

ORIGINAL ARTICLE

Contribution of ICT to Logistics Management of Fish-Exporting Companies

ABSTRACT

This study examines the role of Information and Communication Technologies (ICT) in the logistics management of fish-exporting companies across three significant cantons in the province of Manabí, Ecuador. The purpose of this research is to identify the benefits and major barriers to the implementation of ICT. A descriptive methodology with a quantitative approach was used, applying surveys to fish-exporting companies. The study findings indicate that high acquisition costs, organizational culture, and difficulty in using ICTs due to lack of training and knowledge are the primary barriers to the adoption of ICTs. In contrast, the benefits of ICT implementation include inventory turnover, cost and delivery time reduction, supply chain control, and increased international negotiations. The study also highlights that the usefulness of ICTs varies depending on the area of application. For example, in sales and customer services ICTs can improve commercial strategies and enhance customer satisfaction by delivering orders within agreed timeframes. In warehousing, ICTs can reduce idle time, increase stock flow, and prevent stock-outs. In finance, they can assist with budget analysis, cost organization, and access to statistical charts.

Keywords: ICT; logistics management; competitiveness; export companies.

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INTRODUCTION

Globalization and business competitiveness have compelled companies to take steps to improve their administrative processes and increase productivity by using technological tools that offer opportunities for growth and development, both domestically and abroad. According to Tarazona (2018), the adoption of Information and Communication Technologies (ICTs) is advantageous for logistics management in fishing companies. This is because ICTs facilitate communication between suppliers and customers, making it possible to meet requirements from every link in the supply chain.

Fish production and marketing companies have recognized the need to improve their customer communication strategies through the use of ICT applications. This not only allows them to build relationships, but also to thrive commercially through their implementation in logistics management. As a result, fish-exporting companies can benefit from more efficient production processes, improved supply chain control, and competitive advantages in this critical sector. These benefits contribute to the profitability of organizations applying them, through international recognition.

However, a significant issue in the Andean region, especially in Ecuador, is the logistics costs associated with foreign trade. In the first quarter of 2022, logistics costs increased by 25% compared to the same period of the previous year, mainly due to various challenges that arose after the COVID-19 pandemic. These challenges include quotas in maritime transport, rising fuel prices, and others (Primicias, 2022). Other constraints in the adoption of ICTs in logistics management include the high cost of acquiring ERP (Enterprise Resource Planning) systems, the need for human resources training, management of computer systems, adaptation to digital changes, compliance with rigorous quality standards, and ensuring data protection.

As stated by Landín (2017), Information and Communication Technologies (ICTs) are resources, tools, and programs used to process, manage, share, provide, and transmit information through various media and technological transformations that alter human relations and enable access to knowledge via the Internet. Similarly,

Slusarczyk (2019) highlights that the implementation of ICTs can offer opportunities to enhance productive, administrative, and technological logistics management across three sectors of the economy: governance, university, and business.

Technology has undoubtedly had a significant impact worldwide, both in personal and business relationships, resulting in significant changes for entrepreneurs. In many cases, it is through the internet that they are able to generate income from their offerings, which has led to the creation of information and communication strategies that provide greater support and viability to local and international negotiations (Barrio, 2016). Moreover, the increasing use of ICTs has resulted in changes in society, affecting the social, economic, and cultural aspects of users' lives. One of the primary objectives of ICTs is to meet the needs of customers and companies (Perdigón *et al.*, 2018).

Aguilar (2018) states that logistics management involves "planning, organizing, and controlling... with the purpose of delivering the product to the customer in the place, time and quantity required, taking into account the deduction of the costs incurred for it" (pp. 18-19).

