Digitalization and Performance Management Systems: A Shipping Agency Case Study

Assunta Di Vaio[*], *Luisa Mastellone*[**], *Luigi Lepore*[*], *Luisa Varriale*[***]

Abstract:

This study examines how the digitalization of information processes embraced by shipping intermediaries (i.e. shipping agencies) within supply chain management (SCM) changes performance management systems (PMSs). This exploratory study uses the lens of stakeholder theory and adopts a case study methodology to investigate a shipping agency based in Italy. It uses primary data collected from semi-structured interviews and secondary data. The data were collected from November 2022 to March 2023. The results indicate that the digitalization of information accounting processes has boosted the adoption of key performance indicators (KPIs) to monitor and evaluate the effectiveness and efficiency of operational processes. The results also reveal that, in the agency relationship between agent and shipowner, the agent does not use the benefits of PMSs to identify strategic KPIs for the business. This study highlights that when adopting PMSs in shipping agencies, it is necessary to include both an information accounting and an organizational dimension. Managers should be involved in training programs supporting a culture of sharing information through digitalized systems. The main limitation of this study, due to its exploratory nature, is the lack of analysis including the shipowner's perspective and the impossibility of generalizing based on the results. To the best of our knowledge, this is the first study to investigate digitalization, PMSs, and SCM in terms of the organizational-accounting frameworks of shipping agencies.

Keywords: Digitalization, Performance Management Systems (PMSs), Shipping Intermediaries, Shipping Industry, Stakeholder Theory, Key Performance Indicators (KPIs).

[*] Department of Law, University of Naples "Parthenope", Naples (Italy). Corresponding Author: susy.divaio@uniparthenope.it.

[**] Marinter Shipping Agency Srl, Naples (Italy).

[***] Department of Economics, Law, Cybersecurity and Sports Science. University of Naples "Parthenope", Naples (Italy).

Management Control (ISSN 2239-0391, ISSNe 2239-4397), 2024, 2 – Special Issue
Doi: 10.3280/ MACO2024-002-S1009

1. Introduction

In the last two decades, scholars' and practitioners' attention to the theme of the digital transition – specifically digitalization within any organization, industry, and area – has increased. Digitalization significantly involves and affects the overall supply chain of products and services (Pargman et al., 2023). The digital transition increasingly involves supply chain management (SCM) and the business organizations that are part of it. Digitalization appears to be the main challenge faced by all actors within SCM; indeed, firms face the challenge of making decisions about the implementation of advanced technologies and digitalized business processes in many areas, including accounting and human resource management, among others (Di Vaio et al., 2023). This transition requires the radical transformation of the environments, processes, and businesses that are primarily responsible for effective and efficient organizational processes to achieve high performance.

In this scenario, intermediaries play a key role in facilitating transactions and ensuring effective and efficient SCM. More specifically, shipping intermediaries operate in the highly complex sector of the shipping industry, which is one of the most influential for the fate of the world economy (Nikitakos and Lambrou, 2007). Digital transformation in the shipping sector yields both beneficial and adverse outcomes, as has been noted by various scholars (Balci, 2021; Quitzau et al., 2018). Accordingly, shipping intermediaries need to confront the challenges posed by digitalization and prioritize the enhancement of their performance management systems (PMSs). To address these challenges, many shipping intermediaries tend to implement PMSs based on digitalization (Xu et al., 2019). These systems enable them to oversee and assess their performance by using industry-specific key performance indicators (KPIs), including delivery punctuality, information precision, and customer contentment.

The implementation of digitalization-based PMSs requires a holistic view that considers the interests of all stakeholders in accordance with the stakeholder theory based on the dependence of resources (Freeman, 1984; Freeman et al., 2010). Shipping intermediaries must therefore consider the needs and expectations of all stakeholders – including shipowners, customers, logistics service providers, carriers, and port authorities – to maximize the value of the entire supply chain, as well as the sharing of resources (including digital ones). While qualitative studies have predominantly been used to examine the shipping industry, ongoing changes such as the evolution of PMSs in shipping intermediary firms due to digitalization are notable. These changes often stem from decisions made by shipowners, with effects that

extend to the managerial accounting systems of shipping intermediaries – that is, the shipping agencies. The persistence of this transformation is largely attributed to industry characteristics. Also, the intermediary firms within the industry, which are commonly small and family-owned firms, make them reluctant to share information and do not lend themselves easily to quantitative studies. Therefore, this exploratory case study – in line with stakeholder theory and based on the dependence of resources – addresses the following research question:

(Q1) Does digitalization change the operational processes and PMSs of shipping intermediaries?

The remainder of this study is organized as follows. The theoretical background section introduces the main issues regarding the digital transition, digitalization, and PMSs for the intermediary organizations through the lens of stakeholder theory. The methodology section explains the case study methodology adopted. The results section describes the data analysis and results. The discussion section critically explains the results, implications, and limitations of this study and offers directions for further research. The final section briefly provides some final remarks and the conclusions of this study.

2. Theoretical Background

There has been significant research into the digitalization of organizational-accounting processes across various industries over the last three decades. This has led scholars and practitioners to focus on analyzing the factors influencing digitalization, its effects, and the intricate decision-making processes involved. There is also growing interest in understanding how digitalization affects firm performance, particularly by enhancing operational processes and procedure (Calderon-Monge and Ribeiro-Soriano, 2024; Zhai et al., 2022).

Digitalization is the use of digital technologies to change the operational processes, thus providing new revenue- and value-producing opportunities. It creates more opportunities for value creation, which leads to greater competitive advantages (Büyüközkan and Göçer, 2018). Digitalization, traceable to various platforms, websites, social media, artificial intelligence (AI), blockchain technology, machine learning, cloud computing, 5G Internet, the Internet of Things (IoT), big data analytics, virtual reality systems, and connected devices, has led to "datafication" (Di Vaio and Varriale, 2020a; Gupta and George, 2016). Digitalization can thus be defined as the integration of digital technologies into all those components of everyday life that can be digitalized (Gray and Rumpe, 2015). Digital technologies have changed

business processes and procedures, and organizations have been forced to adapt (Attaran, 2020). Digital technologies, with the related digital transformation process, can significantly affect how firms and other organizations perform, especially the overall SCM, with relevant implications for their PMSs. This can be observed in the maritime industry and involves all actors, including ports, shipping agencies, and shipping companies, among others (Ferreira, 2024; Di Vaio and Varriale, 2020b).

