Published in the USA
International Journal of Media and Information Literacy
Issued since 2016.
E-ISSN: 2500-106X
2026. 11(1): 48-68

DOI: 10.13187/ijmil.2026.1.48
https://ijmil.cherkasgu.press


# Digital Literacy and Information Seeking Behavior in Specialized Higher Education: A Data-Driven Study of Maritime University Students

Anastasia Konstantinou [a], Petros Kostagiolas [a], Petros Pallis [b, *]

[a] Ionian University, Corfu, Greece
[b] University of the Aegean, Chios, Greece

**Abstract**

This study investigates the connection between information seeking behavior and digital literacy among maritime university students. Despite the recognized importance of digital competencies, empirical research in specialized academic fields remains limited. A cross-sectional survey of 235 Greek maritime students was conducted, integrating Wilson's information-seeking model with the DigComp 2.2 framework. Data were analyzed using descriptive statistics and Exploratory Factor Analysis (EFA).

The results show that while students possess strong basic digital skills, such as using general search engines, their advanced competencies in retrieving and evaluating scholarly literacy strongly correlates with the use of specialized maritime sources. Furthermore, digital competencies, including ICT use and problem solving, operate as an interconnected skill set.

While limited by its cross-sectional nature and specific geographic sample, the study provides valuable empirical evidence. It highlights the urgent need to integrate structured digital literacy training into maritime curricula, focusing on advanced scholarly research skills. Ultimately, this research extends existing information behavior models into domain-specific education, offering practical insights to better prepare maritime students for digitally intensive professional environments.

**Keywords:** information seeking behavior, information literacy, digital competencies, maritime students, DigComp 2.2, maritime education, domain-specific information.

## 1. Introduction

The maritime industry is considered one of the cornerstones of global trade and world economy. As The Economist notes If trade is the lifeblood of the world economy, then the ships... are the red corpuscles (The Economist, 2005). It has a great impact on millions of lives and professions, and it faces several challenges and uncertainty. The basic characteristics of maritime sector are the complexity of operations and vulnerability (Stopford, 2009). According to UNCTAD Review of Maritime Transport (2022) and Clarkson's PLC 2022 Annual Report, ships deliver over 80-85 % of world trade, approximately 12 billion tons of global seaborne trade with an estimated growth of 3,2 % since 2021 (Clarksons PLC, 2023; Donepudi, 2014; UNCTAD, 2022; Zaman et al., 2017). In addition, it is a dynamic industry that changes rapidly and reshapes through digitalization. The application of Industry 4.0 introduces the transition from traditional shipping to smart shipping requiring skilled workforce with digital competencies to contribute greatly to the sustainability of maritime sector (Nguyen et al., 2014; Shahbakhsh et al., 2022).

The advent of Maritime 4.0 marked by the integration of automation, data analytics and smart technologies across shipping and logistic industries has amplified the demand for digitally

* Corresponding author
E-mail addresses: ppallis@aegean.gr (P. Pallis)

competent maritime professionals. Digital competencies are no longer auxiliary skills but core enablers of operational efficiency, regulatory compliance and maritime safety. From real-time data flows to adhering to cybersecurity protocols and ethical digital conduct, maritime workforce must be equipped with a broad spectrum of digital literacies (Fedorov, Levitskaya, 2015; Koh, Yuen, 2022; Shahbakhsh et al., 2022).

Within the novel maritime ecosystem, the role of information and the information-seeking behaviors of all involved actors become crucial. Awareness of information needs, as well as the use of high-quality information resources to meet those needs and effectively utilize information, is essential. According to Case and Givens (Case, Givens, 2016) there is a plethora of models and theories to explain information seeking behavior depending on the work/social roles. The methodology adopted here for capturing the information seeking behavior of maritime students is based on an adaptation of the well-known Wilson's macro-model (Wilson, 1997; Wilson, 2006; Wilson, 2020). According to this conceptual approach, information-seeking behaviours are closely linked to the fulfilment of individuals' information needs (Bawden, Robinson, 2013). Moreover, European Union recently provided a framework of digital literacy in DigComp 2.2 Report (2022) by identifying five main areas of important competencies (Vuorikari et al., 2022): i) information and data literacy, ii) communication and collaboration, iii) digital content creation, iv) safety and v) problem solving. These competencies are essential to utilize information, utilize online resources, employ Artificial Intelligent and analyze dig data (Chlomoudis, Kostagiolas, 2011; Karanikola, Panagiotopoulos, 2018).

By aligning our research with DigComp 2.2 our work attempts to capture the nuanced digital behavior of maritime students in a way that reflects real-world expectations. In the context of Maritime 4.0 where digital operations are integral to safety, logistics and communication, the DigComp 2.2 framework offers a valuable tool to evaluate the preparedness of future maritime professionals.

A survey was administered between March and April 2023, to assess digital competencies, involving 235 students enrolled in maritime studies programs at three Greek Universities. Both descriptive and inferential statistical analyses were employed, and Exploratory Factor Analysis (EFA) was applied to identify underlying constructs among the original survey items. The findings underscore the significant impact of digital competencies and the fulfillment of information needs on students' academic success and readiness for professional engagement in the maritime sector. Concisely, the findings highlight a strong link between literacy and source quality, meaning that maritime students with higher information literacy skills are significantly more likely to access and use specialized maritime information content. Furthermore, the integration of advanced digital competencies is closely tied to socially responsible ICT use and another key takeaway is that foundational and advanced digital skills, collaborative ICT use, problem solving and online safety awareness form a mutually strong competence set. This fact indicates that one domain can have positive effects on maritime students' digital skills.

## 2. Materials and methods

The importance of information needs and information seeking behavior of students of maritime studies was highlighted by Udayangani de Silva and Chandrawamsa (Udayangani de Silva, Chandrawamsa 2016). They suggest that academic library is important in assisting students to retrieve information and cover their academic needs. Abarquez et al. (Abarquez et al., 2015) demonstrated that maritime students are aware that using library tools enhances their information searching and the satisfaction of their information needs. In the same context, Colar (Colar, 2021) suggests the need for programs aiming at further expanding library services for the benefit of students. These may include maritime data centres as well as special maritime databases and libraries.

Head (Head, 2012) and Head et al. (Head et al., 2013) summarized findings from six studies showing that students use digital skills to manage large volumes of maritime information, while also highlighting that employers seek graduates with digital competencies developed through higher education studies. More recently, Topal and Süner (Topal, Süner, 2021) studied the search strategies of students at a Turkish state maritime university, concluding that advanced information seeking behaviors require higher levels of digital skills, while Kovačević (Kovačević, 2014) investigated the relationship between maritime companies and the role universities in the development of digital skills. Furthermore, there are many reports published by global maritime organizations and maritime corporations as well, suggesting the essential digital competencies of the future workforce in making the shift to digital transformation in maritime industry (DNV,

2023; IAMU, 2019; IMO, 2010; OECD, 2018; Oksavik et al., 2020; UNCTAD, 2022). Notably, the IMO emphasizes that specific digital competencies should be integrated into its regulatory instruments (Hopcraft, 2021).

