

Digital Transformation in Nautical Tourism*

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Abstract: Digitization in the domain of nautical tourism has stimulated the implementation of innovative applications, serving as integral support mechanisms for service users. This transformation has also given rise to specified smart business ecosystems, ensuring the joint generation of value for all stakeholders. As a result, innovative technologies have not only transformed the overall nautical experience but also led to reduced operating costs and the development of effective business practices, thus becoming a strategic priority for nautical companies. Based on the analysis of a wide body of literature, this paper aims to underscore the significance of information technology and interactive smart systems in nautical tourism. Through the implementation of digital and smart technologies, it becomes feasible to manage multiple segments, including actors, devices and security systems. This operationalization of ship management activities aims to enhance the experience for guests and crew in continuation.

Keywords: Nautical tourism, Cruising, Yachting, Innovations, Smart technology, Digital systems.

1. Introduction

Nautical tourism, as one of the physical manifestations of postmodern society, is an example of a dynamic phenomenon which has a significant impacts on the global socio-economic system [44]. Precisely, as one of the most progressive sectors within the modern tourism industry, nautical tourism represents a powerful catalyst of economic growth globally and in the related industries [30]. In recent decades, essential aspects of nautical tourism, including the marina, charter and cruise industries have shown rapid prosperity and a high degree of permanent development, as evidenced by current data from the Confindustria Nautica–Fondazione Edison [12]. According to the source, on a global scale, there are over 33 million boats, 26 thousand

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nautical ports and more than 4 million moorings in operation. It is estimated that the nautical tourism industry generates between 20 and 28 billion euros of revenue annually, with a large portion coming from related services such as boat rentals and other activities of tourist ports [18]. The outlook for the global yacht market development is positive, with an anticipated annual rate of 5.2% from 2021 to 2028 [24]. According to a report of Grand View Research [24], the global motor yacht and sailing yacht charter market for recreation and tourism generated USD 13.28 billion in 2021 and this trend is expected to continue with an annual growth rate of 5.4% during the period 2021– 2031. Innovative practices such as yacht sharing and the availability of yacht charters, particularly facilitated by online reservation platforms, will stimulate the development of the maritime travel and tourism market [22].

Continuous investments in tourism, tourists' desire to explore new cultures and visit remote destinations, along with advancements in technology have all contributed to the effective positioning of developed and transitional economies in the nautical tourism market [25]. However, one major challenge in nautical tourism is the adoption of digital systems, particularly due to a lack of awareness about suitable innovative interactive systems for the context [31]. Nevertheless, prosperity is clearly visible in the world of online booking platforms and interactive applications within the nautical tourism sector [36]. In fact, as Buhalis [6] indicates, the aforementioned technological systems improve the overall efficiency of the consumption process within the tourism sector, providing guests with the possibility of on-line reservations for dinner, excursions and other cultural entertainment activities on board, etc. In other words, technology plays a pivotal role in improving multiple aspects of nautical tourism [27]. Moreover, reliability and intuitiveness are the main factors in the expansion of the popularity of these systems in recent years and support their continued development in the future [35].

Considering the above, this paper aims to investigate and discuss the impact and potential of innovative digital systems in nautical tourism. Specifically, by drawing on extensive literature in the fields of digitization and nautical tourism, this research aimed to consolidate existing knowledge and address the questions: what are the impacts of technology systems on board and on land in the context of nautical tourism; how digitization benefits the nautical tourism sector and how the diffusion of innovative technological systems transforms the nautical experience. The key aspects of smart technology in the nautical industry are integrated into a specific conceptual framework that emphasizes the multidimensional outcomes of digital systems application.

2. Literature review

2.1. Nautical tourism in digital innovation era

Unlike some tourism systems that use augmented reality as a substitute for objective reality, the nautical tourism industry prioritizes authentic experiences, emphasizing the natural flow as fundamental to its progressive development [32]. The authenticity offered by the nautical industry is crucial to its appeal, drawing in travelers who aim to establish a genuine connection with the sea and coastal environment [41]. Nevertheless, as digital platforms offering efficient services continue to expand, the adoption of innovative technologies in nautical tourism is becoming a powerful strategy for optimizing the overall consumption and business process [4].

Today's tourists seek to explore unique destinations while engaging in a diverse activities within specific environment [20]. They are searching for seamless experiences that combine the convenience of digital mechanisms with the attractiveness of natural resources [16]. The emergence of a more active and sophisticated demand in nautical tourism has led to the need to align business strategies and redesign current services [3]. The expansion of consumer culture and the growing demand for personalized experiences in tourism have emphasized the need for innovative technological systems and networking among all stakeholders in the nautical sector. This aims to enhance the overall tourist experience, from trip-planning to post-trip activities [33].

This comprehensive approach includes ports, destinations, nautical sector companies, educational institutions, governments, and other tourism stakeholders at both macro and micro level. Therefore, the newly formed global context is recognized as a stimulus for the rapid adoption of smart and interactive systems in the service sector, which at the same time serve as the backbone for the advancement of the nautical tourism sector [38]. Generally, the integration of interactive digitized systems in the tourism, including nautical sector, has stimulated modifications in the mechanisms and reservation of services thus conditioning the transformation process in relation to the habits of postmodern consumers.