For Pinheiro *et al.* (2017), logistics theory includes the following:

customer service, information flow and transportation usage, storage space, location of production and storage facilities, inventory control, order processing, procurement of inputs and raw materials, material transfer, distribution, packaging, returns, and forecasting the order volume. (p. 265)

Hurtado (2018) explains that the primary aim of logistics management is "to obtain the appropriate products in the required quantities, at the proper place and time, at a reasonable cost, everything in order to meet the customer's needs" (p. 17). This emphasizes the importance of control over supply, movement, and placement of not only inventory or products, but also personnel and materials needed for inventory transit. Mora (2016) emphasizes that companies find it increasingly difficult to meet customer specifications and market their offerings in a global environment covering economy, communications and international negotiations.

Therefore, he suggests that business logistics management is “an activity that generates product value in terms of timely delivery and cost reduction” (p. 31).

According to Calderón *et al.* (2017), the supply chain plays a fundamental role in logistics processes, as it enables the improvement of relationships between customers and suppliers. The authors argue that it “leads to increased company profits by reducing delivery and distribution times and enhancing information flow, resulting in a better balance between supply and demand” (p. 282). Thus, the supply chain provides business management with essential information on material flow and communications related to business activities and processes. An efficient, timely, and accurate flow leads to proper logistics management.

Barrientos (2017) emphasizes that “the introduction of the Internet has brought significant changes to companies, and those that do not adapt risk being expelled from the market” (p. 43). This underscores the impact of ICTs on organizations, particularly those in the commercial sector, as they strive to retain current customers and attract new ones in both physical and virtual spaces using technology. Furthermore, Carbonell *et al.* (2018) note that “new technologies applied to logistics can enhance productivity through the implementation of automated mechanisms for critical processes such as product collection, classification, and traceability” (p. 12). This highlights the importance and the positive impact of technology on logistics management for exporting companies.

In recent years, there has been a significant dependence on ICTs in business processes and society in general, due to notable technological and structural changes in industries. It is evident that efficient planning can enable the development of long-term projects and implementation of techniques to improve logistics management processes and operational performance of companies. Corporate coordination of external and internal processes, goal setting, resource allocation, and task organization can generate profitability and increase competitive advantage. From the above arises the need for this research, which is justified theoretically as it proposes relevant criteria on the contribution of

ICTs in the logistics management of fish-exporting companies operating in Manta, Montecristi and Jaramijó. It aims to identify how these technological tools affect logistics processes related to international trade and determine the factors involved in any conflicts. Based on the findings, it aims to determine the factors involved in the problem. The study will conclude with improvement strategies to effectively contribute to the solution of the problem.

As a result of the constantly evolving fishing industry, particularly in tuna fishing and canned food production, Manta has become one of Ecuador’s most dynamic cities, with a significant economic impact (Jiménez, 2016). With this in mind, the purpose of this study is to explore how information and communication technologies (ICTs) are contributing to the competitiveness of fish-exporting companies in Manta, Montecristi, and Jaramijó by enhancing their logistics management processes.

In this context, this article considers the following objectives:

- To identify the ICTs most commonly used by fish exporting-companies
- To determine the benefits of using ICTs in the logistics management of fish-exporting companies
- To identify the primary obstacles that hinder the implementation of ICTs in the logistics processes of companies operating in the fish business sector

METHODS

This research adopted a descriptive research design with a quantitative approach. The technique included a survey model consisting of ten objective questions designed to precisely determine the problem considered. According to Gabriel-Ortega (2017), descriptive research “utilizes an analytical method to characterize a specific situation or object of study, identifying its characteristics and properties” (p.146). Surveys are considered a valuable research method for collecting real quantitative data. Bravo and Valenzuela (2019) state that “it is through this process [...] that aspects such as knowledge, behaviors and attitudes are explained or compared. Thus, the idea is to represent a population

through the information obtained from a sample of individuals” (p. 3).

The survey was administered to 49 companies that produce and export fish in the cantons of Manta, Montecristi, and Jaramijó in the province of Manabí, Ecuador. These regions were chosen because of the significance of Manta and the surrounding cantons as main sites for fish-exporting companies. Of the 49 companies contacted, 41 responded, including 36 from Manta, 5 from Jaramijó, and 8 from Montecristi.