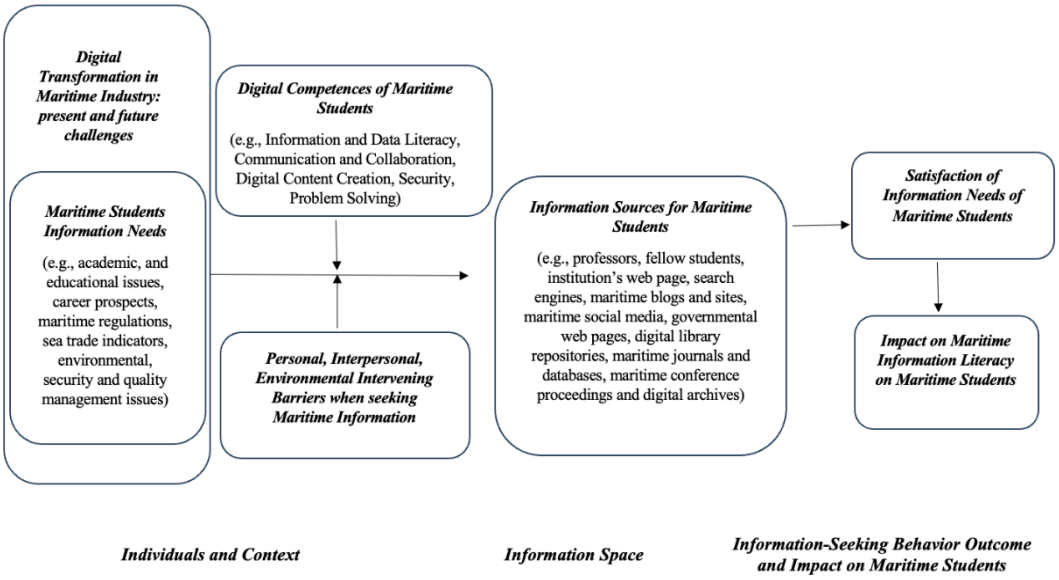


**Fig. 1.** Adoption of Wilson's macro-model (1981) of information seeking behavior for maritime professionals/students, based on Kostagiolas et al. (Kostagiolas et al., 2018)

This study focuses on Wilson's model (Wilson, 1981) as the theoretical framework, emphasizing the distinct role of maritime professionals and students (Chlomoudis et al., 2022). Figure 1 presents Wilson's macro-model for information seeking as applied to maritime students. Wilson's macro-model, as depicted, highlights that information needs are generated within the maritime academic environment. Thereafter, students are employing various information resources to satisfy their information needs. Moreover, Wilson suggests that intervening variables play a crucial role in identifying potential hindrances and facilitators in the information-seeking process. These variables include, among others, psychological, demographic, interpersonal, socio-economic, and environmental factors. Notably, individuals' digital competencies are recognized as key intervening variables that support information seeking among both maritime students and professionals (Chlomoudis et al., 2022; Kostagiolas et al., 2018; Wilson, 2020).

In the same context, Hopcraft (Hopcraft, 2021) highlights the importance of providing appropriate training for seafarers to develop standardized digital competencies, with a focus on cybersecurity in the maritime sector. Hopcraft (Hopcraft, 2021) also discusses IMO's efforts to standardize maritime digital skills related specifically to cybersecurity, introducing the International Convention on Standards of Training, Certification and Watchkeeping (STCW) and the International Safety Management (ISM) Code. Additionally, the author identifies the application of five core functions according to National Institute of Standards and Technology (NIST)-Identify, Protect, Detect, Respond, and Recover-across three levels: support, operational, and management (Hopcraft, 2021). This framework can be embedded in information-seeking behavior. Furthermore, Cabaron (Cabaron, 2023) conducted a survey at the Maritime Education Faculty in the Philippines, concluding that digital competencies are crucial for managing safety and security risks in the future. Cabaron (Cabaron, 2023) also employed the five dimensions of DigComp 2.0-information and data literacy, communication and collaboration, digital content creation, safety, and problem solving-to assess the digital literacy competence of faculty members and identify areas for improvement.

The need for digital competencies in maritime education is also emphasized by Bartusevičienė and Valionienė (Bartusevičienė, Valionienė, 2020). They categorize skills into three groups-general, professional, and research-referring to maritime students' abilities such as collecting data from open-source databases, processing data, using machine learning algorithms, and applying data analysis methodologies in practice. Similarly, Cicek et al. (Cicek et al., 2019) classify digital competencies in maritime education into four categories: technical, social,

methodological, and personal, identifying 33 competencies essential for the future skills of seafarers. Moreover, Sullivan et al. (Sullivan et al., 2021) provide a descriptive definition of Maritime 4.0, highlighting the key elements of digital transformation and the need for highly skilled and educated personnel to manage rapid technological changes in vessels and port administration, noting that the amount of data has grown exponentially over the past five years. Zapalska and McCarty (Zapalska, McCarty, 2017) highlight the urgent need for strategies to develop digital competencies aligned with the digital information literacy framework at the U.S. Coast Guard Academy (USCGA). Educators are expected to equip cadets with business competencies, communication, self-leadership, critical thinking, and information literacy skills. The authors emphasize that USCGA recognizes that IL skills are critical to the success of the Coast Guard as an organization, detailing the stages of the information literacy process.

As far as the survey is concerned, it was conducted between March and April 2023 and designed to examine how digital information literacy and digital competencies influence the academic and professional preparedness of maritime students. It was approved by the Research Ethics and Deontology Committee of Ionian University (2nd Assembly, 28/02/2023). The study complied with the General Data Protection Regulation (GDPR) and institutional research policies.

Participation was voluntary, anonymous and online, with clear instructions regarding confidentiality, privacy, the right to withdraw at any time, the purpose of data collection. Informed consent was obtained from all respondents prior to participation.

The target population consisted of undergraduate and postgraduate students from three Greek maritime university departments:

– Department of Maritime Studies, University of Piraeus.

– Department of Shipping Trade and Transport, University of the Aegean.

– Ports Management and Shipping Department in National and Kapodistrian University of Athens.

– MSc students on Sea Transport and Shipping along with the Department of International and European Studies and the Department of Economics of the University of Macedonia.

The development of the survey was informed by Wilson's model (1981) information seeking behavior and the *European Digital Competence Framework*, *DigComp 2.2* concerning digital competencies. Table 1 presents all questionnaire dimensions based on the above theoretical models, as follows:

– Maritime-related information needs (13 items) frequency of specific information needs

– Maritime-related information sources (15 items) frequency of use of sources

– Digital competencies (26 items) extend to which the five DigComp 2.2 domains (e.g. information and data literacy, communication and collaboration, digital content creation, safety, problem solving)

– Informational attitudes (4 items) perceptions of the usefulness of internet and social media, as well as information literacy seminars during maritime studies.

**Table 1.** Questionnaire dimensions based on Wilson model adaptation and DigComp 2.2

| Questionnaire Dimensions | Definition/measurement items |
|---|---|
| B. Maritime related information needs (Items N = 13) | Measures the frequency of using specific maritime information needs: academic and student issues, lifelong learning programs, maritime conferences/workshops, career prospects, shipping finance, maritime law, maritime indicators, environmental issues, maritime security issues, quality management issues, human resources management, culture, and maritime issues |
| C. Maritime related information sources (Items N = 15) | Measures the frequency at which maritime students employ specific information resources when seeking maritime information: professors, fellow students, department's web page, e-class platforms, search engines (Google), maritime blogs and social media, governmental web pages, library repositories, online maritime portals and websites, specific maritime e-journals and databases, digital maritime proceedings and archives, online maritime news websites |

| Questionnaire Dimensions | Definition/measurement items |
|---|---|
| D. Digital Competencies of maritime students (Items N = 26) | Measures the extent to which the five areas of digital competence framework (DigComp 2.2) contribute to maritime studies: information literacy, communication, and collaboration, developing digital content, safety and problem solving |
| E. Informational attitudes of maritime students (Items N = 4) | Measures the informational attitudes of maritime students: the usefulness of internet and social media during maritime studies and the usefulness of digital behavior and digital skills seminars for maritime students |

In addition to the above, sociodemographic variables are recorded (age, sex, English language proficiency, employment status). All items were measured on a five-point Likert scale (1 = not at all to 5 = very much). The internal consistency of each section of the questionnaire is tested with Cronbach's alpha with values above 0,70 considered satisfactory. As Table 2 shows, reliability coefficients ranged from 0.73 to 0.89, confirming acceptable levels of consistency across all dimensions.