Decision-making and management processes are closely related to the concept of PMSs; they are characterized by two components: efficiency and effectiveness. PMSs are affected by information technology and digital technologies, which can drastically change how performance is measured (Neely, 1999), as firms seek to make PMSs dynamic in deploying changes in the external and internal environments (Bititci et al., 2000). Highly developed information systems can thus create successful PMSs initiatives (Bourne and Neely, 2003). Considering digitalization as a key enabling factor to improve PMSs, the basic idea is to define the best systems for more effective and efficient processes with positive effects on firm performance (Holmström et al., 2019) that are also able to drive the managers undergoing the digital transition to achieve high performance. The PMSs consist of a set of metrics useful for gauging the efficiency and effectiveness of actions (Neely, 1994). To use these performance measurement outcomes, firms must be able to realize the transition towards PMSs (Amaratunga and Baldry, 2002). According to previous studies, a performance measurement system (PMS) can be seen as the combination of evolving formal and informal mechanisms, processes, systems, and networks used by business organizations to convey the key objectives and goals defined by management. It also assists the strategic process and ongoing management through activities such as analysis, planning, measurement, control, rewarding, and broadly managing performance to support and facilitate organizational learning and change (Mancini and Piscitelli, 2018; Ferreira and Otley, 2009; Otley, 1999). Therefore, PMSs include "general processes, both the formal mechanisms, processes, systems, and networks used by organizations, and the more subtle, yet important, informal controls that are used (Ferreira and Otley, 2009, p. 264). PMSs also influence managerial behavior, thus ensuring that managers' knowledge and motivation are suitable for pursuing organizational goals (Otley, 1999).

Some scholars have suggested that advanced PMSs supported by digital technologies are useful, especially for collecting information within and between firms by intensifying inter-organizational relationships (Mancini et al., 2021; Mancini and Piscitelli, 2018; Mancini, 2016), as well as for their pos-

itive impact on workers' performance, satisfaction, and expectations (Rotondo et al., 2019; D'Onza et al., 2015). PMSs require the assimilation of various indicators – classified as service, management, quality, productivity, and efficiency – to consider significant aspects such as information technology, value chains, core values, value creation, institutional pressures, and stakeholder engagement (Ghobakhloo et al., 2023; Chen et al., 2015). The integration of these indicators into PMSs is also empowered by the introduction of digital technologies (Norreklit and Cinquini, 2023; Corsi et al., 2017; Cinquini et al., 2013).

In this general portrait, intermediary players can adopt PMSs to exploit the advantages derived from the capacity to process multiple pieces of information simultaneously, which in turn can influence directly and coordinate the different flows (Saleheen et al., 2018). The supply chain performance measurement model is likewise the result of linking the various intermediary players (Gunasekaran et al., 2004). In the last two decades, the literature has paid particular attention to the issue of intermediary players, who have been defined as facilitators of innovation to highlight their active engagement in network- and system-building activities (Klerkx and Aarts, 2013). At the same time, intermediaries are entities who shape transmitted elements, such as consultants providing specialized services within the supply chain, or actors merely facilitating the flow of (without altering) goods or knowledge (Stewart and Hyysalo, 2008; Latour, 2005). Their role in innovation facilitation is examined in the context of dynamic intermediary ecology, where different players adapt their positions based on skills and operational models. This dynamic ecosystem necessitates intermediary roles to evolve alongside process innovations and technological maturity, thus supporting the entire digital transition overall (Klerkx and Aarts, 2013).

2.1. Performance Management Systems in Shipping Intermediaries through the Lens of Stakeholder Theory

Shipping intermediaries include brokers, custom brokers, and especially shipping agents, also defined as ocean freight intermediaries (Clott, 2000). They can contribute to the digital transition of the shipping industry as a network or assemblage of players (Heilig et al., 2017). In such a network, digital technologies can facilitate the exchange of information between the different shipping intermediaries, while also promoting real-time information and reducing paper consumption. Digital technologies can thus support shipping intermediaries by positively affecting their PMSs (Tijan et al., 2021). The

shipping industry is characterized by great complexity, which makes it particularly sensitive to the digital transition. In the port supply chain – and the shipping industry in general, which is characterized by a high level of competition – the fundamental role of PMSs is fortified by the integration of quality management tools to ensure survival in turbulent environments (Otheitis and Kunc, 2014; Cagnazzo et al., 2010). Indeed, the adoption of quality management tools is considered more of a marketing tool in the shipping industry (Goulielmos et al., 2008), as it enhances operational performance (Triantafylli and Ballas, 2010), which naturally includes forms of PMSs. Quality management tools such as the specific indicators included in ISO certifications can be integrated into PMSs, supporting high performance. The literature in the last decade has focused on intermediary players, but the topic of shipping intermediaries has received less attention (Surucu-Balci et al., 2024; Lambrou et al., 2019). Stakeholder theory, which emphasizes resource dependence and employs descriptive and instrumental approaches (Preston, 1990; Bailur, 2006; Freeman, 1984), has been extensively applied in SCM, particularly within the shipping industry's digitalization focus. However, there is a scarcity of studies examining its adoption in the context of integrated digitalization and PMSs among shipping intermediaries. Accordingly, this exploratory study adopts a stakeholder theory approach, emphasizing resource dependence, to examine how shipping intermediaries integrate technology solutions into their PMSs within SCM. This approach offers valuable insights into how these stakeholders enhance their overall performance by optimizing organizational and information-accounting processes. The descriptive theory of stakeholders is also employed to delineate the nature and variety of technology solutions and PMSs over time, thus providing a comprehensive understanding of their evolution within the shipping industry.

3. Research Methodology

This exploratory study analyzes the Marinter Shipping Agency Srl, which is a multi-firm shipping agency operating in the port of Naples (Italy). It has 12 employees and had a turnover of EUR 4.5 million in 2022. This shipping agency was chosen for several reasons. First, this firm had a high volume of activities and profits in the last three years (https://www.fatturatoitalia.it/), which indicates its considerable position in a highly competitive industry, despite its small size in terms of employees and being predominantly family run. Second, this firm consists of a multi-firm shipping agency. Finally, over the last 10 years, it was involved in a complex and large process of organizational

change that involved institutional pressures for adopting technology within their organization for managing all their activities, operations, and processes.

According to Bichou and Bell (2007), shipping agencies are appropriate intermediaries for SCM, as they handle several operations in the ship–port interface. The case study methodology uses qualitative analysis to investigate unexplored phenomena (Scapens, 2004; Gibbert et al., 2008; Eisenhardt, 1989) by collecting empirical material (Tronvoll et al., 2020). The need to use a case study approach here is related to the investigation of a contemporary phenomenon in its real-life context, especially when the boundaries between phenomenon and context are not evident (Yin, 1981). Following this approach, it is possible to separate phenomena from their contexts and examine specific variables (Yin, 1994). The choice to adopt a single case study related to a specific organization also specifically allowed us to obtain insights that would not be traceable in other situations. This choice also represents "a great way to motivate" a research question and persuade readers and reviewers (Siggelkow, 2007). A case study can be used to explain the development of a phenomenon over an extended period (Ahrens and Chapman, 2006), and some scholars have focused on case studies (Voss et al., 2002; Crotty, 1998) to provide further insights and to overcome the limitations resulting from a lack of replication (Yin, 2006; Eisenhardt, 1989).

