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Digital Transformation and System Interoperability in EU Seaports: A Platform Facilitating Supply Chain in the Cruise Industry

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5.1 Introduction

Digital technology is a driving factor in contemporary businesses. It's a dynamic and transformative force, which alters all areas of organizations, including how they get organized and deliver value to customers. It facilitates adaptation, continuous improvement, new processes,

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innovativeness, development of new products and the invention of disruptive business models (Porter & Heppelmann, 2014; Thrassou et al., 2022a). As a result, increasing digitization is rightly known as 'Digital Transformation'. However, while digital transformation is a way of progress for many businesses, not all organizations are ready to adopt its requirements and overcome its barriers (Shahi & Sinha, 2021). Existing infrastructure, knowhow and workers' skills differ from country to country. Therefore, technology diffusion takes place at different times and speeds in different parts of the world (Szabo et al., 2020).

Within this framework, the current chapter focuses on digital transformation in Greek and Cypriot seaports, along with its role in facilitating a sustainable supply chain for the cruise industry, within a broader framework of sustainable development (Efthymiou et al., 2023). The study is undertaken during a major EU-wide turn towards digitization. Part of this turn entails that seaport authorities are ought to adopt a National Maritime Singe Window (NMSW), a European Maritime Single Window (EMSW), and facilitate the interoperability between various platforms and systems. Systems like the NMSW and EMSW are digital platforms capable of receiving, processing and exchanging data among ships that arrive at or depart in seaports across the EU (Efthymiou et al., 2022a). Besides, in the context of ports, logistics and cruise supply chains, business processes are highly dependent on efficient information flows between seaport authorities and all involved organizations (Heilig et al., 2017), including cruise ships, agents and operators. Specifically, the current chapter examines the progress of the implementation of NMSW and EMSW in Greek and Cypriot ports. In addition, it examines the possible development of an e-marketplace platform, intended to support the cruise industry's supply chain while being interoperable with other systems.

The analysis draws on findings collected through face-to-face interviews and electronic questionnaires with the leadership of Shipping Deputy Ministry, Cyprus Port authority (CPA), cruise companies and other key stakeholders. Also, certain stakeholder-groups (producers, suppliers and cruise companies) were given the opportunity to test the supply-chain platform on a piloting basis, prior to participating in the survey. The chapter's structure is organized in the following manner: in

the next section, the analysis offers a review of digitization, including the evolution of NMSW, EMSW and platform technology in the cruise industry. Then, a section presents the research design and methods of the study. After that, the chapter presents its findings concerning the progress of NMSW, EMSW and the pilot use of an e-marketplace platform. The final section summarizes the chapter's key points while discussing possible implications of digital transformation on the cruise industry's supply chain.

5.2 Literature Review

Digital transformation is becoming increasingly prevalent as it enables the development of new processes, products and business models (Thrassou et al., 2022b). Technologies like Artificial Intelligence (AI), Blockchain, Virtual Reality (VR), Metaverse, Augmented Reality (AR), platform-analytics and robots can now be found in various industries, including tourism (Buhalis, 2020), banking (Batiz-Lazo & Efthymiou, 2016), maritime (Sdoukopoulos et al., 2020; Kapidani et al., 2020), accounting (Batiz-Lazo et al., 2022), health-care (Garcia-Perez et al., 2022), hospitality (Efthymiou, 2018), aviation, insurance (Zarifis & Cheng, 2022), academia (Zarifis & Efthymiou, 2022; Efthymiou et al., 2022b) and learning (Epaminonda et al., 2022). Following the fast and widespread diffusion of digitization in various sectors, seaports, shipping and cruise companies couldn't be an exception.

Digital transformation in seaports concerns specific technologies, which have been deployed gradually over the last 40 years or so. According to Heilig et al. (2017), the evolution and diffusion of digital technology in seaports can be found in three main phases: (a) paperless procedures, (b) automated procedures and (c) smart procedures. In the first phase, important paper documents were transformed into electronic documents. During this phase, which took place in the 1980s, digital transformation was taking place at different levels through the deployment of isolated IT systems with basic IT functionality.

In the second phase, which took place in the 1990s and 2000s, existing Information Technology served as a foundation on which new systems

were added, contributing further to process automation. The new automated systems (e.g. laser technologies for distance detection and collision prevention) provided increased safety and time efficiency (Heilig et al., 2017). Also, by the 2000s, the need to facilitate information exchange between governments and involved organizations led to the development of a National Maritime Single Window (NMSW). This time, nevertheless, digital transformation was intended to be institutionalized across all EU member states. On 20 October 2010, the 'European Parliament and of the Council' issued the 'Directive 2010/65/EU on reporting formalities for ships arriving in and/or departing from ports of the Member States and repealing Directive 2002/6/EC' (Official Journal of the European Union, 2010). Through this directive, all electronic transmissions had to become standardized through a national Single Window, which enables all involved organizations to input a specific set of information electronically, using a single point of data entry and storage. The European Parliament set a deadline for implementation by 1 June 2015, offering to Member States five years to establish a National Maritime Single Window (NMSW).