RESULTS

The results of the survey indicate that 85% of surveyed companies make purchases over the Internet, either frequently or occasionally, while 15% do not make online purchases. According to Toscano (2012), this is due to “widespread mistrust regarding online transactions in the Spanish-speaking market,” resulting in 19% of the population avoiding this type of transaction. Furthermore, the survey found that 88% of companies place a high level of importance on the use of ICTs in their logistics processes, since the application of these technological tools transforms the way business is done and promotes productivity. This is consistent with the assertion of Becerra-González *et al.* (2017) that ICTs contribute to business development and the creation of new businesses. In contrast, 12% of surveyed companies considered ICTs less important in their logistics processes.

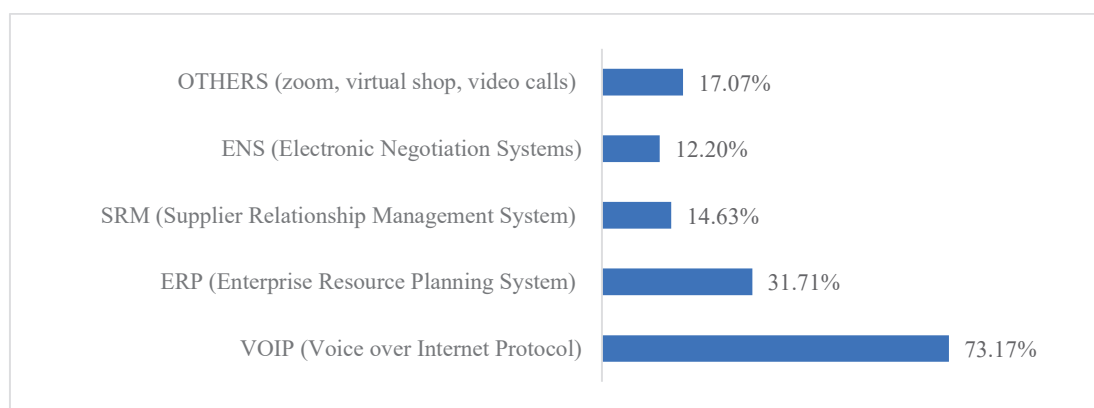
The information collected shows that 36% of fishing companies agree that the develop-

ment of information technologies facilitates logistics processes, while 27% agree strongly. Additionally, 22% state that they neither disagree nor agree. Therefore, the development of ICTs has gained significant acceptance among the analyzed fishing companies, as well as their application in internal and external logistics processes. These findings are consistent with Silva’s (2018) assertion that technology has a positive impact on logistics operations by facilitating planning and resource allocation processes, optimizing time, and reducing goods transportation risks.

The results show that preferences for the application and use adaptation of ICTs vary across fishing companies. The most commonly used technology in these companies is VOIP (Voice over Internet Protocol/Internet calls), with 73.2%, which shows that entrepreneurs are in constant communication with members of the company or branches through different types of software that allow online meetings. Following VOIP is ERP, with 31.7%, which integrates all of a company’s information and functions to automate communication and organization processes inside and outside the facilities (Zambrano *et al.*, 2020). Implementation of these technological resources enables agile communication and a constant flow of information through different electronic media, thereby improving relationships with customers, distributors, branches, and suppliers. However, only a few companies use Supplier Relationship Management and Electronic Negotiation Systems (see Figure 1).

Figure 1

ICTs used in international negotiations



Note. Prepared by the authors, 2023.

Email is the ICT most commonly used in internal logistics management for companies, accounting for 68% of usage. It is considered the most practical method for exchanging information both within and outside the company. Following email, other commonly used ICTs include e-procurement systems, barcodes, and cloud systems (as shown in Figure 2). E-procurement involves the use of electronic means to purchase products from various online catalogs, while barcodes are used to code finished products, which is essential for entering commercial chains or for exporting products. Finally, cloud systems are used for storing information on a private digital platform, allowing access and sharing of information from any electronic device with internet access. In addition, ERP