This study used both primary and secondary data. The data were collected from November 2022 to March 2023. The primary data are represented by interviews (Table 1), which were supported by a semi-structured questionnaire containing sections related to the following specific sections/areas of investigation: general information (age, gender, role and function of the manager interviewed; seniority in the organization and in the industry and background of the manager interviewed; short history about the shipping agency; governance and strategy of the shipping agency; and so forth); digitalization (digital transformation about the operational processes within the shipping agency investigated, timing schedules about the digitalization process, specific software adopted, description of the main operational processes for each specific area, and so forth); new technologies; and performance systems (description about the development and adoption of performance systems, timing schedules, and so forth). All the sections were debated during the interviews, thus providing details about if and how, within the shipping agency investigated, digitalization was linked to their PMSs to improve operational processes and overall performance.

The interviews were conducted by one of the authors, who is a member of the board of directors of the shipping agency investigated. The managing director, the chief financial officer (CFO), and the chief operating officer (COO) were interviewed in the period from February to March 2023. Each

interview lasted about 50 minutes. The interviews, conducted during face-to-face meetings, were recorded using a digital device. The recorded interviews were shared among all the authors, who then discussed them and proposed possible different readings about them on the topic of analysis. To understand the data deriving from the interviews better, the authors analyzed the secondary data together. The secondary data, collected during the same interviews, include non-financial documents, reports produced by software, and emails from business partners, which are useful for identifying the evolution of the shipping agency investigated and some of the key performance indicators (KPIs) considering digitalization and PMSs together.

The secondary data were also analyzed by the managing director, CFO, and COO during the meetings to collect further comments and suggestions to gain a better understanding of the business processes and the actions taken within them for PMSs aimed at ensuring higher performance. During the interviews, the functioning of the software *TeamSystem Enterprise*, *Navision*, *Afsys*, *Hyperion*, and *Global OA* was also demonstrated. As the literature suggests (Glesne and Peshkin, 1992), the business and organizational processes were directly observed during the interviews. The direct observations made it possible to reveal insights into the structures, processes, and behaviors of the people already interviewed, which would not be accessible through other data collection methods (Furlong, 2010). Such triangulation of data sources, including primary data, secondary data, and direct observations, allowed us to develop a comprehensive understanding of the phenomenon and verify the test validity through the convergence of information originating from different sources (Patton, 1999).

Table 1 - Interviewees' Information

MEETING/INTERVIEW WITH	NO. OF MEETINGS AND INTERVIEWS	TOTAL DURATION (MIN)	SECTIONS
Managing Director	1	50	• General Information • Digitalization • New Technologies • Performance Systems • Governance • Strategy
Chief Financial Officer (CFO)	2	30; 20	• General Information • Digitalization • New Technologies • Performance Systems
Chief Operating Officer (COO)	1	50	• General Information • Digitalization • New Technologies • Performance Systems

Source: Authors' processing

4. Results

Since 1985, the year of its foundation, the investigated shipping agency has tried to keep up with technological developments. From the start, it decided to equip itself with *Telex* to facilitate the exchange of information with shipowners, other shipping agents around the world, and, especially, the ships for which it had acquired the mandate. For several years, despite the advent of the fax machine, Telex was the main interface between the shipping agency and the other players in the seaport supply chain. Telex was therefore the first and fundamental technological tool used in the shipping agency business area.

The shipping agency and integrated logistics business areas primarily require technological tools that facilitate communication between the shipping agency, shipowners, ships, other shipping agents, port authorities (e.g. harbor masters), and the actors and intermediaries in the seaport supply chain. In these two business areas, in 1997, the launch of *Microsoft Office 97* software represented a turning point for the shipping agency. Telex was supplanted by *email*, a more practical and immediate tool. Email provided considerable advantages to all the characteristic and integrative functions implemented by the shipping agency but obliged the latter to train its employees in the use of this new tool. The digital innovation that has brought about major changes to the characteristic functions of shipping agency and integrated logistics is the *Port Management Information System* (PMIS). As a tool provided for by legislation, the PMIS was adopted by the investigated shipping agency in 2014, when it became operational in the port of Naples. With the advent of the PMIS, Marinter's employees no longer needed to visit the harbor master's office to carry out their paperwork but began to complete it in front of their PC in the office. While the exchange of information is supported by tools such as Telex, e-mail, and the PMIS, the accounting processes in the shipping agency and integrated logistics business areas require the implementation of specialized software, such as *Sysint*.

4.1 From Sysint to TeamSystem Enterprise

In 1995, Marinter decided to acquire *Sysint*, which is a computer program released by *TeamSystem*; its adoption represented a breakthrough in the firm's accounting processes. The idea of using software for accounting management was initially promoted by an external financial advisor. The shipping agency's business activity experienced a big increase in 1995, so it was no longer possible to manage the accounting movements externally; internal

accountants therefore had to start reporting. The external financial advisor's suggestion to acquire this software was confirmed by the managing director:

> *We were only prompted to purchase Sysint at the suggestion of our external financial advisor. At that time, we had no knowledge of management software. The choice fell on Sysint, as one of our accountants already knew some of the most basic functions of such software.*

The adopted software primarily facilitated accounting tasks through double-entry bookkeeping and balance sheet preparation. However, manual invoicing was handled using the Office package. Sysint was limited to use by accounting and administration personnel, primarily based in the agency's back office. The adoption of this software allowed the accounting department to manage accounting processes independently. Despite this, an external financial advisor continued to oversee tax compliance and provide consultancy services.

In 2013, following the implementation of regulations regarding electronic invoicing for private transactions, the shipping agency was obliged to upgrade its software to the latest version of Sysint, known as TeamSystem Enterprise. It has the typical characteristics of enterprise resource planning (ERP) software (Davenport, 1998) with a modular architecture, in which the information can be accessed and input by different people from different locations. Everyone can access the software and find any kind of information (Quattrone and Hopper, 2005). The shipping agency could, through the modules, handle different functions, such as administration, finance, and tax returns, budget, and management control. The shipping agency primarily makes use of the administration, finance, tax returns, budgeting, and management control modules, which are considered essential for supporting accountancy tasks. These modules make it possible to manage initial notes, monitor economic and asset status in real-time, and prepare balance sheets. TeamSystem Enterprise streamlines the invoicing process for the shipping agency. Invoices created through this software are seamlessly integrated into accounting records, ensuring compliance with electronic invoicing regulations when submitted to the appropriate authorities.