**Table 2.** Reliability statistics for each section of the questionnaire

| | Cronbach's Alpha | N of Items |
|---|---|---|
| Section B Information needs | .885 | 13 |
| Section C Information sources | .857 | 15 |
| Subsection D.1 Information and data literacy | .743 | 5 |
| Subsection D.2 Communication and | .795 | 8 |
| Subsection D.3 Digital content creation | .802 | 5 |
| Subsection D.4 Safety | .814 | 4 |
| Subsection D.5 Problem solving | .730 | 4 |

The statistical analysis of the survey data was conducted using IBM SPSS Statistics (v.23). Internal consistency reliability was assessed with Cronbach's alpha, confirming that all constructs were reliable. The Kolmogorov-Smirnov and Shapiro-Wilk tests were applied to assess normality. The results that did not follow a normal distribution ($p < 0.5$) were subsequently analyzed with non-parametric analysis. Specifically, the Mann-Whitney U test was employed to identify significant differences between two independent subgroups, while the Kruskal-Wallis H test was used for comparisons involving more than two independent subgroups (results are shown in the Appendix tables). Descriptive statistical analysis excluded subgroup categories with fewer than 20 responses from the non-parametric tests (e.g. in the Sex category, the subgroup Prefer not to say [N = 11]).

Exploratory Factor Analysis (EFA) was conducted using Kaiser's criterion (eigenvalue ≥ 1) as the factor extraction method. Principal Component Analysis (PCA) with varimax rotation was also applied to identify clusters of maritime information needs, sources, and digital competencies. Items with low factor loadings (< 0.40) were removed from the process to retain only those strongly associated with the factor. The reliability of each factor was further examined by using Cronbach's alpha. Although, in some cases factors exhibit poor internal consistency ($0.6 > \alpha \geq 0.5$), they demonstrated strong loadings and theoretical coherence. Therefore, they were retained and considered scientifically justified due to the limited number of items (Pallant, 2020).

The suitability of the data for factor analysis was confirmed by Kaiser-Meyer-Olkin KMO measures ranging from middling to marvelous and Bartlett's Test of Sphericity ($p < .000$). Finally, bivariate correlation analysis was used to examine associations between the identified factors and other variables of interest.

## 3. Discussion

The findings of this survey underscore a transformative shift in maritime education, where digital competencies and information literacy emerge as foundational pillars for both academic and professional success. The analysis confirms that maritime students not only rely heavily on digital tools to fulfill their academic needs, but they also display an understanding of broader implications

of digital engagement, based on their answers for ethical considerations to digital well-being and cybersecurity awareness.

Most shipping organizations and operators have complied with the structured training in digital maritime information literacy, ensuring that graduates can critically engage with complex digital environments of maritime sector. In this context, DNV Study, digitalization is identified as one of the fundamental factors for the transformation of the maritime industry by 2030. The study, co-sponsored by the Singapore Maritime Foundation (SMF), reveals that approximately 81 % of seafarers expressed the need for advanced training in digital technologies. However, only 13 % of them believe that they are adequately trained in this area (DNV, 2023). The integration and acceptance of digital technologies, such as blockchain, Machine Learning (ML), Artificial Intelligence (AI), Internet of Things (IoT), big data, cloud computing, and automation technologies, contribute to transparency and facilitate more responsive and agile processes (Shahbakhsh et al., 2022; UNCTAD, 2022). Consequently, this necessitates a transformation in the traditional skills and competencies of maritime professionals, offering improved career prospects (DNV, 2023; Nguyen et al., 2014).

The digital transformation demands knowledge and competencies that promote sustainable careers for employees in the maritime sector, extending beyond a mere understanding of hardware and software devices (Ferrari, 2012). The rapidly evolving maritime industry also requires well-trained and educated university graduates who possess the ability to adapt to the changes brought about by the digital era and exhibit flexibility in their career paths (Caesar et al., 2014). As emphasized by the OECD, digital literacy and data literacy are increasingly crucial, alongside physical health and mental well-being (OECD, 2018).

The realm of new knowledge and digital abilities effectively encapsulates the fundamental technical attributes of a global maritime professional. These attributes include: i) possessing all the necessary technical competencies required for their operational responsibilities, ii) possessing advanced academic skills that encompass logical and critical thinking, iii) exhibiting a high level of professionalism and ethical conduct, iv) demonstrating strong interpersonal skills, v) displaying emotional intelligence and an awareness of multiculturalism and diversity, vi) possessing leadership abilities, the capacity to work in a team, and the initiative to take personal responsibility, vii) exhibiting environmental consciousness, and viii) possessing a comprehensive understanding of contemporary maritime issues (Cicek et al., 2019; IAMU, 2019; Kaspersen et al., 2022; van Laar et al., 2017). As a result, combining technical skills with digital literacy competencies, which became both a requirement and a right, as mentioned by European Commission Joint Research Centre (2001) (Ferrari, 2012), education is the only solution to keep up with the new challenges and embrace them thoroughly (OECD, 2018).

Notably, the primary objective is to present proof and elucidate a crucial inquiry, which is whether information aids maritime scholars in achieving their academic pursuits. With the advent of the digital age, the use of the internet has become indispensable, resulting in a disparity among people worldwide, commonly known as the digital divide, as stated by Wilson, particularly after the outbreak of the Covid-19 pandemic in 2020 (Wilson 2020). Numerous studies expound on competencies as a compilation of individual and organizational outcomes (Cicek et al., 2019), specifically digital competencies that are vital in all aspects and roles of daily life. Consequently, even in maritime sector there is a tendency to develop courses specially designed to advance information literacy skills in academic and professional fields (Zapalska, McCarty, 2017). Cabaron's study (2023) based on the previous European framework DigComp 2.0 also proved that the five pillars of digital competence need to be improved. referring to maritime students (Cabaron. 2023). European Commission's Report (2012) states that if citizens want to be functional today, digital competence is a requirement and a right (Ferrari, 2012).

Generally, the findings reveal a distinct hierarchy in maritime students' information seeking preferences and competencies. Informal sources, such as search engines and e-class platforms are the most frequently used and highly valued, while specialized and professional maritime resources are underutilized. This fact shows a gap between academic or professional information sources, potentially reflecting both accessibility barriers and a lack of familiarity with specialized tools. Similarly, maritime students demonstrate strong basic literacy skills, including effective search engine use (e.g. Google) and software proficiency, their advanced information literacy skills, such as navigating in scholarly databases and evaluating academic sources, remains comparatively underdeveloped. For instance, the overall high percentage (52.3 %) of the respondents that believe

the use of artificial intelligence tools (e.g. ChatGPT) contributes A little to their studies or Not at all, could be attributed that the tool was not widely adopted by students during the study and started to gain traction slowly. Another explanation is the insufficient awareness or lack of integration into the curriculum. However, the strong positive correlation between information literacy and the use of specialized sources underlines the potential for targeted training to shift maritime students' preferences toward higher-value resources.

Besides, the influence of demographic variables, such as age and gender on digital tool adoption and information behavior is another important insight. For instance, younger students (Gen Z), postgraduates and those with higher English proficiency exhibit stronger engagement with scholarly maritime digital archives. Conversely, foundational tools such as videoconferencing software or management platforms showed higher relevance for early-year students, indicating evolving digital needs across the academic lifecycle.

Digital competencies show uneven development too. Collaborative and managerial ICT tool proficiency, problem solving skills with digital technologies are relatively strong, while creative and ethical digital content creation and advanced ICT use for professional networking are less established. In the same context, safety related competencies, especially awareness of the health impacts of digital overuse are recognized but not uniformly practiced. At the same time, the high values of importance of internet use for completing maritime studies along with positive satisfaction levels regarding maritime information, reflect a generally supportive digital environment. Noteworthy, maritime students recognize the need to participate in digital information literacy programs/seminars to fill the gaps in this area and build an integrated curriculum based on digital competencies according to EU standards, although they did not participate in the past. Maritime digital information literacy programs/seminars could align student practices with professional maritime standards, fostering readiness for the demands of Maritime 4.0 or even further, ensuring a workforce adept at navigating both general and specialized information landscapes.