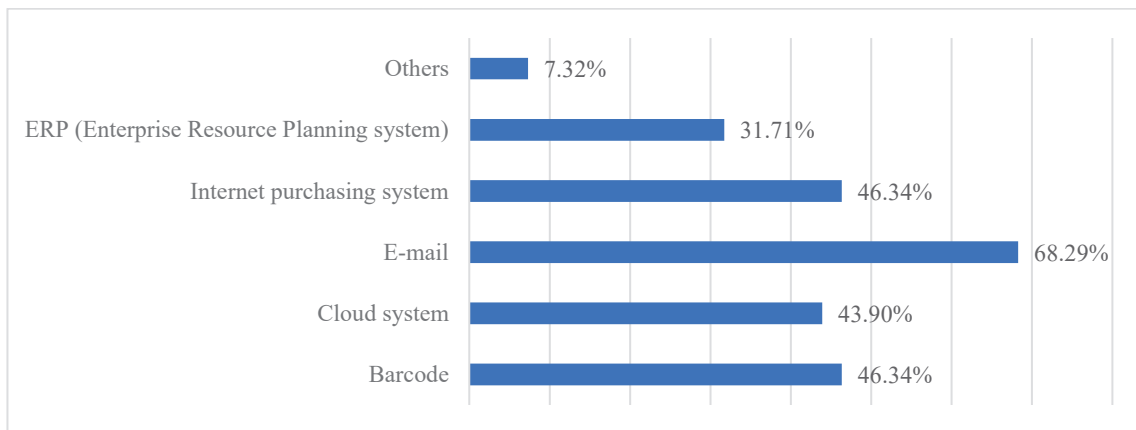
systems are a crucial technological tool used for the development and management of companies through computer systems. This system encompasses administrative, productive, accounting, and management processes.

Fish-exporting companies in the city of Manta primarily use two ICTs for their distribution logistics processes: EDI (Electronic Data Interchange) and GPS (Global Positioning System), with usage rates exceeding 50%. In contrast, the usage rates of TMS (Transportation Management System) and CRM (Customer Relationship Management) are both less than 25%, as shown in Figure 3.

According to Rocha and Echavarría's (2017) research, ICTs are a requirement for

Figure 2

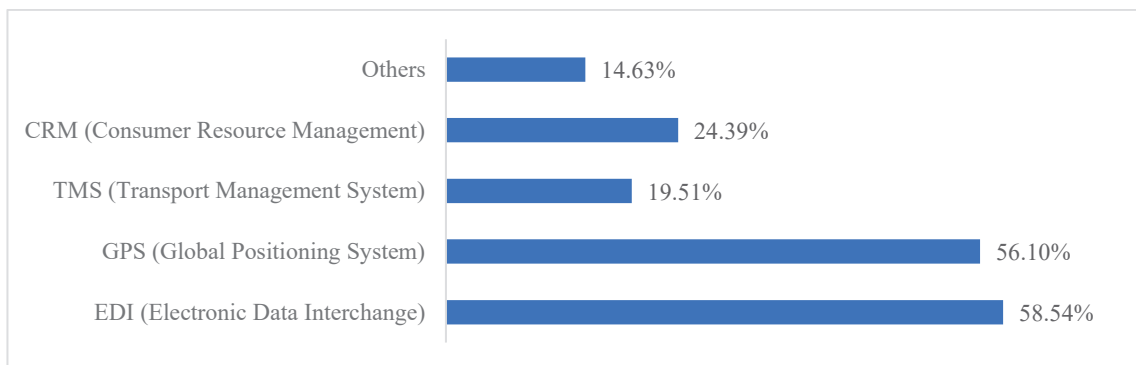
ICTs used in internal logistics management



Note. Prepared by the authors, 2023.