Smart technologies and online booking platforms have taken an important place in terms of the operationalization of business activities for various stakeholders in the nautical tourism industry, thus initiating a transformation in the domain of overall experience creation [45]. For instance, digital platforms guarantee personalized services, notably improving the travelers' experience [45]. Moreover, customer relationship management (CRM) platforms allow managers to predict and satisfy the tourists' requests,

thereby boosting overall satisfaction and loyalty [17]. In addition to enhancing service distribution, these technologies also play a critical role in fostering sustainability and business effectiveness [43].

In summary, the technology innovation era is remodeling nautical tourism industry by merging superior experiences with cutting-edge digital systems. This fusion not only increases the potential of nautical tourism but also intensify adaptation to the increasingly sophisticated interests of contemporary tourists [14].

2.2. Application of digital systems to nautical tourism: effects and perspective

The multilateral nature of the tourism experience encourages the adoption of innovative technological systems and the digitalization of service processes, particularly within the nautical sector [7]. The application of modern technologies that predominantly include phones, computers, and wearable devices facilitate the decision-making process of consumers in nautical tourism and complete their overall experience [39] by enhancing the accessibility to information and its consolidation [29]. Current trends show that mobile phone-based online booking is becoming increasingly dominant; however, users of these services prefer applications over web page searches [48]. According to Farkhondehzadeh et al. [19], online reservation systems enable fast data access, automated response, and privacy. In addition, numerous digital applications appear as a powerful mechanism that determines the choice of payment method as an essential aspect of the overall experience in the context of tourism; namely, users of these applications can choose from several alternatives that include the possibility of paying in advance, with credit cards or cash, while the security of personal data is guaranteed [10].

From online booking systems to mobile applications providing efficient service, real-time updates and personalized information, technology enhances the entire travel experience in nautical tourism [9]. For example, digital concierge services and virtual on-board tours further complete the passenger experience [45]. Moreover, virtual reality can greatly contribute to the transformation of the ship's environment into a virtual context that significantly determines the overall entertainment experience of tourists [11]. It becomes clear how multimedia entertainment systems on cruise ships and yachts generate entertainment opportunities for passengers, thereby enhancing individual engagement during the journey [46].

Emphasizing the importance of technology for the operational efficiency, Dias et al. [15] point out that the Internet of things on board allows guests smooth boarding/disembarkation, baggage tracking, automatic ac-

cess to their cabin, automated temperature adjustment in cabins, geolocation, etc. At the same time, advanced automation systems and predictive maintenance technologies can stimulate the reduction of fuel consumption, maintenance costs and turnaround times [23]. This enables nautical tourism actors to optimize vessel operations, manage more sustainably, create memorable experience for passengers and generate profit [47].

Analyzing the effects of digitization on nautical tourism, Krpetic et al. [28] advocate that satellite communication and wireless systems ensure networking and permanent connectivity, enabling travelers and employees to remain connected to shore and communicate in emergencies. Regarding this, Priadi [37] indicates that emergency response and remote monitoring technologies enable prompt response to emergency circumstances, thereby minimizing risks and ensuring safe voyage. Therefore, it becomes evident that monitoring systems and access control mechanisms increase on board security, thus ensuring the safety of travelers [40]. Advanced navigation mechanisms, GPS and radar technologies ensure strong safety of maritime travel facilitating accurate positioning and route determining assistance [42]. To be more precise, these technologies serve captains as critical means to navigate safely, helping in avoiding obstacles and adverse weather conditions [26].

Finally, it is important to emphasize the significance of smart ship systems for environmental monitoring and sustainability; in other words, technology is extensively being used to optimize the ecological impact of nautical tourism [31]. From on board waste management systems to the use of alternative fuels and energy-efficient technologies, digital innovations are helping to reduce carbon footprint of maritime travel and increase environmental conservation efforts [1].

At a practical level, nautical destinations around the world tended to analyze digitization transformation within nautical industry, examining the effects and level of interactive platforms adoption. For instance, using the sample of 129 port websites of major destinations and countries for nautical tourism in the Mediterranean including the Balearic Islands, the French and Italian Rivas, Costa Smeralda, the Adriatic Basin and the Greek and Turkish Aegean coast, research of Benevolo and Spineli [5] provided deeper insight into the level of use and quality of websites as significant digital support by tourist ports located in the Mediterranean Sea. Suggesting that Italy is the most dominant country in implementing interactive platforms in the nautical business context, the findings further reveal that tourist ports' websites are well-managed and designed, providing better linkage with the destination. However, the authors suggest that these websites are not user-friendly enough failing to provide all the necessary information and services

to travelers, indicating the need for user adaptation. Observing the nautical system in Montenegro, using a sample of 150 managers, Vukčević and Ljubić [47] found that the intensity of electronic business application in Montenegrin marinas is not at a satisfactory level, emphasizing that this limitation negatively affects overall business performance. The authors pointed out that the critical factors for low level of e-business adoption among nautical tourism ports in Montenegro include the absence of an explicit e-business strategy, insufficient investment in interactive systems and a lack of knowledge regarding technological innovations among managers. Further, examining the digital aspects related to the energy and environmental efficiency of various port and marina systems in Croatia, Gallo [21] reveals technology as essential factor in enhancing competitiveness in nautical tourism market, promoting the sustainability, and fostering the general economic prosperity of the nautical industry.