However, despite being helpful, each country's NMSW does not facilitate harmonization across EU ports. Therefore, the European Commission proposed to bring reporting requirements under one digital space through a 'European Maritime Single Window—EMSW'(Official Journal of the European Union, 2010). This development is part of the third phase of digital transformation, which began in the 2010s and is currently ongoing. The main aim of EMSW is to harmonize reporting procedures for shipping operators and ensure that data can be shared and reused efficiently through the once-only principle, where ships can report once per port-call and the same information would be reused for subsequent port-calls within the EU. The regulation was published on 25 July 2019 and entered into force on 14 August 2019 as *Regulation (EU) 2019/1239 of the European Parliament and of the Council of 20 June 2019 establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU* (EU Monitor, 2019).

Digital transformation through EMSW results to improved interoperability between various systems, making it much easier to share and reuse data (Maritime Cyprus, 2019). Digitization facilitates information

transfer, retention, reuse and re-dissemination. Also, EMSW promotes cooperation between customs and business communities, enables traders to trade with a single administrative authority and support the smooth movement of goods through secure international supply chains (Koliousis & Katsoulakos, 2015).

The capabilities offered in the third phase of digital transformation enable us to explore further the development and application of an e-marketplace platform, capable of supporting a supply chain in the Cruise Industry in Greece and Cyprus. More specifically, we explore the progress of the implementation of EMSW in Greece and Cyprus and whether the interoperability of systems could enable the development of an e-marketplace platform that brings together small producers, local suppliers and international cruise companies, as part of sustainable supply chains.

5.3 Research Design and Methods

Two different studies have been conducted for the purposes of this chapter. The first study was qualitative and included face-to-face interviews with different stakeholders. The purpose was to explore the progress of the implementation of NMSW and EMSW in Greek and Cypriot seaports. The interviews were conducted with government officials from the Shipping Deputy Ministry, Port Managers, cruise-company representatives, local producers, suppliers, Information Technology and Communication companies, International Ship Management companies, International Cruise and Infrastructure Consultants, and representatives of DP World (operator of the largest port in Cyprus). During face-to-face interviews, we also had the opportunity to observe how different platforms operate. For example, in one of our visits, the Cyprus Port Authority's (CPA) representative offered a tour of NMSW by sharing his computer screen with us. To align with established ethical standards on anonymity, all participants' names are kept confidential.

The second study was quantitative, aiming to collect findings concerning the evaluation of the e-marketplace platform. Prior to circulating the questionnaire, responders were asked to test the platform (e-marketplace).

The Platform was put into trial operation at the beginning of 2021, and a pilot implementation was carried out for the ports of Heraklion, Chania, Rhodes, Mytilene, Chios, Santorini, Larnaca and Limassol.

The total population from which the primary data of this research was drawn is composed of the two main categories of users involved: (a) suppliers/producers of local products and (b) cruise companies/agencies. Primary data were collected with the aid of a structured self-completion questionnaire. The questionnaire was created with the help of the Google Forms web tool and distributed electronically. The completion of the questionnaire was anonymous and was delivered only to respondents being registered on the Platform.

The questionnaire was distributed to:

- One hundred seventy-nine companies, members of the Cyprus Chamber of Commerce and Industry. These enterprises were invited to register on the Platform and to take part in the pilot application. These are enterprises active in the primary and secondary sector—dairies, mills, wineries, producers of sausages, traditional sweets and bakeries
- Two cruise companies in Cyprus
- Members of the Cyprus Sustainable Tourism Association (local producers and passengers)

The evaluation of the Platform in Greece, which followed the pilot implementation stage, was developed in two levels. At the first level, producers and suppliers of local traditional products registered on the Platform. At the second level, they responded to the evaluation questionnaire. The questionnaire was created with the use of the Google Forms online tool, was not anonymous and was distributed to the 71 businesses that had registered on the Platform to take part in the pilot. Convenience sampling method was selected, and 38 questionnaires were collected. The businesses that participated in the survey are active in the primary and secondary processing sectors—mills, cheese dairies, wineries, distilleries, beekeepers, producers of local sweets and local traditional products—and the trade of their products.