Figure 3

ICT used in distribution management



Note. Prepared by the authors, 2023.

companies to remain competitive in the market by utilizing existing technological resources. Therefore, it is widely accepted that ICTs offer numerous advantages to companies. The fishing companies surveyed report that the use of ICTs results in a number of advantages, including improved overall production and service quality, increased flexibility in adapting to the market, and a competitive advantage in terms of delivery times, stock rotation, and customer response. These advantages account for 48.8%, 46.3%, and 41.5% of responses, respectively, as illustrated in Figure 4. These findings indicate that ICTs can enhance a company's competitive position in the global market and enable more efficient activities within the value chain (Oliveros and Martínez, 2017).

In addition to the advantages previously mentioned, the use of ICTs by fishing companies also results in a reduction of costs and the generation of perceived benefits, as reported by 36.6% of respondents. New technological processes create the need for digital services and equipment to support the installed software, which can have a favorable impact on the company's accounts. Lastly, 19.5% of fishing companies reported other benefits of ICT use, including the ability to control the fishing fleet and track it using GPS systems, as well as managing the sales force and monitoring stock using an ERP system. Additionally, the use of a CRM system for communication with customers can lead to improved brand loyalty, procurement,

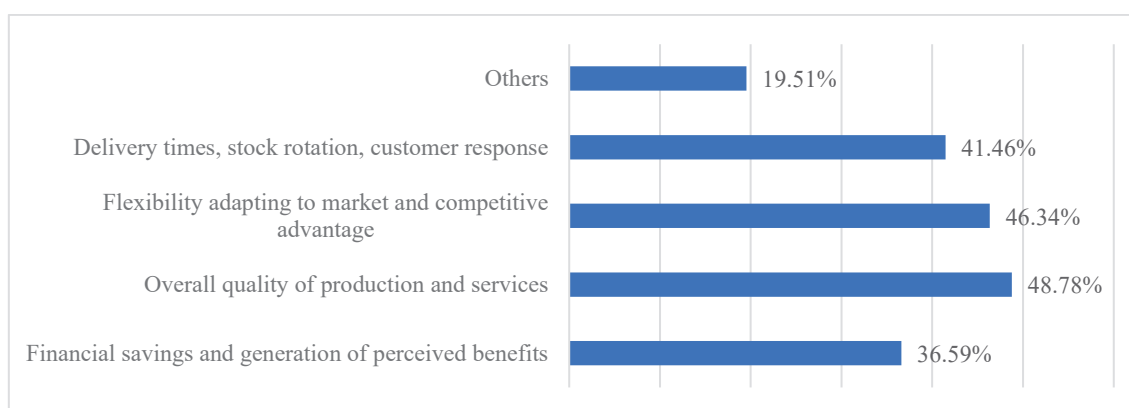
and purchasing, according to de Vass *et al.* (2018).

The data collected indicates that most companies surveyed believe that the primary benefit of adopting ICTs is the reduction of delivery and distribution times, with 53.7%. This reduction in logistics times is attributed to improved production, shipping, and flow of uninterrupted information resulting from the implementation of technological solutions. Additionally, companies report that the use of ICTs leads to an increase in the flow of information, with 51%, and proximity to potential customers and increased negotiations, each with 43.9%. The latter benefits arise from a desire to improve commercial relationships with suppliers of raw materials and other materials, as well as to enhance commercial negotiations and seek potential customers. These additional benefits are illustrated in Figure 5.

The main barrier to the implementation of ICTs in fish-exporting companies in Manta is the high acquisition cost, as indicated by data presented in Figure 6. These systems are complex and powerful, resulting in a high market value that can reach up to US\$5,000 gross per year, depending on the needs, customization, and number of users (Consultor especializado, 2020). Additionally, the lack of organizational culture is another obstacle to the implementation of these technologies. This suggests that companies are not aware of the long-term