In this direction, the organizational process and the specific activities for the accountants are significantly simplified and made faster, and monitoring and control are effectively supported. Paper consumption is also significantly reduced. The CFO said: "In my opinion, cloud computing represents a very useful innovation. Thanks to this, I can control each aspect at any time and everywhere." Following the adoption of this last software, the accounting department was reorganized, including the CFO and three other individuals,

all women around 40 years of age, with a secondary school education. They exhibit significant flexibility in grasping digital technology features, as confirmed by the CFO: "When I ask my collaborators to learn a new TeamSystem Enterprise feature, they find the video tutorials and implement the knowledge acquired from them in a short time."

The accounting department of the shipping agency exclusively learned about TeamSystem Enterprise features through video tutorials provided by the software house. Despite tutorials on KPIs being available, they were not deemed relevant by the accounting department. The CFO said: "The development of KPIs is not something our management pays attention to."

4.2 From *Emulazione* to *Navision*

The container cargo segment, unlike other divisions, underwent substantial digital transformation due to agreements with Intersea Genova Srl and the establishment of Yang Ming (Napoli) Srl. This led the shipping agency to adopt management systems such as Emulazione and Navision software. These programs, created by the Italian general agent's programmers and shared with the shipping agency in 1997, are operational software and primarily targeted the operations department. They facilitated bill of lading processing, freight rate corrections, and global data transmissions (Proctor, 1997). This software also facilitated the acquisition of new skills among employees at the shipping agency, with a notably brief training period. The managing director stated:

> *As soon as we received the mandate, after just a week, we already had the programmers of the general agent in Genoa in our office who were installing Emulazione on our computers. In practice, our employees in the operations department did the training directly in the field.*

Navision, unlike Emulazione, is a comprehensive ERP system developed by Microsoft Dynamics. Yang Ming (Italy) Spa, the Italian general agent, obtained Navision and extended its use to Yang Ming (Napoli) Srl in 2007. Yang Ming (Napoli) Srl efficiently handles operational tasks with this software, including managing export container cargo bookings and issuing import cargo delivery orders. Export container cargo bookings, which are initiated by freight forwarders and confirmed by shipping agents, are the official documents securing the reservation of space on a vessel. Conversely, import cargo delivery orders authorize freight forwarders to retrieve containers from the port. Freight forwarders are the primary clients of shipping agents in container traffic. Navision not only facilitates operational tasks but also stream-

lines accounting management, as it features automated invoicing. This automation records each service-related financial transaction in the initial note, minimizing the accountants' workload. Navision also enables the generation of balance sheets directly from initial note entries and facilitates tax obligation settlements. Navision software benefits both SCM stakeholders and the accounting department, enhancing overall efficiency and effectiveness. The CFO said:

> *The automatic invoicing and the direct writing of the relative movement in the first note made it possible to facilitate and reduce the work of the accountants. It has allowed our department to focus more on other aspects of accounting as well.*

Although the adopted software allows the accountants to focus on other aspects of their work, no attention is paid to PMSs or KPIs. Navision has always supported the development of KPIs, but the shipping agency has not used these tools because they have never been required by management. In the same way, the COO highlighted that Navision has changed the way the operations department works:

> *Before the arrival of Navision, bookings were made manually on a form we prepared in Word and reported in a register kept by us. Instead, now the bookings are entered by the operations department in Navision, which in turn is able to generate them on paper or digitally. Digital bookings are then sent to customers via email.*

Employees underwent training conducted by Microsoft Dynamics at the general agent's Genoa offices to hone skills relevant to their roles. The shipping agency, a shareholder of Yang Ming (Napoli) Srl, pays Yang Ming (Italy) Spa an annual flat-rate fee to use Navision. This fee covers software access, training provided by the software house, and IT assistance from the general agent. The favorable fee stems from the longstanding trust between the general agent and Marinter. The adoption of both software programs has become vital for the shipping agency and was facilitated through its affiliate Yang Ming (Napoli) Srl. Given the dynamic nature of the container sector, proficiency in these systems is essential for adapting swiftly to technological advancements.

4.3 Afsys, Hyperion, and Global OA: Software Developed by the Yang Ming Marine Transport Corporation

The evolution of the container cargo sector led Yang Ming Marine Transport Corporation to develop Afsys, an autonomous ERP software in

2012. This software manages the entire process from booking issuance to bill of lading generation, including freight correction and data transmission for global agents. Designed by Information Dynamics, this software focuses solely on operational functions and provides a centralized system. It enables Yang Ming to oversee and coordinate activities across its global network of agents, thus enhancing control and standardizing procedures. Adoption of this software consolidates the shipowner's authority, while establishing clear rules and procedures that agents must adhere to, thereby streamlining decision-making processes. The limitation of decision-making power through the software was mentioned by the managing director: "With Afsys, we are controlled by the shipowner at any time." The centralized structure of the adopted software facilitates data gathering for KPIs. Consequently, Yang Ming (Napoli) Srl, operating as the sole agent of Yang Ming Marine Transport Corporation in the port of Naples and affiliated with the investigated shipping agency, was mandated to implement this software.

This software is used throughout the export process, starting from the initial booking request by freight forwarders to the confirmation of the booking and the generation of the bill of lading. The investigated software is also integrated into the INTTRA platform, enabling customers, particularly freight forwarders, to submit booking requests digitally, thus eliminating the need for traditional email communication. Thanks to this software, the export process has undergone a digital transformation that has led to increased speed and efficiency while also reducing paper use in the operations department. However, the implementation of the software required a training phase for employees and caused initial distress. The intensive week-long training, conducted by Information Dynamics representatives at the general agent's offices in Genoa, was entirely in English, which posed a challenge for employees with lower English proficiency levels – particularly those in operational roles with a B1 level of English proficiency. The COO said:

> *The main difficulty about the English language was accompanied by the need to memorize all the Afsys processes immediately. Indeed, during the training phase, no manuals or other types of material that could help us to carry out the functions were released.*

When learning the functions of the software used, the employees faced two main difficulties: the use of the English language during the training phase and the lack of a manual to support their work, which was not available to limit the disclosure of confidential information.

The use of this software by the shipping agency comes at no expense.

Instead, the general agent assumes responsibility for covering the shipowner's annual fee. This arrangement fosters a trusting relationship, enabling the shipping agency to reduce expenses associated with conducting cargo container sector operations. Nonetheless, Yang Ming Marine Transport Corporation maintains oversight over its agents' accounting procedures. More specifically, the Hyperion software, tailored to the shipowner's specifications, requires agents to furnish monthly reports and budgets, thus ensuring ongoing involvement in financial processes. The compiled reports and budgets form the foundation for the shipowner's consolidated financial statements. As a subsidiary of the Taiwanese shipowner, Yang Ming (Napoli) Srl is tasked with preparing these reports and budgets, which play a vital role in the consolidated financial statements. The data submitted via Hyperion by each shipping agency are subsequently used by the shipowner to establish precise financial KPIs.