Moreover, the findings related to students' ability to recognize false or misleading information (D.5.4) highlight the pivotal role of digital competencies in navigating contemporary media environments characterized by pervasive misinformation. Recent research demonstrates that digital literacy, particularly its cognitive and critical dimensions, enhances individual's capacity to evaluate information credibility, verify sources, and resist misleading content circulating on social media. However, this competence operates within complex media ecosystems where news consumption is increasingly shaped by platform logistics and social practices. As Swart (2023) shows, news literacy is not merely a set of technical skills, but a situated practice embedded in everyday social media use, where users must actively negotiate platform norms and mixed information genres (Jacob et al., 2025; Swart, 2023). In this context, the relatively strong awareness among students regarding misinformation aligns with evidence that critical attitudes toward media and active verification behaviors (e.g. cross-checking sources) are key predictors of misinformation recognition (Anthonysamy, Sivakumar, 2024; Jacob et al., 2025; Swart, 2023; Zhang et al., 2026).

At the same time, emerging AI-driven information environments introduce new challenges that require more advanced forms of digital and AI literacy. Studies show that while digital competencies can support academic and information-seeking outcomes, they do not automatically translate into critical engagement, particularly when users develop trust in systems such as ChatGPT (Barisione et al., 2025; Shrivastava, 2024; Swart, 2023). This is even more complicated by phenomena such as AI hallucinations where users may accept inaccurate but persuasive information without verification, reinforcing pre-existing beliefs (Jacob et al., 2025). In addition, the power of AI blurs the boundaries between authentic and synthetic content, making the identification of misinformation increasingly difficult and dependent on users' technological familiarity and critical awareness (Barisione et al., 2025; Shrivastava, 2024). Therefore, the present findings support the argument that combating misinformation in higher education requires not only foundational digital competencies but also the development of advanced critical, reflective, and AI-related literacies, enabling students to engage more effectively with the evolving media landscape (Lee et al., 2025; Swart, 2023; Zhang et al., 2026).

Educational institutions should address both dimensions informal/professional and formal/institutional digital learning tools to support comprehensive digital literacy among maritime students. Maritime students also appear to engage with both technical and ethical

components of digital literacy in a holistic manner, they perceive importance of cybersecurity and digital health and finally the survey revealed their ability to navigate digital and technical challenges, maintaining a critical approach to information accuracy and inclusivity. For that reason, educational programs should integrate both tool-oriented training and media literacy for a comprehensive approach to digital competence.

Regarding the limitations of the survey, the research utilized a cross-sectional survey design which captured data on the information-seeking behaviors and digital competencies of maritime students at a specific period. just prior to the widely spread AI tools (e.g. ChatGPT). Consequently, it is possible that the study does not reflect any changes that may have occurred following the widespread adoption of AI tools and their implications. Moreover, some factors, although exhibiting strong loadings yielded low Cronbach's alpha values, a fact that warrants cautious interpretation of results. Nonetheless, their inclusion is scientifically justified.

Beyond the academic context, these findings carry significant implications for curriculum design. industry collaboration and policy development. Maritime education institutions should not only embed digital information literacy into maritime curricula, but also establish stronger partnerships with shipping companies, professional associations and regulatory organizations to ensure alignment with evolving industry standards and practices, as Maritime 4.0. Therefore, continuous professional development opportunities could help bridge the gap between maritime students' competencies and the advanced digital skills in an increasingly demanded industry.

## 4. Results

The following section presents the descriptive statistics of the survey participants, providing an overview of their socio-demographic characteristics. Table 3 summarizes the socio-demographic characteristics of the participants. According to the results, most participants were female (54.9 %, n = 129), belonged to the Gen Z age group (as categorized by Dimock (Dimock, 2019) (91.9 %, n = 216), had excellent knowledge of the English language (74 %, n = 174), were undergraduate students (88.5 %, n = 208) at the University of Piraeus (69.8 %, n = 164), and were unemployed (59.1 %, n = 139). Among the working students (40.9 %, n = 96), the majority reported that their jobs were not related to their field of study (78.1 %, n = 75) and were part-time (57.3 %, n = 55). Additionally, the data show that most respondents were in their second year of study (40.4 %, n = 95), and only 8 % (n = 19) had attended information literacy programs or seminars in the past five years.

**Table 3.** Survey participants' demographics and students' characteristics

| Demographic characteristics | Respondents | Percentage |
|---|---|---|
| A.1. Sex (valid N = 235) | | |
| Male | 101 | 43.9 |
| Female | 129 | 54.9 |
| Prefer not to say | 5 | 2.1 |
| A.2. Age (valid N = 235) | | |
| Gen Z | 216 | 91.9 |
| Millennials | 12 | 5.1 |
| Gen X | 7 | 3 |
| A.3. English degree (valid N = 235) | | |
| No degree/A1-A2-B1 | 10 | 4.3 |
| Lower B2 | 39 | 16.6 |
| Advanced C1 | 12 | 5.1 |
| Proficiency C2 | 174 | 74 |
| A.4. Institution (valid N = 235) | | |
| University of Piraeus | 164 | 69.8 |
| Uiversity of Aegean | 59 | 25.1 |
| National and Kapodistrian University of Athens | 9 | 3.8 |
| University of Macedonia | 3 | 1.3 |
| A.5. Studies (valid N = 235) | | |

| Demographic characteristics | Respondents | Percentage |
|---|---|---|
| Undergraduate | 208 | 88.5 |
| Postgraduate | 27 | 11.5 |
| A.6. Work (valid N = 235) | | |
| Yes | 96 | 40.9 |
| No | 139 | 59.1 |
| A.6.1. Work relevant to studies (valid N = 235) | | |
| Yes | 21 | 21.9 |
| No | 75 | 78.1 |
| A.6.2. Work full time/part time (valid N = 235) | | |
| Full time | 41 | 42.7 |
| Part time | 55 | 57.3 |
| Students' characteristics | | |
| A.7. Year of studies (valid N = 235) | | |
| 1st year | 39 | 16.6 |
| 2nd year | 95 | 40.4 |
| 3rd year | 57 | 24.3 |
| 4th year | 33 | 14 |
| >5 year | 11 | 4.7 |
| A.8. Attending information literacy | | |
| Yes | 19 | 8 |
| No | 32 | 13.6 |

In the Appendix, distinct tables present descriptive results and subgroup statistics for all dimensions of the questionnaire. It should be noted that, while Appendix identifies significant subgroup statistics through superscripts in the result tables, only a selection of these demographic differences is discussed in the main text.

As is illustrated in Table I of the Appendix, maritime students report a higher frequency of information needs related to academic issues (median = 4) and career prospects (median = 4). Specifically, undergraduate maritime students express greater interest in students' issues than postgraduate students ($p < 0.05$, with mean rank = 121.31 and 92.52 respectively). Furthermore, Table II indicates that search engines (e.g. Google) and e-class platform (median = 5) are utilized by maritime students more frequently, followed by department's webpage (median = 4).

Table III reveals that the most valued digital competency related to information and data literacy is the ability to find/evaluate maritime information through search engines (median = 5), followed by the proficiency to use software (median = 4) and the ability to find/evaluate scholarly documents within scientific databases (median = 4). In the same context, Table IV reports that collaboration through open platforms (median = 5) is the most valuable digital competency related to communication and collaboration, followed by use of management software (median = 4) and videoconference software (median = 4).

Table V indicates that most important digital competency related to digital content creation is creating maritime content/posts on social networks (median = 3) and the understanding of ethics in sharing maritime information (median = 3). Notably, 1st year maritime students regarded knowledge of programming languages as a more significant digital competence than students in later semesters (mean rank = 129.7, compared with 120.26 for 2nd year, 96.58 for 3rd year and 125.37 for 4th year students). In addition, the most important digital competency referring to safety, according to maritime students, is the understanding that excessive use of digital technology may affect health (median = 4), as it is revealed in Table VI.