Figure 4

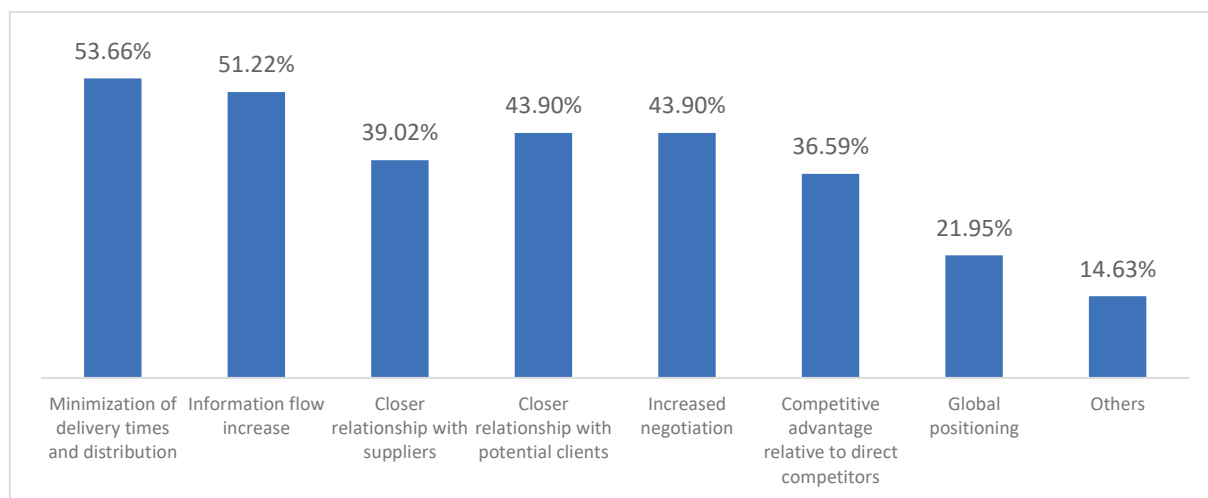
Business benefits with ICT adoption



Note. Prepared by the authors, 2023.

Figure 5

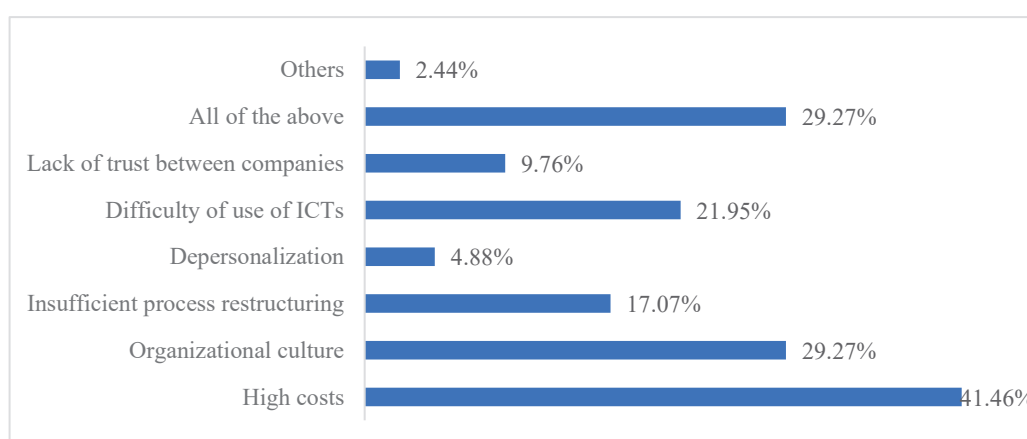
Benefits obtained after ICT adoption



Note. Prepared by the authors, 2023.

Figure 6

Barriers to ICT implementation



Note. Prepared by the authors, 2023.

benefits of using and developing ICTs in logistics management. Some fishing companies are managed by people who are accustomed to face-to-face processes, downplaying the importance of ICT use and falling into mistrust. While lack of trust is not a major obstacle to the implementation of these technologies, there is disagreement regarding the provision of confidential information such as off-balance sheet records, customer portfolios, formulas, etc. To avoid this type of situation, most companies sign contracts with confidentiality agreements regarding the information provided to these companies.

DISCUSSION

The use of ICTs has been increasingly significant in various aspects, particularly in international relations, according to Díaz (2014). It facilitates interaction and communication between entities from different countries and even contributes to increasing the possibilities of doing business between them. This situation is evident in the analyzed fish-exporting companies, as 76% of them use digital media for international communication, while 24% prefer traditional negotiation processes, i.e., face-to-face meetings.