Hyperion, the next software used, was developed by Oracle; it is a web-based program with archival capabilities that enable convenient access to uploaded reports from any device. This eliminates the need for physical archiving, further reducing paper use. However, the requirement for the shipowner to input data into specific accounts within the same software for consolidated financial statements places significant pressure on the shipping agency's accounting department. The stress from meeting the shipowner's demands and using this last software sometimes compels accounting staff to work overtime to ensure all data are entered promptly. The CFO said: "Every month the shipowner stresses us to complete in Hyperion the reports he requests and within the deadlines he dictates."

The accounting department staff received training on Hyperion via an instruction manual from Oracle. The use of this software enables the department to align with the financial KPIs mandated by the shipowner, enhancing performance evaluation. Because this software is provided free by the shipowner to Yang Ming (Napoli) Srl, the shipping agency bears no expense. Thus, the agency facilitates its accounting staff to familiarize themselves with essential PMSs tools without financial outlay. Moreover, by implementing Hyperion, the shipowner introduced the Global OA software, which enables shipping agents worldwide to input container loading and discharging lists, thus facilitating the creation of stowage plans. These plans are decisive for minimizing costs by reducing unnecessary loading and unloading movements at ports (Ding and Chou, 2015). Global OA not only gathers these lists but also generates operational KPIs for the shipowner. Through Yang Ming (Napoli) Srl, the shipping agency enters loading and discharging lists into Global OA for each ship call. This digital recording ensures easy access and

provides a reliable archive. The COO is the primary user of Global OA, having learned its functionalities from the instruction manual provided by Oracle. The COO said: "I had no problems using Oracle. The interface is very simple, and access is via the web browser." The use of Global OA does not involve any cost for the shipping agency, which operates through Yang Ming (Napoli) Srl.

4.4 Trust: Software Developed by the United Arab Shipping Company

Trust oversees all operational facets and manages the export process from booking requests to bill of lading issuance, including tasks related to data transmission and freight rate adjustments. Trust also plays a role in the import process by issuing delivery orders, a function not shared by Afsys. Unlike Afsys, Trust's jurisdiction encompasses both export and import processes (Figure 2 and Figure 3). Like Afsys, Trust operates in a centralized manner, enabling the shipowner to oversee the activities of its global network of agents. The implementation of Trust software for managing both export and import processes significantly reduced paper use, although it created challenges during the training phase due to its complexity. Training sessions lasted for a few weeks and were conducted at the workplace by experienced personnel from the general agent in Genoa. Despite the software's complexity, it fostered a closer relationship between the shipping agency and the shipowner. Previously, as a subagent, the agency had to communicate with the shipowner through the general agent, but Trust minimized this intermediary step. Like Afsys, Trust does not incur costs for the shipping agency; instead, the general agent covers the annual expenses. Leveraging the trust built over time with the general agent, the shipping agency gains access to digital tools without financial burden.

4.5. PMSs for the Shipping Agency

The evolution of digitalization within the examined shipping agency probably changed its PMSs. Collaborations with various partners likely prompted a heightened focus on performance control and monitoring. The partnership with a Taiwanese shipowner and an Italian general agent resulted in the formation of Yang Ming (Napoli) Srl, the introduction of advanced digital tools, and influenced the agency's performance monitoring. Consequently, the PMSs in container cargo operations underwent adjustments. Shared software like Hyperion, Afsys, Global OA, and Navision facilitated more precise and continuous performance monitoring across all partners. More specifically, the shipowner's KPI development and monitoring through dedicated software directed the agency toward structured PMSs. The

shipowner's aim to incorporate Yang Ming (Napoli) Srl into its financial statements also amplified the significance of shipowner-defined KPIs, which are tracked using specialized software.

Using Hyperion, the Taiwanese shipowner oversees the financial performance of its global shipping agents and employes specific KPIs for assessment. Financial KPIs are assessed quarterly via the Trial Balance process, using data provided by the shipping agency, a shareholder of Yang Ming (Napoli) Srl. This allows for comparison between actual and anticipated performance, while enabling the shipowner to seek clarification on discrepancies. Notably, financial KPIs are not shared with Yang Ming (Napoli) Srl, which contributes to the shipowner's overarching PMS without altering its own. The primary impact on Yang Ming (Napoli) Srl is the obligation for its accountants to furnish required information to the shipowner within defined deadlines. This has not led Yang Ming (Napoli) Srl to establish its own financial KPIs but has necessitated more precise performance monitoring. Similarly, the shipowner's discretion in disclosing operational KPIs, calculated through Afsys and Global OA, has resulted in limited visibility for Yang Ming (Naples) Srl.

The Afsys software offers a range of operational KPIs for firms. Yang Ming (Napoli) Srl primarily uses the Freight Checking Report Index, which is periodically communicated via email. This index, which is tied to turnover, quantifies the corrections made to freight rates on bills of lading sent electronically in the previous month. Monitoring this report motivates the company to enhance the accessibility and functionality of software, including Afsys. This focus on improvement is spurred by the desire to optimize operational efficiency and effectiveness.

Another operational KPI provided by Afsys is the INTTRA Booking Requests Index. This index is linked to turnover and measures the number of export booking requests processed on the INTTRA platform. In April 2023, Yang Ming (Napoli) Srl reported a result of 0 for this KPI, which indicates that no bookings were requested through INTTRA that month. The INTTRA Booking Request Index thus motivated Yang Ming (Napoli) Srl to better integrate its information with that of its customers, such as freight forwarders. Similarly, the Global OA software provides one KPI for Yang Ming (Napoli) Srl: The Operational Activity Performance Index. This index evaluates each agent's ability to finalize loading and discharging lists within 24 hours of the ship's departure, for both loading and discharging ports, respectively. Collected regionally, this KPI aims to enhance Yang Ming (Napoli) Srl's use of the Global OA software by improving operational efficiency. The efficiency in reaching the shipowner's goals can thus be effectively assessed using any of these three indicators (Table 2).

Table 2 - Key Performance Indicators (KPIs)

KPIs	Software	Value	Container Cargo
Freight Checking Report Index	Afsys	0%-100%	Yes
INTTRA Booking Requests Index	Afsys	0%-100%	Yes
Operational Activity Performance Index	Global OA	0%-100%* **on a regional basis*	Yes

Source: Authors' processing of Marinter's data

5. Discussion

The innovation process in accounting systems and PMSs within the investigated shipping agency followed the same evolution as IT and digital advances in general. This was confirmed by Granlund and Mouritsen (2003), who even argued that "from its earliest days, accounting information and technology were related." Similarly, it confirms how the adoption of specific digital technologies has transformed the data and information management protocols within the studied firm, while also influencing the working methods of accountants. Digitalization changes accounting practices (Karimi and Walter, 2015). Our results confirm that digitalization represents a key factor in changing PMSs, which becomes easier and more immediate. Inefficiencies are also reduced. According to Neely (1999), digital technologies can change how performance is measured, with positive implications for organizational processes as it improves them and makes them more effective and efficient. Indeed, in the case study analyzed, the introduction of software led to new forecasts and reports that made it possible to reduce costs and encourage a cultural and behavioral change (Duan et al., 2019). Marinter's collaboration with Yang Ming (Italy) Spa and Yang Ming Marine Transport Corporation in 2003, which resulted in the formation of Yang Ming (Naples) Srl, accelerated the digitalization of accounting systems and affected the PMSs of all stakeholders. Data from the PMSs of these business organizations are processed concurrently, directly shaping and aligning various operational processes (Saleheen et al., 2018). This suggests that PMSs and management control are no longer confined to internal operations but are influenced by external factors as well (Marchi, 2011).