5.4 Findings

Study 1: Implementation of NMSW, EMSW and Links to the Cruise Supply Chain

The findings of the first study suggest that the National Maritime Single Window was established fully in most EU countries, including Cyprus, in line with the Directive 2010/65/EU. However, the system in Greece has only been implemented partially. The delay has to do with a number of factors, such as the numerous Greek islands and ports, often with limited availability of human resources. Also, our findings suggest that different stakeholder-groups are trained on how to use it, such as the private shipping agents who interact with the NMSW system directly via the Cyprus Port Authority (CPA).

At the same time, authorities in each EU member state (e.g. Ministries of Shipping) work in a coordinated way to implement the European Maritime Single Window (EMSW). The deadline for implementation is 15 August 2025. Representatives of CPA and the Shipping Deputy Ministry of Cyprus explained that much of the work has already been done. Although its full implementation is going to take some years, many of the processes have already been established, employees have attended relevant training and much of the infrastructure is already in place. According to officials in CPA's IT Department, several meetings took place with the other 26 member states, where they decided what exactly the EMSW should include. The system will be standardized for all ports across the EU. The components and forms used will be the same across the entire network, and no changes will be allowed on the platform by individual member states.

When we asked about the possible contribution of EMSW to the supply chain, the immediate response was *No. EMSW will neither be related to, nor enhance the cruise supply chain. The system will be so standardized that leaves no space for modifications relating to the supply chain.* As we understand by such statements, due to its standardized structure, EMSW will have no direct impact on the cruise supply chain. However, some of its benefits, which concern time efficiency and information transfer in

real time across EU ports, are likely to enhance cooperation between customs and business communities, facilitate smooth movement of goods and minimize the complexity of inter-stakeholder relationships (Interview 5 in a Ship Management Company, Control Room Manager). Also, due to the interoperability of systems, EMSW can work in parallel with existing systems, such as the NMSW and SafeSeaNet, to enhance the utilization of information in the cruise supply chain. In other words, while EMSW will not contribute directly, it adds to the development of a digital environment, in which other systems and stakeholders coexist.

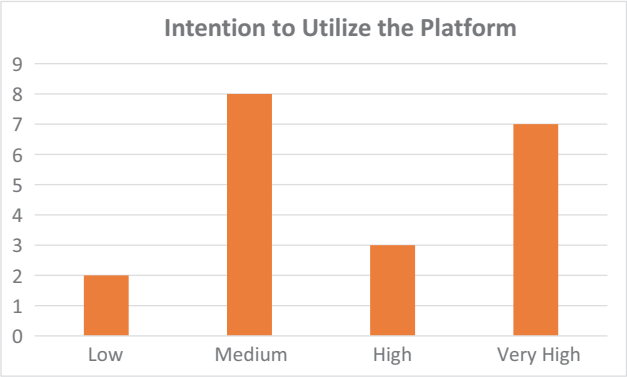
Moreover, departing by the benefits stemming by the EMSW environment, we attempted to identify the intention of stakeholders in using an e-marketplace platform through a second study. Below we present the survey's findings.

Study 2: Stakeholders' Opinion About the Development of a Platform-Based e-Marketplace

The findings in this section were collected through a survey, by responders who tested the actual e-marketplace platform. In Cyprus, the majority of participants in the evaluation process (60%) state that they are satisfied with the Platform, while 20% are very satisfied. Similarly, in Greece, the vast majority of respondents (82%) from the three regions expressed an overall satisfaction with the Platform, with 53% stating that they are satisfied and 29% very satisfied. A comparative assessment of the responses from the three regions shows a common positive view of the participants.

Platform Strengths

Concerning the Platform's strengths, companies in Cyprus indicated the ease of registering a new user, with which the majority of respondents said they were satisfied (55%) or very satisfied (25%), as well as the ease of access, which gained the satisfaction of all respondents (90%). Almost all participants (90%) in the evaluation process expressed their