Moreover, Appendix Table VII demonstrates that the most valuable digital competency related to problem solving is the use of technological devices (median = 5), followed by knowledge of digital tools for solving technological problems (median = 4) and the ability to use assistive tools improving access to information (median = 4), equally.

In Appendix Table VIII, maritime students highlight the importance of internet use to complete their studies (median = 5). Furthermore, within the context of informational attitudes of maritime

students, overall satisfaction of maritime information (median = 4), importance of using social media for maritime information (median = 4) and importance of digital behavior/digital competencies seminars for maritime studies (median = 4) are considered fundamental for their studies. Especially, overall satisfaction with maritime information currently available is high, with more than half of the students (57 %) expressing strong or very strong satisfaction. This percentage indicates that most maritime students feel that their current information needs are met to a considerable extent, reflecting generally a positive attitude towards the adequacy and relevance of the maritime information sources and their ability to access. It is interesting also, that 1st year maritime students reported higher satisfaction with maritime information compared to students in later semesters (mean rank = 131.47 versus 121.93 for 2nd year, 99.37 for 3rd year and 114.65 for 4th year students).

In addition, these findings demonstrate the central role of internet use in academic success, the recognized value of targeted digital skills training and the appreciation of social media as an information source.

Results from Exploratory Factor Analysis (EFA) revealed one category (factor) of information needs that collectively explained 43.14 % of the total variance, as it is depicted in Table 4. The factor named Maritime information literacy demonstrated high internal consistency (Cronbach's alpha = 0.890), indicating strong reliability. In addition, this factor (mean = 2.80 and std. dev. = 0.794), suggests a moderate overall engagement with maritime quality management, maritime security issues, maritime market indicators/global trade indicators and maritime economics among information needs. This fact highlights that maritime students' information literacy priorities extend across both operational and strategic maritime domains.

**Table 4.** EFA results for frequency of information needs of maritime students

| Information Needs | Factor |
|---|---|
| | 1 |
| | |
| B.11 Maritime quality management | 0.777 |
| B.10 Maritime security issues | 0.762 |
| B.8 Maritime market indicators/global trade indicators | 0.75 |
| B.6 Maritime economics | 0.735 |
| B.12 Maritime human resources management | 0.674 |
| B.5 Maritime conferences/workshops | 0.669 |
| B.3 Career prospects | 0.658 |
| B.4 Maritime lifelong educational programs | 0.651 |
| B.7 Maritime law/commercial maritime law | 0.631 |
| B.13 Maritime culture issues | 0.616 |
| B.9 Maritime environmental issues | 0.611 |
| B.1 Academic issues | 0.527 |
| Cronbach's alpha | 0.890 |
| Mean value | 2.80 |
| Standard dev | 0.794 |
| Notes: (1) Maritime information literacy. Extraction method: Principal Component Analysis. a. 2 components extracted. | |

In Table 5, EFA results for information sources revealed three factors collectively explained 56.74 % of the total variance. The first factor Specialized and professional maritime information sources (10 items, Cronbach's alpha = 0.909), the second is Academic information sources (4 items, Cronbach's alpha = 0.507) and the third one is Informal maritime information sources (1 item) emerged from the analysis. Although the second factor demonstrated low Cronbach's alpha (0.507), this value is acceptable within the context of exploration search and the limited number of items. Table 5 also presents the descriptive statistics (mean values and standard deviation) for identified factors. The results indicate that maritime students rated informal maritime sources (mean = 4.56) as more important than academic information sources (mean = 3.41) and

specialized and professional maritime sources (mean = 2.34). This observation indicates a significant inclination to well-known digital tools that facilitate both academic and everyday activities, in antithesis to institutional and specialized maritime resources with low median scores, highlighting a potential gap in students' engagement with academic resources.

**Table 5.** EFA results on maritime students' information source frequency of use

| Information Sources | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| | | | |
| C.12 Maritime databases | 0.824 | | |
| C.11 Maritime scientific e-journals | 0.809 | | |
| C.10 Maritime web portals | 0.794 | | |
| C.8 Government webpages | 0.767 | | |
| C.13 Maritime e-proceedings | 0.763 | | |
| C.14 Maritime digital archives | 0.741 | | |
| C.9 Academic library repositories | 0.705 | | |
| C.6 Maritime blogs | 0.644 | | |
| C.15 Maritime press online/maritime website news | 0.618 | | |
| C.7 Maritime social media | 0.571 | | |
| C.4 E-class platform | | 0.755 | |
| C.3 Department's webpage | | 0.669 | |
| C.1 Professors | | 0.603 | |
| C.2 Fellow students | | 0.506 | |
| C.5 Search engines | | | 0.84 |
| Cronbach's alpha | 0.909 | 0.507 | - |
| Mean value | 2.34 | 3.41 | 4.56 |
| Standard dev | 0.88 | 0.71 | 0.74 |
| Notes: (1) Specialized and professional maritime information sources, (2) Academic information | | | |

EFA results for digital competency in information and data literacy identified two distinct factors. explaining 70.39 % of the total variance, in Table 6. The first factor Advanced information literacy (3 items, Cronbach's alpha = 0.64), including skills such as finding and evaluating scholarly files in professional hosting services, maritime information in social media/webpages/blogs and scholarly documents in scientific databases. The second factor, Basic digital literacy (2 items, Cronbach's alpha = 0.59) comprises software use and the ability to use and evaluate maritime information by using search engines. The results indicate that maritime students rate their basic digital literacy skills highly (mean = 4.23), in antithesis to their advanced information literacy competencies (mean = 3.14) that are comparatively less developed. This outcome highlights that the basic digital literacy skills contribute greatly to completing their studies.

**Table 6.** EFA results for Subgroup D.1 Information and Data literacy for digital competencies of maritime students

| D.1 Information & Data literacy | Factor 1 | Factor 2 |
|---|---|---|
| | | |
| D.1.4 Finding/evaluating scholarly files on online professional content | 0.864 | |
| D.1.3 Finding/evaluating maritime information in social | 0.827 | |
| D.1.5 Finding/evaluating scholarly documents in scientific databases | 0.630 | |
| D.1.1 Software use | | 0.880 |
| D.1.2 Finding/evaluating maritime information using search engines | | 0.814 |
| Cronbach's alpha | 0.64 | 0.59 |

| D.1 Information & Data literacy | Factor 1 | Factor 2 |
|---|---|---|
| Mean value | 3.14 | 4.23 |
| Standard dev | 1.05 | 0.80 |
| Notes: (1) Advanced information literacy, (2) Basic digital literacy. Extraction method: Principal | | |

EFA results for digital competency in communication and collaboration grouped in two distinct factors also, explaining 56.79 % of the total variance. As a result, in Table 7 the first factor Advanced and Socially Responsible ICT use (4 items, Cronbach's alpha = 0.75) reflect modern and interactive approaches to maritime education and the second factor Collaborative and managerial ICT tools (4 items, Cronbach's alpha = 0.70) emphasizes in formal collaboration systems, such as institutional file-sharing and open-access educational platforms, reflecting structured support for academic learning. The results indicate that maritime students report stronger competence in collaborative and managerial ICT tools (mean = 3.64), their skills in advanced and socially responsible ICT use are comparatively less developed (mean = 2.81).