The shipping agency analyzed in this study, in collaboration with the other two involved parties, was not only able to introduce cutting-edge digital software but also to enhance PMSs. The Taiwanese shipowner and the Italian general agent ere intermediaries influencing the adoption of innovations by gathering and disseminating information, thus facilitating digitalization within the shipping agency (Lichtenthaler, 2013). This role aligns with the concept of "facilitators of innovation" (Klerkx and Leeuwis, 2009). Moreover, the integration of different PMSs through software sharing among the involved organizations was reinforced by the shipowner's need to consolidate the financial statements of all parties involved into its own budget. The collaborative use of accounting software among stakeholders facilitates the processing of the KPIs mandated by the shipowner, which include different dimensions, but primarily focus on the effectiveness and efficiency of operational processes, as well as economic, environmental, and social factors. This holistic approach can support the fulfillment of the shipowner's obligation to disclose corporate social responsibility.

The changes in the shipping agency studied here highlight the capacity to enhance operational processes and overall supply chain performance through digitalization. This transformation is interpreted positively through PMSs and relationships with stakeholders. Specifically, software provided by shipowners (Afsys, Hyperion, and Global OA) has altered employee and accountant behavior. This software, which can generate specific KPIs, has redefined the accountants' role, empowering them as performance analysts and report preparers for shipowner management. The firm's accountants thus operate in a dynamic environment where their capabilities foster real-time communication between shipping agency staff and Yang Ming Marine Transport Corporation managers during a digital transition.

The lack of well-structured PMSs forced the accountants of the shipping agency studied to adapt to software tools to process the KPIs mandated by the shipowner. Leveraging digital technologies alongside quality management tools from certifications like ISO 9001:2015, ISO 14001:2015, and ISO 45001:2018 facilitated the design of KPIs to meet high performance objectives. KPIs such as the Freight Checking Report Index, INTTRA Booking Request Index, and Operational Activity Performance Index fostered the adoption of more sophisticated PMSs, while also promoting effective and efficient practices in the management of operations internal to the shipping agency and between it and the shipowner, as well as with other SCM firms. The implementation of advanced software enabled the shipping agency to enhance dematerialization, reducing paper consumption and costs (Crawford, 2017). Consequently, the strong link between digitalization and PMSs

within the shipping agency has positively influenced operational processes in the organizational-accounting architecture, enhancing effectiveness, efficiency, and profitability.

5.2 Academic and Managerial Implications

This study explored the academic significance of a shipping intermediary within SCM during a digital transition. Intermediaries are recognized as pivotal agents driving the shift toward more socio-technical systems (Kivimaa et al., 2019). This study contributes to the literature by expanding the understanding of intermediaries, with a specific focus on shipping agents. It also highlights the ongoing investigation into how digitalization influences the PMSs of intermediary organizations. This study advocates for a deeper exploration of the interplay between PMSs and digitalization within a dynamic, evolving, and competitive landscape (Sahlin and Angelis, 2019).

The managerial implications deriving from this study suggest that, to develop more structured PMSs, the shipping agency should implement training programs for its employees to impart PMSs-related tools, such as KPIs. The training programs should concern both knowledge of the KPIs and ways to use software to process them. Training programs must also enhance cultural change, which must involve not only the employees who process the KPIs but also the management reliant on KPIs for performance control. The need for this cultural change is also evident from the interviews conducted with the managing director, the CFO, and the COO, who demonstrated that they have minimal knowledge about KPIs. The shipping agency investigated in fact still relies on traditional financial reporting tools to monitor performance.

6. Conclusions

This case study highlighted the changes brought about by digital technologies on PMSs. It acknowledges the ongoing uncertainty surrounding the relationship between digitalization and PMSs, despite scholarly attention, and Sahlin and Angelis (2019), Lee et al. (2021), and Dubey et al. (2022), among others, have contributed to this discourse. The investigation into the PMSs of shipping intermediaries, as shipping agents, remains ongoing, despite previous research on PMSs in the shipping industry (Otheitis and Kunc, 2014). After analyzing documents and conducting interviews, the current PMSs of the shipping agency appear to lack a strong structure. However, the integration of dig-

ital technologies enhances efficiency, decision-making, and the efficacy of operational processes. These technologies also make the PMSs more adaptable by facilitating responses to reporting demands from stakeholders. The alignment between the agency's control tools and those of shipowners thus becomes apparent. Additionally, the agency has started to embrace quality certification systems, incorporating PMSs with KPIs to meet commercial requirements. This study addressed a gap in existing research, which has predominantly focused on digitalization in the shipping industry, while often overlooking the pivotal role of shipping agents in innovative SCM.

The main limitations of this study are to be found in its exploratory approach, especially given the challenge of gathering sufficient and well-organized information. Data are fragmented across employees and their software systems, which hinders a systematic analysis. Additionally, the study lacks the shipowner's perspective, which limits the scope of analysis. Future research could examine PMSs across multiple shipping agencies and delve into the role of digital technologies. Exploring the social and cultural factors influencing digital technologies in shipping intermediaries' PMSs, with a focus on sustainable performance, could also provide valuable insights. Adopting a stakeholder theory perspective is crucial for considering all parties involved in fostering effective and sustainable PMSs but incorporating institutional theory as a theoretical framework could further illuminate the impact of institutional pressures on digitalization within the shipping industry (Kuo et al., 2021; Lambrou et al., 2019). From the perspective of sustainability, future research should investigate the role of digital technologies as an enabling factor for the integration of sustainability into the PMSs of shipping agencies and the creation of sustainable business management. Indeed, over the last decade, the sustainability transition has increasingly been linked to digitalization. The European Commission (2021) described it the two as "twin transitions," which could lead to a "green digital transformation."

Acknowledgements
The authors would like to thank the Editor-in-Chief and Associate Editor for handling of the manuscript providing helpful comments and suggestions, which led to improving the article. This work is an outcome of the "Blue-Shipping&Cruise Lab" (BSCLab), Department of Law, University of Naples "Parthenope", Naples, Italy.