Graph 5.1 Intention to use the Platform in Cyprus

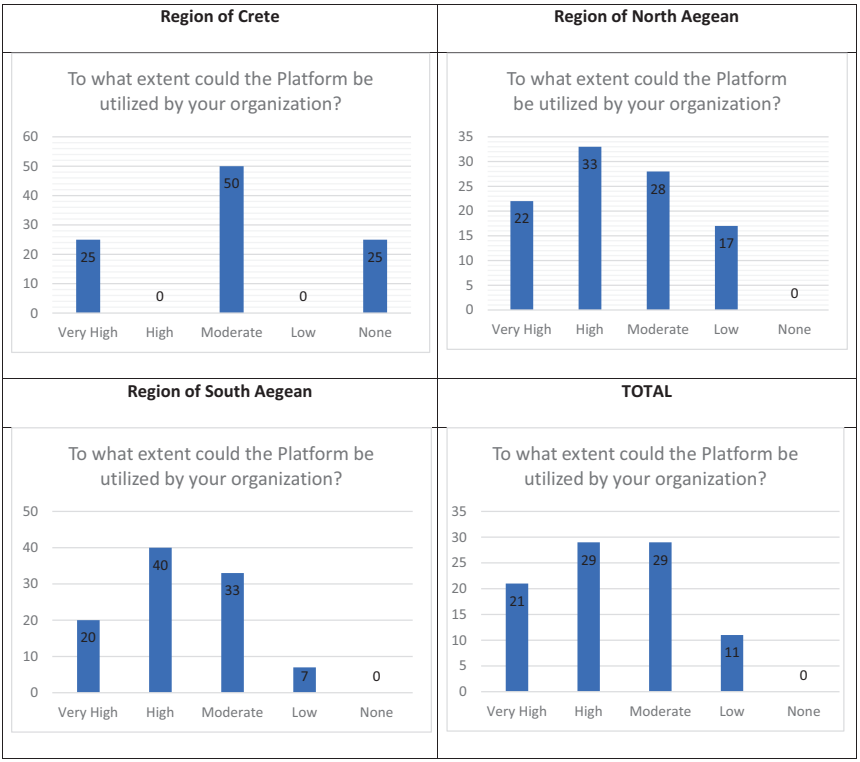
satisfaction with the usability of the Platform, while the majority of them positively evaluated the loading speed (Graph 5.1) and the way products are presented, and described the Platform as elegant and user-friendly. One element of the Platform that, according to the participants, is subject to significant improvement is the support through the submission of queries.

Similarly, businesses in Greece pointed out the ease of user registration as the strongest point of the platform, followed by the platform's aesthetics and friendliness and the speed of loading. One element of the platform that, according to the participants, is subject to significant improvement is its usability and ease of access to it.

Use of the Platform by PDO Organizations and Products

One of the most important findings of the survey is the view expressed by respondents in Cyprus that the Platform is quite (40%) to very (35%) likely to be used by organizations related to the cruise industry (Graph 5.2).

In Greece, regarding the likelihood of the Platform being used by local producers/suppliers, a generally positive attitude emerges, with 21% responding that it is very likely and 58% responding that it is very or



Graph 5.2 Intention to utilize the Platform in Greece

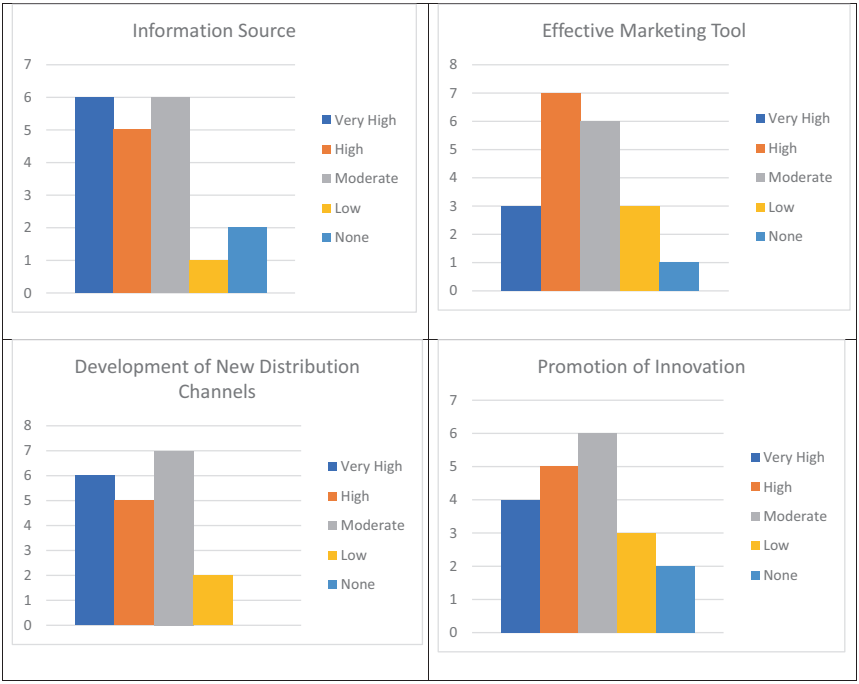
likely that the platform will be used by organizations related to the cruise industry (Graph 5.2).