**Table 7.** EFA results for Subgroup D.2 Communication and collaboration for digital competencies of maritime students

| D.2 Communication and collaboration | Factor 1 | Factor 2 |
|---|---|---|
| D.2.7 Use of artificial intelligence | 0.767 | |
| D.2.8 Identifying hostile online messages/activities | 0.726 | |
| D.2.5 Participation in professional/scientific digital networks for sharing ideas | 0.714 | |
| D.2.6 Participation in seminars/workshops/access to educational resources | 0.688 | |
| D.2.2 Collaboration through open platforms | | 0.809 |
| D.2.1 Use of file management software | | 0.747 |
| D.2.3 Use of videoconference software | | 0.596 |
| D.2.4 Use of daily task management software | | 0.594 |
| Cronbach's alpha | 0.75 | 0.70 |
| Mean value | 2.81 | 3.64 |
| Standard dev | 1.01 | 0.85 |
| Notes: (1) Advanced and Socially Responsible ICT use, (2) Collaborative and Managerial ICT Tools. Extraction method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 3 iterations. | | |

The EFA conducted for the digital competencies subcategory digital content creation extracted a single factor, labeled Creative and ethical digital competency (1 item, Cronbach's alpha = 0.802), explaining 56.06 % of the total variance. As presented in Table 8, the findings indicate that maritime students demonstrate competencies in creative and ethical digital content creation. However, the mean scores (mean = 2.63) indicate that these skills are perceived to be developed to a moderate extent.

**Table 8.** EFA results for Subgroup D.3 Digital content creation for digital competencies of maritime students

| D.3 Digital Content Creation | Factor 1 |
|---|---|
| D.3.2 Creating maritime audiovisual content | 0.810 |
| D.3.3 Creating infographics using applications/software | 0.810 |

| | |
|---|---|
| D.3.5 Knowledge of programming languages | 0.729 |
| D.3.4 Understanding of ethics in sharing maritime information | 0.726 |
| D.3.1 Creating maritime content/posts on social networks | 0.658 |
| Cronbach's Alpha | 0.802 |
| Mean | 2.63 |
| Standard dev | 1.27 |
| Note(s): (1) Creative and ethical digital competency. Extraction method: Principal Component Analysis a. 1 components extracted. | |

In Table 9, the results from EFA analysis in digital competencies' subcategory safety extracted one factor Digital protection and well-being awareness (1 item, Cronbach's alpha = 0.814), explaining 64.42 % of the total variance. The factor loadings reflect strong relationship among safety skills and indicate that maritime students generally report moderate proficiency in digital safety practices and awareness of well-being in online environments, as well as digital overuse (mean = 3.39).

**Table 9.** EFA results for Subgroup D.4 Safety for digital competencies of maritime students

| D.4 Safety | Factor |
|---|---|
| | 1 |
| D.4.2 Knowledge of installing and use of protection services | 0.859 |
| D.4.1 Creating strong passwords and secure data management | 0.832 |
| D.4.3 Detecting suspicious emails (phising) | 0.819 |
| D.4.4 Understanding excessive use of digital technology may affect health | 0.69 |
| Cronbach's Alpha | 0.814 |
| Mean | 3.39 |
| Standard dev | 1.29 |
| Note(s): (1) Digital protection and well-being awareness. Extraction method: Principal Component Analysis. a. 1 components extracted. | |

EFA results in digital competencies' subcategory problem solving extracted a single factor Digital resourcefulness and critical evaluation (1 item, Cronbach's alpha = 0.73). As it is depicted in Table 10, all items loaded strongly, indicating strong relationships among problem solving skills, suggesting also that maritime students generally possess well-developed competencies in applying digital solutions and critically evaluating information sources (mean = 3.98).

**Table 10.** EFA results for Subgroup D.5 Problem solving for digital competencies of maritime students

| D.5 Problem solving | Factors |
|---|---|
| | 1 |
| D.5.2 Knowledge of digital tools for solving technological problems | 0.807 |
| D.5.4 Understanding the importance of identifying false/misleading news | 0.769 |
| D.5.1 Use of technological devices | 0.756 |
| D.5.3 Ability to use assistive tools improving access to information | 0.685 |
| Cronbach's Alpha | 0.73 |
| Mean | 3.98 |
| Standard dev | 1.08 |
| Note(s): (1) Digital resourcefulness and critical evaluation. Extraction method: Principal Component Analysis. a. 1 components extracted. | |

Table 11 shows the bivariate correlations of the factors developed by EFA analysis of each section of the survey. Pearson correlation was performed to determine the relationship between each factor separately. Subsequently, the correlation analysis revealed several noteworthy relationships among the extracted factors.

Maritime information literacy showed a very strong positive correlation with specialized and professional maritime information sources (r = 0.806**), indicating that students with higher literacy skills tend to utilize more specialized sources. In addition, advanced information literacy is strongly correlated with both advanced and socially responsible ICT use (r = 0.623**) and creative and ethical digital competency (r = 0.619**), suggesting that higher-level digital skills are interconnected with ethical creation practices. Moreover, advanced and socially responsible ICT use is strongly related to creative and ethical digital competency (r = 0.653**) and digital protection and well-being awareness (r = 478**), underlining the connection between responsible ICT engagement, creativity and online safety.

**Table 11.** Bivariate correlations of the survey factors

| Correlations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Factors/Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | 1 | | | | | | | | | | |
| 2 | .806** | 1 | | | | | | | | | |
| 3 | .232** | .186** | 1 | | | | | | | | |
| 4 | .164* | .189** | .156* | 1 | | | | | | | |
| 5 | .462** | .498** | .152* | .203** | 1 | | | | | | |
| 6 | .268** | .254** | .172** | .292** | .421** | 1 | | | | | |
| 7 | .384** | .392** | .168** | .131* | .623** | .237** | 1 | | | | |
| 8 | .315** | .332** | .218** | .194** | .474** | .408** | .477** | 1 | | | |
| 9 | .353** | .381** | .113 | .086 | .619** | .207** | .653** | .519** | 1 | | |
| 10 | .198** | .191** | .299** | .142* | .377** | .265** | .478** | .399** | .558** | 1 | |
| 11 | .133* | .162* | .243** | .212** | .381** | .463** | .460** | .478** | .396** | .488** | 1 |

Notes: 1. Mean 2.80. std deviation 0.794; 2. M 2.34. std 0.88; 3. Mean 3.41. std 0.71; 4. M 4.56. std 0.74; 5. M 3.14. std 1.05; 6. M 4.23. std 0.80; 7. M 2.81. std 1.01; 8. M 3.64. std 0.85; 9. M 2.63. std 1.27; 10. M 3.39. std 1.29; 11. M 3.98. std 1.08.
*p < 0.05 and **p < 0.001, 1. Maritime information literacy; 2. Specialized and professional maritime information sources; 3. Academic information sources; 4. Informal maritime information sources; 5. Advanced information literacy; 6. Basic digital literacy; 7. Advanced and Socially Responsible ICT use; 8. Collaborative and managerial ICT tools; 9. Creative and ethical digital competency; 10. Digital protection and well-being awareness; 11. Digital resourcefulness and critical evaluation

Collectively, these findings indicate that maritime students' information literacy, digital competencies and ICT use form an interdependent skill set that supports both academic and professional digital practices.

## 5. Conclusion

The importance of acquiring digital competencies in various aspects of life has been widely acknowledged in literature review. In the digital era, where a vast amount of information is readily available for educational and professional purposes, there is a growing need for individuals to possess digital literacy skills. While the results revealed that students exhibit high engagement with general digital tools, such as search engines and management software, their interaction with specialized

maritime databases and scholarly repositories remains limited. This digital behavior suggests an ongoing reliance on informal information channels, highlighting a key area for curricular enhancement.

The advent of Maritime 4.0 marked the integration of automation and led to the implementation of governmental policy initiatives worldwide aimed at enhancing digital competencies. In this regard, the European Union has adopted the Digital Competence Framework (DigComp) to improve citizens' digital competence and assist policymakers in developing education and training programs to address this issue (Vuorikari et al., 2022). Moreover, maritime students recognize the importance of digital competence seminars and the necessity to familiarize themselves with digital scientific research. In this context, we suggest MarDigiComp. information literacy educational programs, specifically for maritime studies.

