the effective use of information offered by Information Systems contribute to the acquisition of a competitive advantage for their users.

This paper explores the impact and degree of coverage offered by Information Systems on business logistics processes.

## II. CONCEPTUAL APPROACH AND REASONS FOR INSTALLATION

In an increasingly competitive globalized market, the key to organizational success is the ability to maintain and increase competitive advantage.

From the late 1980s to the early 1990s, companies realized that offering only quality products was not sufficient to satisfy customer needs and maintain an ongoing buyer-supplier relationship [23]. Presently, customers demand comparable degrees of value in merchandise and the benefits that come from them.

This has created a new challenge of how to deliver these commodities to customers in the quantity and medium they

need, when they need it, where they need it, and still offer it at low prices [6]. Looking for mechanisms to address these key issues, companies have come to appreciate the importance of integrating information technology into logistics management and creating a heterogeneous group of buyers and sellers [3]. According to Morash and Clinton [18] supply chain integration connects a firm with its customers, suppliers and other channel members by integrating their relationships, activities, functions, processes and locations. This integration supports the current movement from contractual, long-term and often conflict-laden relationships to cooperative, long-term business partnerships and strategic alliances [15].

At the same time, the inclusion of logistics managers not only in overseeing the coordination of upstream companies that supply inputs but also of downstream companies that are responsible for distribution and after-sales assistance became necessary.

Effective logistics management focuses on information, but with technology, a promotional influence can be applied for competitive logistics strategy [3].

The integration of information technology (IT) into business operations involves the use of information technology to introduce, enhance, complement and extend skills [17].

According to Wilson et al. [34], information technology is exclusively related to computer hardware and software applications that transmit, store, transform, process, protect and securely retrieve any information within a company. With a significant number of companies taking advantage of IT today, it can be proven that IT and information technology exist to improve customer responsiveness. This has ultimately reshaped the industry, while also affecting the form of relationships between organizations [6].

Overall, the information system has been shown to have a significant impact on logistics performance and at the same time on overall company performance, helping to achieve efficiency and streamline information flow [4],[7],[12].

Information technology has made it easier for managers to focus on routine issues and core skills, while enhancing the

use of logistics intermediate businesses, such as distribution, by automating numerous tedious logistics operations [13].

However, due to increased costs and a widespread lack of expertise among users, the pace of IT validation remains sluggish, providing a huge opportunity for third party logistics (3PL logistics) sources to capitalize on innovative their information technology skills [31]. These third party operators exist to serve the non-core competencies of businesses while allowing them to focus on their core as they pursue their competitive advantages [11].

These responsibilities range from the very traditional functions such as packaging, storage, transportation, to less conservative ones that include tracking and tracing, invoicing, as well as customs clearance. As a manufacturer outsources logistics activities, the focus is on three achievements which are customer intimacy, product leadership, and cost reduction throughout the supply chain [13].

Consequently, a key function performed by information technology in the logistics industry is based on the synchronization and coordination of multifaceted supply chain processes within logistics operators and their customers [33].

One of the reasons a company is pushed to install an Information System is to improve its business processes. In an era characterized by constant changes and challenges, the organization offered by the installation of such a system is particularly important. An information system improves processes such as the overall reduction of operating costs, the utilization of business information and resources, the improvement of communication between departments, the improvement of customer service, the more efficient management of stocks and the warehouse in general, etc. Also, the resulting outputs must be used in the decision-making process at all levels (operational, tactical, strategic) as well as in the process of preparing strategic business plans [18], [5].

According to Christopher [6], the rapid exchange of information at a relatively low cost between supply chain (SC) partners is ultimately the greatest success of IT solutions. As

a result, efficiency was achieved in internal operations due to this high level of transparency.

Furthermore, situations at the operational, tactical, and strategic levels are made efficient and effectively improved through processes and systems that are designed, developed, and used on a regular basis to improve a variety of organizational and human problem-solving efforts using information technology [37]. This can be demonstrated, for example, when customer order data is recorded earlier - operational, improved use of production and transportation capacity can be realized - tactical, through appropriate resource planning or planning - strategic [6].