Funding
This work was supported by the University Parthenope, Naples, Italy, Research Financial Resources, "Ministero dell'Università e della Ricerca con

Decreto Ministeriale del 25.06.2021 n. 737 for research project entitled Transizione digitale per Modelli di Business Sostenibili e Resilienti nell'interfaccia nave-porto verso l'Agenda 2030 – P.I. Prof. Dr. Assunta Di Vaio."

References

Amaratunga D., Baldry D. (2002), Moving from performance measurement to performance management, *Facilities*, 20(5/6), pp. 217-223.

Attaran M. (2020), Digital technology enabòers and their implication for supply chain management, *Supply Chain Forum: An International Journal*, 21(3), pp. 158-172.

Balci G. (2021), Digitalization in container shipping: Do perception and satisfaction regarding digital products in a non-technology industry affect overall customer loyalty?, *Technological Forecasting and Social Change*, 172, 121016.

Bichou K., Bell M.G.H. (2007), Internationalisation and Consolodation of the Container Port Industry: Assessment of Channel Structure and Relationships, *Maritime Economics & Logistics*, 9, pp. 35-51.

Bititci U.S., Turner U., Begermann C. (2000), Dynamics of performance measurement systems, *International Journal of Operations & Production Management*, 20(6), pp. 692-704.

Bourne M., Neely A.D. (2003), Why some performance measurement initiatives fail: Lessons from the change management literature, *International Journal of Performance Management*, 5(2), pp. 246-269.

Büyüközkan G., Göçer F. (2018), Digital Supply Chain: Literature Review and a Proposed Framework for Future Research, *Computers in Industry*, 97, pp. 157-177.

Cagnazzo L., Taticchi P., Brun A. (2010), The role of performance measurement systems to support quality improvement initiatives at supply chain level, *International Journal of Productivity and Performance Management*, 59(2), pp. 163-185.

Calderon-Monge E., Ribeiro-Soriano D. (2024), The role of digitalization in business and management: a systematic literature review, *Review of Managerial Science*, 18(2), 449-491.

Chen D.Q., Preston D.S., Swink M. (2015), How the use of big data analytics affects value creation in supply chain management, *Journal of Management Information* Systems, 32(4), pp. 4-39.

Cinquini L., Mitchell F., Nørreklit H., Tenucci A. (2013), Methodologies for managing performance measurement, In *The Routledge Companion to Cost Management* (pp. 360-380), Routledge.

Clott C.B. (2000), Ocean Freight Intermediaries: An Analysis of Non-Vessel Operating Common Carriers (NVOCC's) and Maritime Reform, *Transportation Journal,* 40(2), pp. 17-26.

Corsi K., Mancini D., Piscitelli G. (2017), The integration of management control systems through digital platforms: A case study, In *Reshaping Accounting and Management Control Systems: New Opportunities from Business Information Systems* (pp. 131-151). Springer International Publishing.

Crawford M. (2017), *The role of technology in the UN SDGs*, Part two.

Crotty M.J. (1998), The foundations of social research: Meaning and perspective in the research process, *The foundations of social research*, pp. 1-256.

D'Onza G., Lamboglia R., Verona R. (2015), Do IT audits satisfy senior manager expectations? A qualitative study based on Italian banks, *Managerial Auditing Journal*, 30(4/5), pp. 413-434.

Davenport T.H. (1998), Putting the enterprise into the enterprise system, *Harvard business review*, 76(4).

Di Vaio A, Latif B, Gunarathne N, Gupta M, D'Adamo I (2023), Digitalization and artificial knowledge for accountability in SCM: a systematic literature review, *Journal of Enterprise Information Management*, 37(2), pp. 606-672.

Di Vaio A., Varriale L. (2020a), Blockchain technology in supply chain management for sustainable performance: evidence from the airport industry, *International Journal of Information Management*, 52, 102014.

Di Vaio A., Varriale L. (2020b), Digitalization in the sea-land supply chain: experiences from Italy in rethinking the port operations within inter-organizational relationships, *Production Planning & Control*, 31(2-3), pp. 220-232.

Duan Y, Edwards J.S., Dwivedi Y.K. (2019), Artificial intelligence for decision making in the era of Big Data–evolution, challenges and research agenda, *International Journal of Information Management*, 48, pp. 63-71.

Dubey R., Bryde D.J., Dwivedi Y.K., Graham G., Foropon C. (2022), Impact of artificial intelligence-driven big data analytics culture on agility and resilience in humanitarian supply chain: a practice-based view, *International Journal of Production Economics,* 250, 108618.

Eisenhardt K.M. (1989), Building theories from case study research, *The Academy of Management Review,* 14(4), pp. 532-550.

EU Commission (2021), EU Countries commit to leading the green digital transformation, viewed 19 April 2023, -- https://digital-strategy.ec.europa.eu/en/news/eu-countries-commit-leading-green-digital-transformation.

Ferreira A., Otley D. (2009), The design and use of performance management systems: An extended framework for analysis, *Management Accounting Research*, 20(4), pp. 263-282.

Ferreira P.S.A. (2024), Developing a roadmap for implementing digital transformation to improve the resilience of port operations*, International Journal of Scientific Management and Tourism*, 10(3), e888-e888.

Freeman R.E., Harrison J.S., Wicks A.C., Parmar B.L., De Colle S. (2010*), Stakeholder theory: The state of the art*, Cambridge University Press.

Freeman RE. (1984), *Strategic Management: A Stakeholder Approach*, Pitman Publishing, Boston, MA.

Furlong M. (2010), Clear at a distance, jumbled up close: Observation, immersion and reflection in the process that is creative research, In P. Liamputtong (Ed.), *Research methods in health: Foundations for evidence-based practice* (pp. 153-169). South Melbourne, Australia: Victoria Oxford University Press.

Ghobakhloo M., Iranmanesh M., Tseng M.L., Grybauskas A., Stefanini A., Amran A., (2023), Behind the definition of Industry 5.0: a systematic review of technologies, principles, components, and values, *Journal of Industrial and Production Engineering*, 40(6), pp. 432-447.

Gibbert M., Ruigrok W., Wicki B., (2008), What passes as a rigorous case study?, *Strategic Management Journal*, 29(13), pp. 1465-1474.

Glesne C., Peshkin A. (1992), *Becoming qualitative researchers*. White Plains, NY.

Goulielmos A., Mitroussi K., Gatzoli A. (2008), Marine accidents: quality vs safety and one step further, *International Journal of Ocean Systems Management*, 1(1), pp. 45-67.

Granlund M., Mouritsen J. (2003), Special section on management control and new information technologies, *European Accounting Review*, 12(1), pp. 77-83.

Gray J., Rumpe B. (2015), Models for digitalization, *Software & Systems Modeling,* 14, pp. 1319-1320.

Gunasekaran A., Patel C., McGaughey RE. (2004), A framework for supply chain performance measurement, *International Journal of Production Economics*, 87(3), pp. 333-347.

Gupta M., George J.F. (2016), Toward the development of a big data analytics capability, *Information and Management*, 53(8), pp. 1049-1064.