In both Cyprus (60%) and Greece (59%) the majority of respondents expect that the new products available through the Platform will meet the market needs for PDO (protected designation of origin) products. Regarding the possibility to carry out economic transactions through the Platform, in Cyprus, a sufficient number of evaluation participants expressed their distrust, which may be due to the lack of sufficient information on how the Platform is managed. On the contrary, in Greece, the majority of participants (64%) in the evaluation expressed a positive attitude towards the possibility of conducting financial transactions through the Platform if the Platform operates smoothly and under certain

conditions to secure transactions. Noteworthy, however, is the percentage of participants (32%) who expressed reservations about the Platform's ability to support financial transactions.

5.5 Competitive Advantages of the Platform (Graph 5.3)

Exploring the potential competitive advantages of the Platform, participants both in Cyprus and in Greece acknowledge its important role as a source of information and consider it an important marketing tool. The Platform's contribution to the development of new sales channels and the promotion of innovation has been regarded as less important. In Cyprus, half of the respondents state that the Platform could improve



Graph 5.3 Platform's competitive advantage points (firms in Cyprus)

employability, while 45 of them highlight the possibility of local products being offered through interconnection with other ports. In Greece, the vast majority of respondents stress that the Platform could significantly enhance employability, while 70% of them consider possible the provision of local products through other ports.

5.6 Discussion and Conclusion

Our findings reconfirm that digital transformation is subject to localized conditions and takes place in different places at different times. The example of National Maritime Single Window (NMSW) is quite indicative. While Cyprus has implemented the 2010/65/EU directive in all ports, other EU member states are yet to complete its deployment. This finding resembles with previous studies, suggesting that some technologies are implemented easier and more frequently, depending on different factors, such as each country's available resources, specialization, existing technology, expertise and workers' skills (Szabo et al., 2020).

Moreover, digital transformation these days is also about institutionalized standardization and efficiency. For example, the EU2019/1239 directive concerns the implementation of the European Maritime Single Window (EMSW) by 15 August 2025, across all EU member states. The system will be standardized in all EU ports, and no changes will be allowed on the platform by individual member states. According to our participants, standardization is the only way towards materialization.

Another finding concerns the interoperability of EMSW and e-marketplace platforms. While EMSW is not expected to contribute directly to an enhanced supply chain for the cruise industry, there are a number of indirect benefits. Time efficiency, fast turnover, information transfer amongst EU ports and reuse of that information are amongst the benefits, creating an environment where supply chains can improve along with enhanced interconnectivity among stakeholders.

Then, another purpose of this study was to explore the possible development of a platform-based e-marketplace, aiming to elicit the involvement of various stakeholders in the cruise supply chain in Greek and Cypriot ports. More specifically, the idea was to examine whether

different stakeholders are willing to become users of a platform that links end-users directly with local producers through trustworthy and secured transactions while promoting tourism authenticity with the provision of local products. According to the responders and participants, the Platform is an innovative tool for the supply chain in Greek and Cypriot ports. It strengthens interoperability with other systems while enhancing the dissemination of information between stakeholders. Also, the Platform can significantly strengthen local economies, offering opportunities for local producers in both Greece and Cyprus to promote their products in the cruise sector without mediation.

In terms of Authenticity, the promotion of certified local products, which promise guaranteed quality while promoting their traditional profile, can contribute significantly to the enhancement of tourists' experience. Also, new products can be made available that are labelled as PDO (Protected Designation of Origin). In other words, it can be a means of promoting and exhibiting local products.

The evaluation survey of the NAYS e-marketplace platform in both Cyprus and Greece shows the remarkable overall satisfaction of the respondents from the operation of the Platform. However, while in Greece the majority of the respondents underlined that the Platform can significantly facilitate the sale and distribution of products through interconnection with other ports, in Cyprus more than half of the respondents expressed their distrust regarding the ability of the Platform to facilitate the sale and distribution of products through interoperability with other ports. This reveals that the Cypriot market is not yet ready to interchange through the Platform. Also, it goes back to the main point discussed in this section, suggesting the digital transformation is also subject to local conditions. Furthermore, participants suggested that the Platform needs to be centrally managed and marketed to the cruise market. If done properly, the Platform can boost employment.

Finally, the current study makes a significant contribution to literature as it is driven by the voice of leading stakeholders to explore the digitization of the cruise industry and its impact on its supply chain. It's not a study that generalizes its findings. Rather, it provides a micro-snapshot of how two countries influence and are influenced by digital transformation. Also, the digital transformation presented in this study concerns

both institutionalized and private initiatives, which can both contribute towards efficiency in a digitized supply chain for the cruise industry. The study's findings can be useful to ports in the Mediterranean region and other member states. Future research can examine EMSW's progress of implementation and how new technologies contribute further to inclusion and interoperability.

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