In summary, the significant influence of technology on the operationalization of multiple activities in the nautical sector is explicit. Technological innovations appear as an indispensable category in the improvement of various aspects of navigation, whether it is about the service for passengers or the improvement of the ship's performance, which ensures safe and sustainable navigation.

3. Research methodology

A review of the literature dealing with the domain of nautical tourism revealed a gap in the conceptualization of the application and effects of digital innovations in nautical tourism. Specifically, the lack of conceptualization regarding the application and effects of digital innovations in the nautical industry of tourism underscores the need for a thematic framework to guide future research efforts. Thus, this study aimed to review published studies and analyze the effects and potential of digital technology in optimizing the overall managerial process and tourist experience in the nautical sector. In other words, this research aimed to answer the questions:

- a) which are impacts of the information and communication technology systems on board and ashore in the context of nautical tourism,
- b) in what way digitalization benefits the nautical tourism sector and
- c) how diffusion of innovative technology systems is revolutionizing the nautical experience.

This qualitative approach involved examining secondary sources, including professional and sectoral publications, using keywords: "nautical tourism", "cruising", "yachting", "innovations", "smart technology", and "digital systems". In addition, a comprehensive search was performed on the

home page of organizations and associations in the domain of the nautical sector. Since this study tends to consolidate existing knowledge and address specific questions on the effects of digital mechanisms in nautical tourism, the methodology engage comprehensive literature overview that aligns with the aim of comprehending impacts of technology and digitization within the industry.

4. Results and discussion

The findings confirm a growing attention to nautical tourism over the years, yet there is relatively limited research on the effects of digitalization within the industry. The literature predominantly focuses on specific issues, often neglecting vital research aspects related to the economic relevance and effects of smart technologies and digital systems in nautical tourism. In the modern economic context characterized by continuous changes, the application of smart technologies in the nautical sector is imperative [13]. In other words, technology is of significant importance in improving multiple aspects of nautical tourism, enhancing safety, efficiency, sustainability and overall experience [34]. In this respect, digitized systems emerge as vital factors in reducing costs, improving navigation safety, and strengthening the positioning and effectiveness of managing the overall business system within the nautical sector industry [2]. In other words, the integration of multiple information-communication and digital technology such as object detection systems, internet of things, satellite communications, big data and virtual reality, can stimulate the achievement of various business goals in the tourism industry, including nautical sector, primarily through improving the loyalty and overall value of the tourist experience, strengthening the differentiation of the overall product, as well as encouraging networking and more efficient cooperation within the innovative context [8].

Based on the analysis of existing literature, this article highlights the multidimensional effects of using digitization in nautical tourism. Precisely, in an effort to integrate existing knowledge on the tourism and digitization, this study aims to shed the light on the influence of technology on transformative process of nautical sector, focusing on tourist experience and managerial activities of operators. Following this manner, we conclude that technology is revolutionizing the nautical tourism, ensuring safer, more efficient and environmentally sustainable maritime travel experiences while enhancing overall tourist satisfaction and operational efficiency. Therefore, the results confirm the significance of digital transformation, providing valuable insights for industry stakeholders and a clearer understanding of the impact of technology in nautical tourism.

5. Conclusion

This study underscores the transformative potential of digitalization in nautical tourism. Specifically, apart from improving operational efficiency and passenger satisfaction, the implementation of technological systems generates new opportunities for sustainable development and environmental management within the industry. By adopting smart systems and digital innovations, nautical tourism operators can strongly contribute to mitigating environmental impacts, optimizing resource management and fostering an environmentally friendly nautical travel experience. This systematic approach highlights the importance of embracing digital transformation not only as a strategic imperative for long-term business prosperity, but as a key driver for advancing sustainability goals and ensuring permanent viability of the nautical tourism industry in contemporary global context.

Achieving full potentials of digitization in nautical tourism implies facing adoption challenges and continuously innovating in response to contemporary industry demands. To this end, this research can help in understanding major principles for improving the digital aspects of nautical tourism operations, thus serving as a reliable foundation for creating digitized nautical products that ensure sustainable development of the industry. Operators and managers in nautical tourism should be aware of the advantages of digital platforms and interactive systems to improve the operation of ships while creating impressions for tourist that will exceed their expectations and generate an unforgettable experience. By analyzing the impacts of digitization, policymakers within the industry should understand the multiple contribution of technological innovations to the development of nautical tourism and the need for a systematic approach to their adoption. This approach can encourage the sustainable development of nautical destinations and the long-term prosperity of companies operating in the nautical sphere. Finally, due to the limited dialogue between interactive systems and customers in nautical tourism of Mediterranean countries, our research highlight the necessity for making digitized systems more travelers-oriented.

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