Heilig L., Lalla-Ruiz E., Voß S. (2017), Digital transformation in maritime ports: analysis and a game theoretic framework, *Netnomics: Economic research and electronic networking*, 18(2), pp. 227-254.

Holmström J., Holweg M., Lawson B., Pil F.K., Wagner S.M. (2019), The digitalization of operations and supply chain management: Theoretical and methodological implications, *Journal of Operations Management*, 65(8), pp. 728-734.

Karimi J., Walter Z. (2015), The role of dynamic capabilities in responding to digital disruption: a factor-based study of the newspaper industry, *Journal of Management Information Systems*, 32(1), pp. 39-81.

Klerkx L., Aarts N. (2013),The interaction of multiple champions in orchestrating innovation networks: conflicts and complemetarities, *Technovation*, 33(6-7), pp. 193-210.

Kuo H.M., Chen T.L., Yang C.S. (2022), The effects of institutional pressures on shipping digital transformation in Taiwan, *Maritime Business Review*, 7(2), pp. 175-191.

Lambrou M., Watanabe D., Iida J. (2019), Shipping digitalization management: conceptualization, typology and antecedents, *Journal of Shipping and Trade*, 4(1), 1-17.

Latour B. (2005), *Reassembling the Social*, Oxford University Press, Oxford.

Lichtenthaler U. (2013), The collaboration of innovation intermediaries and manufacturing firms in the markets for technology, *Journal of Product Innovation Management*, 30, pp. 142-158.

Mancini D. (2016), Accounting information systems in an open society: Emerging trends and issues, *Management Control*, 1, pp. 5-16.Doi: 10.3280/MACO2016-001001.

Mancini D., Lombardi R., Tavana M. (2021), Four research pathways for understanding the role of smart technologies in accounting, *Meditari Accountancy Research*, 29(5), pp. 1041-1062.

Mancini D., Piscitelli G. (2018), Performance measurement systems in business networks: a literature review, *International Journal of Business Performance Management*, 19(1), pp. 87-104.

Marchi L. (2011), L'evoluzione del controllo di gestione nella prospettiva informativa e gestionale esterna, *Management Control*, 3, pp. 5-16. Doi: 10.3280/MACO2011-003001.

Neely A.D. (1994), Performance measurement system design – third phase, *Performance Measurement System Design Workbook*, 1.

Neely A.D. (1999), The performance measurement revolution: Why now and what next?, *International Journal of Operations & Production Management*, 19(2), pp. 205-228.

Nikitakos N., Lambrou M.A. (2007), Digital shipping: the Greek experience, *Research in Transportation Economics*, 21, pp. 383-417.

Norreklit H., Cinquini L. (2023), Introduction to the Special Issue of Journal of Management and Governance:"Performance, management and governance in the digital age", *Journal of Management and Governance*, 27, pp. 689-693.

Otheitis N., Kunc M. (2014), Performance measurement adoption and business performance. An exploratory study in the shipping industry, *Management Decision,* 53(1), pp. 139-159.

Otley D. (1999), Performance management: a framework for management control systems research, *Management Accounting Research*, 10, pp. 363-382.

Pargmann J., Riebenbauer E., Flick-Holtsch D., Berding F. (2023), Digitalisation in accounting: a systematic literature review of activities and implications for competences, *Empirical Research in Vocational Education and Training*, 15(1), 1.

Proctor C. (1997), *The Legal Role of the Bill of Lading, Sea Waybill and Multimodal Transport Document*, Interlegal, Pretoria.

Procurement Executives' Association (US), 1998. Guide to a Balanced Scorecard: Performance Management Methodology: Moving from Performance Measurement to Performance Management (Vol. 1). US Department of Commerce.

Quattrone P., Hopper T. (2005), A 'time-space odyssey': management control systems in two multinational organisations, *Accounting, organizations and society*, 30(7-8), pp. 735-764.

Quitzau J., Tontara N., Vöpel H., Jahn M., Otto A.H, Wolf A. (2018), Shipping in an era of digital transformation (No. 25e), *Strategy 2030-Capital and Life in the Next Generation.*

Rotondo F., Corsi K., Giovanelli L. (2019), The social side of sustainable business models: An explorative analysis of the low-cost airline industry, *Journal of Cleaner Production*, 225, pp. 806-819.

Sahlin J., Angelis J. (2019), Performance management systems: reviewing the rise of dynamics and digitalization, *Cogent Business & Management*, 6(1), 1642293.

Saleheen F., Habib M.M., Hanafi Z. (2018), Supply Chain Performance Measurement Model: A Literature Review, *International Journal of Supply Chain Management*, 7(3), pp. 70-78.

Scapens R.W. (2004), Doing Case Study Research, in: C. Humphrey & B. Lee (Eds.). *The real life guide to accounting research. A Behind-the-Scenes View of Using Qualitative Research Methods*, pp. 257–279, Oxford.

Siggelkow N. (2007), Persuasion with case studies, *Academy of Management Journal,* 50(1), pp. 20-24.

Stewart J., Hyysalo S. (2008), Intermediaries, users and social learning in technological innovation, *International Journal of Innovation Management*, 12(3), pp. 295-325.

Surucu-Balci E., Iris Ç., Balci G. (2024), Digital information in maritime supply chains with blockchain and cloud platforms: Supply chain capabilities, barriers, and research opportunities, *Technological Forecasting and Social Change*, 198, 122978.

Tijan E., Jović M., Aksentijević S., Pucihar A. (2021), Digital transformation in the maritime transport sector, *Technological Forecasting and Social Change*, 170, 120879.

Triantafylli A., Ballas A. (2010), Management control systems and performance: evidence from the Greek shipping industry, *Maritime Policy & Management*, 37(6), pp. 625-660.

Voss C., Tsikriktsis N., Frohlich M. (2002), Case research in operations management, *International Journal of Operations & Production Management*, 22(2), pp. 195-219.

Xu X., Lu C., Cui J. (2019), The Impact of Digitalization on the Performance Management of Intermediaries in the Shipping Industry. Proceedings of the 2nd International Conference on Industrial Economics System and Industrial Security Engineering, pp. 556-560.

Yin R.K. (1981), The case study crisis: some answers, *Administrative Science Quarterly*, 26(1), pp. 58-65.

Yin R.K. (1994), Discovering the future of the case study method in evaluation reasearch, *Evaluation Practice*, 15(3), pp. 283-290.

Yin R.K. (2006), Case study methods, in Green, J.L., Camilli, G. and Elmore, P.B. (Eds), *Complementary Methods in Education Research*, Lawrence Erlbaum Associates, Hillsdale, NJ, pp. 111-122.

Zhai H., Yang M., Chan K.C. (2022), Does digital transformation enhance a firm's performance? Evidence from China, *Technology in Society*, 68, 101841.