The objective of these seminars is twofold; either maritime students are assisted during their studies or in their future profession. Researchers in literature review the necessity of adopting contemporary digital information literacy programs based on ACRL and EU's digital agenda (i.e.. DigiComp 2.2). The primary objective is to motivate maritime students to adapt to novel information sources, innovative techniques for searching and assessing maritime information, and particularly to acquire the skills to effectively utilize information for their maximum benefit.

This study confirms that:

– Maritime related information needs' satisfaction is extremely important for students to complete their studies and to build a professional profile for the future.

– Maritime students recognize the importance of finding, evaluating, and using maritime information in digital era and in more specific scientific sources.

– Artificial intelligence (AI) tools are not so widespread among maritime students yet, whereas it's not considered crucial by the maritime students for completing their studies.

However, more research and the repetition of the survey in maritime universities in the future is significant to confirm the results and to update the data of some variables, such as AI use. It is crucial for the students in maritime studies to be familiar with digital competencies especially in such demanding sectors, such as maritime industry. Consequently, the outcome of this survey is to target more precise interventions in maritime information satisfaction, concluding the overall satisfaction during their studies and as future maritime professionals.

**References**

Abarquez et al., 2015 – *Abarquez, J.C.B., Dalawangbayan, S.S., De Chavez, M.J.M., Dimaculangan, J.P.C., Hernandez, J.M., Caiga, B.T.* (2015). Awareness of Maritime Students on the Sotero H. Laurel Learning Resource Center (SLRC) Club. *Asia Pacific Journal of Maritime Education*. 1(1): 57-62.

Anthonysamy, Sivakumar, 2024 – *Anthonysamy, L., Sivakumar, P.* (2024). A new digital literacy framework to mitigate misinformation in social media infodemic. *Global Knowledge Memory and Communication*. 73(6/7): 809-827. DOI: https://doi.org/10.1108/gkmc-06-2022-0142

Barisione et al., 2025 – *Barisione, M., Rama, I., Marolla, F.* (2025). Between AI fear and digital agency: technological familiarity and risk perception of generative AI's epistemic power. *Information, Communication and Society*. 1–20. DOI: https://doi.org/10.1080/1369118x.2025.2606101

Bartusevičienė, Valionienė, 2020 – *Bartusevičienė. I., Valionienė, E.* (2020). Meeting digitalization challenges to future specialists: development of educational environment at lithuanian maritime academy to ensure effectiveness of studies in shipping and logistics information systems. *Proceedings of 24th International Scientific Conference, Transport Means, 2020:* 316-321.

Bawden, Robinson, 2013 – *Bawden, D., Robinson, L.* (2013). No such thing as society? On the individuality of information behavior. *Journal of the American Society for Information Science and Technology*. 64(12): 2587-2590. DOI: https://doi.org/10.1002/asi.22971

Cabaron, 2023 – *Cabaron, R.C.* (2023). Enhancing the digital competence of maritime education faculty in the philippines using DigComp 2.0 Framework. *International Journal of Multidisciplinary: Applied Business and Education Research*. 4(4): 1096-1101. DOI: https://doi.org/10.11594/ijmaber.04.04.06

Caesar et al., 2014 – *Caesar, L., Cahoon, S., Fei, J.* (2014). Challenging the current paradigms of seafarer training and careers. *IAMU AGA*. 15: 348-356.

Case, Givens, 2016 – *Case, D.O., Given, L.M. (Eds.).* (2016). Looking for information: A survey of research on information seeking, needs, and behavior (4th ed.). Emerald Publishing.

Chlomoudis et al., 2022 – *Chlomoudis, C., Konstantinou, A., Kostagiolas, P., Pallis, P.* (2022). Information needs and information-seeking behaviour of maritime students: a systematic literature review using the PRISMA method. *Library Management*. 43(5): 353-369. DOI: https://doi.org/10.1108/lm-11-2021-0105

Chlomoudis, Kostagiolas, 2011 – *Chlomoudis, C.I., Kostagiolas, P.* (2011). An internationalized approach to European perspectives for the safety and security in port industry. *European Research Studies Journal*. XIII(2): 105-112.

Cicek et al., 2019 – *Cicek, K., Akyuz, E., Celik, M.* (2019). Future skills requirements analysis in maritime industry. *Procedia Computer Science*. 158: 270-274. DOI: https://doi.org/10.1016/j.procs. 2019.09.051

Clarksons PLC, 2023 – *Clarksons PLC.* (2023). Clarksons PLC – Enabling Global Trade. Leading positive change. [Electronic resource]. URL: https://www.clarksons.com

Colar, 2021 – *Colar, C.K.F.* (2021). Usage of library resources and services of Maritime academy of usage of library resources and services of Maritime Academy of Asia and the Pacific (MAAP): Bases for Promotional Strategies Asia and the Pacific (MAAP): Bases for Promotional Strategies. *Library Philosophy and Practice (e-Journal)*. 4935.

Dimock, 2019 – *Dimock, M.* (2019). Defining generations: Where Millennials end and Generation Z begins. Pew Research Center. [Electronic resource]. URL: https://www.pewresearch.org

DNV, 2023 – DNV. The Future of Seafarers 2030: A decade of transformation. 2023. [Electronic resource]. URL: www.dnv.com

Donepudi, 2014 – *Donepudi, P.K.* (2014). Technology growth in shipping industry: An overview. *American Journal of Trade and Policy*. 1(3): 137-142. DOI: https://doi.org/10.18034/ajtp.v1i3.503

Fedorov, Levitskaya, 2015 – *Fedorov, A., Levitskaya, A.* (2015). The framework of media education and media criticism in the contemporary world: the opinion of international experts. *Comunicar*. 2015. 23(45): 107-115.

Ferrari, 2012 – *Ferrari, A.* (2012). Digital Competence in practice: an analysis of frameworks. *Joint Research Center – European Commission*. DOI: https://doi.org/10.2791/82116

Head et al., 2013 – *Head, A.J., van Hoeck, M., Eschler, J., Fullerton, S.* (2013). What information competencies matter in today's workplace? *Library and Information Research*. 37(114): 74-104.

Head, 2012 – *Head, A.* (2012). Learning curve: how college graduates solve information problems once they join the workplace. Project Information Literacy Research Report: "Learning Curve". Project Information Literacy (PIL). [Electronic resource]. URL: https://eric.ed.gov/?id =ED536470

Hopcraft, 2021 – *Hopcraft, R.* (2021). Developing Maritime Digital Competencies. *IEEE Communications Standards Magazine*. 5(3): 12-18. DOI: https://doi.org/10.1109/ mcomstd.101. 2000073

IAMU, 2019 – IAMU. Global Maritime professional body of knowledge. 2019. [Electronic resource]. URL: https://iamu-edu.org

IMO, 2010 – IMO. International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). 2010. [Electronic resource]. URL: https://www.imo.org

Jacob et al., 2025 – *Jacob, C., Kerrigan, P., Bastos, M.* (2025). The chat-chamber effect: Trusting the AI hallucination. *Big Data & Society*. 12(1). DOI: https://doi.org/10.1177/20539517241306345

Karanikola, Panagiotopoulos, 2018 – *Karanikola, Z., Panagiotopoulos, G.* (2018). 4th Industrial Revolution: The challenge of changing human resources skills. *European Journal of Training and Development Studies*. 5(3): 1-7.

Kaspersen et al., 2022 – *Kaspersen, R.A., Karlsen, H.Ø., Helgesen, H., Giskegjerde. G., Lagerstedt Krugerud, C., Nyegaard Hoffmann, P.* (2022). Insights into seafarer training and skills needed to support a decarbonized shipping industry. *DNV*. [Electronic resource]. URL: https://www.ics-shipping.org

Koh, Yuen, 2022 – *Koh, L.Y., Yuen. K.F.* (2022). Emerging competencies for logistics professionals in the digital era: A literature review. *Frontiers in Psychology*. 13. 965748. DOI: https://doi.org/10.3389/fpsyg.2022.965748

Kostagiolas et al., 2018 – *Kostagiolas, P.A., Kourouthanassis, P.E., Martzoukou K., Korfiatis, N., Niakas, D.* (2018). Information seeking behavioural paths of physicians for diabetes mellitus care: a qualitative comparative analysis of information needs, sources, and barriers. *Health Systems*. 7(1): 13-28. DOI: https://doi.org/10.1080/20476965.2017.1390050

Kovačević, 2014 – *Kovačević, B.* (2014). Knowledge management – indispensable development factor for Maritime Companies. *Nauchni trudove na rusenskiya universitet*. 53(5.1): 104-108.