Therefore, the use of IT is not limited only to specific logistics functions but to overall activities of the companies that contribute to the achievement of the specific logistics objectives.

### III. THE ROLE OF IT SCIENCE IN LOGISTICS

In order to achieve efficiency and effectiveness in the logistics industry, information technology exists to serve the following according to Waters [33].

- i) Collection and collection of data for all services and products based on specific logistics functions, such as procurement, to provide real-time, reliable and accurate raw data.
- ii) Storing collected data in a specific IS in predefined categories and formats, such as a customer database management system.
- iii) Gaining economies of scale and implementing low cost strategies by applying transaction cost theory.
- iv) Development of generalized and rigorous information management policies, regulations and control measures through standardization of logistics operations and data retrieval process.
- v) Facilitate supply chain management (SCM) incident response and SCM performance evaluation to improve productivity and reduce costs by analyzing stored data to produce meaningful information for management decision-making.

vi) Collaborate with SC partners to reduce information lag time as well as misunderstanding and achieve visibility of data resources to all SC partners.

vii) Achieving planning and control of information exchange and flows through strengthening the core competencies and positioning of the SC focal organization.

viii) Facilitating the management of marketing, customer, product and service knowledge accumulated in supply chain management and sharing it with partners and suppliers in activities such as replenishment, forecasting and collaborative planning.

ix) Stabilizing the supply chain structure and strengthening relationships with neighboring upstream and downstream allies by managing partner and customer relationships through resource-based and rational views.

x) Enable SC competition globally through international sourcing and offshore production by developing SC resources and capabilities, and

xi) Elimination of duplicate activities such as supplier managed inventory in place of physical warehouses to achieve reengineering of SC operations.

Moreover, route planning systems for logistics and distribution companies are a type of advanced software application that aids in the optimization of transportation and delivery operations. The best route is determined by route optimization algorithms based on real-time data such as traffic updates, vehicle size, and driver schedules. It also continuously monitors performance by reporting driver information, fuel efficiency, carbon emissions, and a variety of other business performance indicators. Route planning software and route optimization can help reduce delivery costs significantly, which means increased profits for the company. Route planners use factors such as distance, traffic conditions to create an efficient plan that allows your drivers to make fewer stops on their routes and arrive at customers' doors faster. This can improve customer satisfaction scores and reduce late deliveries.[41],[42].

#### IV. LOGISTICS PERFORMANCE

As a subset of organizational performance, logistics performance depends on how logistics objectives are achieved and how resources are economically used to achieve them. that is, efficiency and effectiveness. This entails the concentration of operating costs, the means to promote income improvement and the means to promote shareholder value [18].

The ability to outperform in the logistics industry also depends on how organizations respond to continuous changes in the business environment, technology, customers, employees, infrastructure, locations, markets, costs, competitors, as well as products [33]. The performance of the logistics industry is also expressed by metrics such as profitability, innovation, productivity, efficiency and effectiveness [22]. In addition, in order for a logistics company to ensure performance, it should focus on motivation, analytical goal setting, reactive goal setting, and currency performance [38].

#### V. INFORMATION TECHNOLOGIES IN LOGISTICS

Shatat and Udin [29] when they conducted a study on Enterprise Resource Planning Issues, Challenges and Benefits revealed that systems like ERP have become one of the basic prerequisites for many companies that allow them to compete in markets both locally and international level. ERP has acted as the backbone for e-business and the entire supply chain, so it is considered as the "price of entry". The findings also revealed many benefits that ERP offers, such as cost reduction, efficiency improvement, scalability improvement, reliable and secure access to data and information, easy adaptability to various corporate settings, reduction in delivery time, as well as global reach through customer relationship management and supply chain management. The study also concluded some of the challenges facing ERP, including challenges in misalignment, cultural issues, integration and level of economic development.