For Carbonell *et al.* (2018), the primary technologies employed in distribution logistics processes include TMS (Transportation Management System), CRM, ECR (Efficient Consumer Response), which is based on the use of barcodes and EDI (Electronic Data Interchange), EPC (Electronic Product Code), and GPS. Based on the results, it can be stated that most fish-exporting companies utilize EDI (58.5%) and GPS (56.1%) in their distribution logistics processes. Additionally, approximately 24.4% of these companies implement CRM, 19.5% use TMS, while 14.6% rely on other technological tools such as RFID (Radio Frequency Identification), e-procurement, and digital platforms.

The use of ICTs has significantly contributed to the logistics management of fish exporting companies, enabling them to expand their reach globally and attain recognition as high-quality producers. Cano-Pita (2018) asserts that companies that have benefited the most from technology are those that assess the potential impact of technological tools on their operations prior to implementation. Furthermore, ICTs promote more efficient and productive work by facilitating improved communication, collaboration among team members, effective management of existing products, financial analysis, and increased product visibility in niche markets.

According to Correa and Gómez (2009), the primary barriers to adopting ICTs in companies include “high implementation costs, organizational culture, insufficient restructuring of processes, and lack of trust between companies” (p.37). For fish-exporting companies, one of the primary hurdles to adoption is high implementation costs, with 41.5% of respondents identifying this as a major challenge. This is because customized information systems are complex and require high performance, making their cost higher in the market (Consultor especializado, 2020). Additionally, according to Carbonell *et al.* (2018), high costs is a significant obstacle to ICT implementation in companies as they hinder access to technological tools. Organizational culture, accounting for 29.3%, is another significant barrier to technology implementation. This is because some companies are unaware of the benefits of using ICTs in logistics management, and some are still

managed by individuals who prefer traditional processes, leaving them aside and increasing distrust in ICTs. A smaller percentage of companies, 9.8% and 4.9%, respectively, consider the lack of trust between companies and depersonalization as barriers to the implementation of ICTs.

CONCLUSIONS

- The studies conducted on logistics management processes in fish-exporting companies located in Manta, Montecristi, and Jaramijó have yielded insightful results. The adoption of various Information and Communication Technologies (ICTs) has been found to enhance the effectiveness and sustainability of supply chain processes. Furthermore, implementing these technologies enables better organization of different areas within the company, leading to improved operational and administrative performance. The use of ICTs provides benefits in decision-making, planning, and execution of strategic activities for production and future negotiations. This approach helps maintain process quality and enables companies to achieve desired objectives.
- Companies focused on continuous development have invested in acquiring ICTs such as Enterprise Resource Planning (ERP) systems to meet requirements by distributors, final consumers, and suppliers. These technologies also aid in improving the practice of internal and external logistics management. The study identified *e-procurement*, GPS, CRM, EDI, RFID, and other tools used in logistics management processes in the fish-exporting companies studied. It is recommended that these technologies be complemented in the various company processes. Moreover, to ensure proper functioning, constant training, and organizational restructuring should be considered.
- The study revealed that the high costs of acquiring ICT services and the lack of organizational culture are the main obstacles to implementing ICTs in logistics processes in the fishing sector. Most companies lack sufficient capital for implementing ICTs, and many owners reject electronic systems within the company due to traditionalism.

They argue that the technology will not generate profits, but rather unnecessary expenses. Additionally, to many employees the systems become challenging due to a lack of preparation and training in their use.

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Competing interests

The authors declare that there is no conflict of interest.

Authors' Contribution

Yandri Javier Franco-Medranda (lead author): Collection/obtainment of results, analysis and interpretation of data, writing of the manuscript and critical review of the manuscript.

Claudia Alexandra Zambrano-Yépez (coauthor): Conception and design of the work, analysis and interpretation of data, writing of the manuscript, critical review of the manuscript and approval of its final version.