Hazen [13] conducted a study on the Application of Information Technology in Logistics in China and revealed barcoding as one of the pillars of information in military support. He identified the need to create a corresponding

technical system that achieves logistic information. His findings revealed that the advanced adoption of 2D barcoding in logistics was useful for the automatic identification and description of materials in the logistics process. The technology has been adopted in military rescue to identify necessary medical evidence of military recruits, such as contradictions in drugs, blood types and identities.

Lynch (1990) when conducting a study on the impact of Electronic Point of Sale (EPOS) on marketing strategy and retailer-supplier relationships in the UK found that there was a significant force of EPOS in UK retail as merchants retailers and suppliers became more specialized. in its application and being aware of its tactical and strategic capabilities. This was due to technology's emphasis on developing innovative approaches to channel cooperation while simultaneously constructing new strategic alliance patterns.

Mohammadreza, B., Zahra, G. & Soudabeh [17] when conducting a study on Information Technology Trends in Logistics, revealed an important use of Electronic Data Interchange (EDI) as a factor that enables the achievement of competitive advantage for effective management supply chain. Findings revealed that as a primary enabler, EDI improved supply chain efficiency with approximately 50% facilitation of electronic file sharing by 2001. The researcher identified other prospective benefits associated with EDI such as the growing importance of retailers and the increase in the number of shipping warehouses.

Nyagawani [39] when he led a study on the impact of IT on supply chain management in Tanzania, the Commission on Aids (TACAIDS) revealed an important role played by the Office Automation System, particularly web-based technologies in creating virtual platforms that increased efficiency in the ordering process and cooperation with suppliers, improved transparency, reduced transaction costs, record management and elimination of information distortions and delays. Despite challenges related to the unavailability of IT infrastructure, public procurement laws and the cost of computers, the researcher recommended training to equip staff in the adoption process.

## VI. THE IMPACT OF IT ON LOGISTICS PERFORMANCE

Oyugi and Noor [19] led a study in Kenya on the role of information technology in supply chain performance and found a significant adoption of Enterprise Resource Planning (ERP) system in supply chain organizations. The findings indicated that there was significant value of IT in supply chain performance, as global rapid technological developments have confirmed the requirement for IT in security of goods, new product improvements and information sharing. The findings therefore concluded that supply chain optimization was possible through the integration of IT into its performance. As a result, reduced lead times, cost savings and flexibility were cited as benefits of the research.

Szymonik [32] when conducting a study on Information Technologies in Logistics in Poland revealed that systems such as ERP achieve effective logistics cost management through continuous analysis of financial results. With systems such as ERP, automatic data storage and retrieval can be efficiently handled while eliminating the chances of entering incorrect information. The findings also revealed that balanced inventory was achieved among the impacts of barcoding as it saved 25% of the labor time required for inventory management.

Shatat and Udin [29] again in their study continued to reveal more impacts of IT suggesting that many companies implemented ERP to standardize and speed up production processes, reduce inventory, improve customer service, facilitate reduce cycle time and improve scalability by offering flexible and comprehensive decision support. On the other hand, the researchers added that managers gained "control" over all business processes with results such as streamlining, speeding up business processes and improving decision making as a result of ERP adoption.

## VII. OBSTACLES TO THE PRACTICAL SPREAD OF INFORMATION

Saura et al. [40] when conducting an empirical study on Information Technology and Logistics Quality: A Base for Companies' Segmentation in Spain revealed that companies

could be grouped based on the level of introduction and use of IT and perceptions of the level of service quality they provided by the supplier. As companies wished to collaborate, IT systems faced complex challenges in sharing and integrating information, thereby reducing the level of customer satisfaction. The conclusions revealed that despite the use of IT to modify the logistics specificity of business areas, its adoption was still a challenge.

Wilhite et al. [36] revealed several barriers when researching drivers and barriers to innovation in logistics in the Netherlands. These barriers included financial costs and organizational rigidities, limited research dedicated to innovation and improving collaboration. Regarding organizational inflexibilities (support and encouragement), additional factors such as a low sense of urgency and the absence of relevant experience and knowledge were outlined as significantly hindering innovation and improvement in the logistics industry. Improving collaboration, on the other hand, revealed that managers were not fully familiar with such ideas, thus creating managerial barriers. They suggested that to improve innovation management, managers needed to be aware of what innovation could deliver by being aware of drivers and barriers to innovation.

The findings of their study identified barriers that hindered effective innovation in logistics practices, such as lack of information, infrastructure, financial constraints, lack of cooperation between actors such as government, supply chain members, competing companies, customs agencies, borders and controls and standards. Also, the findings identified a lack of trust in information technology tools and a fear of information system damage during the development of IT tools. Finally, the researchers concluded that financial - high maintenance costs - and organizational barriers - bureaucracy and tight management control - are also responsible for the poor integration of supply chain information sharing in the Indian manufacturing industry.

## VIII. EFFECTS OF IT ADOPTION

Despite the significant impact of minimizing manual operations, information technology has existed to provide greater accuracy, save energy and improve the quality of the industry. According to Robinson [23] and Szymonik [32], the effects of IT adoption include:

**Improved customer service/service delivery:** designing means to improve customer satisfaction involves analyzing the level of customer satisfaction and how it varies over time through service and product improvement. When done well, logistics services such as real-time cargo tracking, freight accounting, insurance and auto-pickup, when customized to suit the company and its customers, will help realize the cost and duration for the arrival of the cargo with automatic notifications. Other benefits relate to the preparation and management of logistics documents, invoices and local purchase orders (LPOs).

**Reduced costly errors:** by eliminating manual data entry errors that can lead to increased shipping costs in the transportation and logistics industry, systems like ERP efficiently handle automatic data storage and retrieval while eliminating the chances of entering incorrect information. Other companies outsource such services to ensure early detection of such errors and save costs.

**Balanced inventory:** logistics automation facilitates the full potential of up-to-date inventory while minimizing waste. On the other hand, efficiency is also improved through accurate records that also help minimize costs.

**Improved demand/supply planning:** technologies like ERP play an important role in helping companies reduce inventory while maximizing item convenience. This system achieves forecasting of purchases and inventory needs as it anticipates customer purchasing patterns to optimize inventory levels while fulfilling buyer requirements.

**Access to real-time evidence and load analysis:** improved business decisions from trends and company history can be generated through the ability to run reports and access real-time freight data. The availability of this data in real time

serves as a strategy for making total cost assessments while mitigating costly bad decisions in the future.

**Speed and scalability:** with more freight shipments and growth, information technology is proving its ability to suffice the available resources by managing departments such as transportation, freight and logistics by easily entering new data and keeping it running smoothly. However, the accounting features in these systems make it easy to consolidate multiple freight invoices into a single one for efficient management.

**Organizational control:** through an automated rules engine optimized for drivers and routing plans, the company can effortlessly regain control of risk, transportation costs, as well as cargo management. When devised and executed by logistics experts, these systems can force all users to follow policies, adjust custom corporate rules, thus ensuring efficient and cost-effective shipping.

## IX. CONCLUSIONS

From what was mentioned in the bibliographic overview of the subject, it is now more than obvious that the installation and use of Information Systems is a one-way street for modern businesses in order to improve their processes and survive in today's competitive environment. Their impact is undeniable in logistics and their use is an opportunity for businesses to gain a competitive advantage in this area.

Nevertheless, the success of the installation depends to a very large extent on the correct system selection, parameterization, and also on the human factor. In case the program fails to fulfill the objectives for which it was acquired in the first place then the significant cost of the investment will be borne by the business. In today's business environment the concept of information and its processing plays a decisive role. It is practically impossible to make informed business decisions at all levels without using the right tools. The Information Systems were created in order to provide solutions in this direction and certainly their evolution and improvement will offer even more solutions in the future.

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