Lee et al., 2025 – *Lee, J., Lee, J., Min, J.* (2025). The pursuit of online misinformation literacy: Understanding age-varying competence for misinformation recognition. *Telematics and Informatics*. 97(102228): 102228. DOI: https://doi.org/10.1016/j.tele.2024.102228

Nguyen et al., 2014 – *Nguyen, T.T., Ghaderi, H., Caesar, L.D., Cahoon, S.* (2014). Current challenges in the recruitment and retention of seafarers: An industry perspective from Vietnam. *The Asian Journal of Shipping and Logistics*. 30(2): 217-242. DOI: https://doi.org/10.1016/j.ajsl.2014.09.005

OECD, 2018 – OECD. The Future of Education and Skills. Education 2030, the future we want. 2018. [Electronic resource]. URL: https://www.oecd.org

Oksavik, et al., 2020 – *Oksavik, A., Hildre, H.P., Pan, Y., Jenkinson. I., Kelly, B., Paraskevadakis, D., Pyne, R.* (2020). SKILLSEA – Future Skill and Competence Needs. Erasmus+ Programme of the European Union. [Electronic resource]. URL: https://ntnuopen.ntnu.no

Pallant, 2020 – *Pallant, J.* (2020). SPSS survival manual: A step by step guide to data analysis using IBM SPSS. Routledge.

Shahbakhsh et al., 2022 – *Shahbakhsh, M., Emad, G.R., Cahoon, S.* (2022). Industrial revolutions and transition of the maritime industry: The case of Seafarer's role in autonomous shipping. *The Asian Journal of Shipping and Logistics*. 38(1): 10-18. DOI: https://doi.org/10.1016/j.ajsl.2021.11.004

Shrivastava, 2024 – *Shrivastava, A.* (2024). Transformative landscape of ChatGPT in higher education: unveiling the academic discourse. *Global Knowledge Memory and Communication*. DOI: https://doi.org/10.1108/gkmc-02-2024-0068

Stopford, 2009 – *Stopford, M.* (2009). Maritime Economics (3rd ed.). Routledge. DOI: https://doi.org/10.4324/9780203891742

Sullivan et al., 2021 – *Sullivan, B.P., Arias Nava, E., Desai, S., Sole, J., Rossi, M., Ramundo, L., Terzi, S.* (2021). Defining Maritime 4.0: Reconciling principles. elements and characteristics to support maritime vessel digitalisation. *IET Collaborative Intelligent Manufacturing*. 3(1): 23-36. DOI: https://doi.org/10.1049/cim2.12012

Swart, 2023 – *Swart, J.* (2023). Tactics of news literacy: How young people access, evaluate, and engage with news on social media. *New Media & Society*. 25(3): 505-521. DOI: https://doi.org/10.1177/14614448211011447

The Economist, 2005 – The Economist. Boom and bust at sea. Economist (London. England: 1843). 2005. [Electronic resource]. URL: https://www.economist.com

Topal, Süner, 2020 – *Topal, A.D., Süner, M.* (2020). Information searching and commitment strategies of maritime faculty students on the web. *Information Development*. 37(3): 431-443. DOI: https://doi.org/10.1177/0266666920903782

Udayangani de Silva, Chandrawamsa, 2016 – *Udayangani de Silva, A.P., Chandrawamsa, P.S.* (2016). Information needs and information seeking behavior of students at higher educational institutes: With special reference to CINEC maritime campus. *Sociology and Anthropology*. 4(6): 494-499. DOI: https://doi.org/10.13189/sa.2016.040608

UNCTAD, 2022 – UNCTAD. Review of Maritime Transport 2022 – Overview. 2022. [Electronic resource]. URL: https://unctad.org

van Laar et al., 2017 – *van Laar, E., van Deursen, A.J., van Dijk, J.A., de Haan, J.* (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*. 72: 577-588. DOI: https://doi.org/10.1016/j.chb.2017.03.010

Vuorikari et al., 2022 – *Vuorikari, R., Kluzer, S., Punie, Y.* (2022). DigComp: The Digital Competence Framework for Citizens. *Joint Research Center – European Commission*. DOI: https://doi.org/10.2760/115376

Wilson, 1981 – *Wilson, T.D.* (1981). On user studies and information needs. *Journal of Documentation*. 37(1): 3-15.

Wilson, 1997 – *Wilson, T.D.* (1997). Information Behaviour: an interdisciplinary perspective. *Information Processing and Management*. 33(4): 551-572.

Wilson, 2006 – *Wilson, T.D.* (2006). On user studies and information needs. *Journal of Documentation*. 62(6): 658-670.

Wilson, 2020 – *Wilson, T.D.* (2020). Exploring Information Behaviour an introduction. Preliminary Edition. [Electronic resource]. URL: https://informationr.net

Zaman et al., 2017 – *Zaman, I., Pazouki, K., Norman, R., Younessi, S., Coleman, S.* (2017). Challenges and opportunities of big data analytics for upcoming regulations and future transformation of the shipping industry. *Procedia Engineering*. 194: 537-544. DOI: https://doi.org/10.1016/j.proeng.2017.08.182

Zapalska, McCarty, 2017 – *Zapalska, A.M., McCarty, M.* (2017). Strategy for information literacy development: Management undergraduate program at U.s. coast guard academy. *Advances i Social Sciences Research Journal*. 4(11). DOI: https://doi.org/10.14738/assrj.411.3264

Zhang et al., 2026 – *Zhang, C. (xinyi), Rice, R.E., Wang, L.H.* (2026). College students' literacy, ChatGPT activities, educational outcomes, and trust from a digital divide perspective. *New Media & Society*. 28(2): 673-695. DOI: https://doi.org/10.1177/14614448241301741

## Appendix

**Table I.** Frequency of information needs of maritime students

| | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| Valid Responses N = 235 | 1 | 2 | 3 | 4 | 5 | Median |
| B.1 Academic issues φ, σ, ε | 6 (2.6 %) | 20 (8.5 %) | 82 (34.9 %) | 89 (37.9 %) | 38 (16.2 %) | 4 |
| B.2 Student issues σ | 50 (21.3 %) | 58 (24.7 %) | 62 (26.4 %) | 44 (18.7 %) | 21 (8.9 %) | 3 |
| B.3 Career prospects | 9 (3.8 %) | 31 (13.2 %) | 57 (24.3 %) | 66 (28.1 %) | 72 (30.6 %) | 4 |
| B.4 Maritime lifelong educational programs | 28 (11.9 %) | 49 (20.9 %) | 58 (24.7 %) | 46 (19.6 %) | 54 (23 %) | 3 |
| B.5 Maritime conferences/workshop φ | 40 (17 %) | 64 (27.2 %) | 50 (21.3 %) | 39 (16.6 %) | 42 (17.9 %) | 3 |
| B.6 Maritime economics σ, η, ε | 40 (17 %) | 54 (23 %) | 72 (30.6 %) | 39 (16.6 %) | 30 (12.8 %) | 3 |
| B.7 Maritime law/commercial maritime law α | 69 (29.4 %) | 69 (29.4 %) | 62 (26.4 %) | 24 (10.2 %) | 11 (4.7 %) | 2 |
| B.8 Maritime market indicators/global trade indicators σ | 52 (22.1 %) | 64 (27.2 %) | 66 (28.1 %) | 34 (14.5 %) | 19 (8.1 %) | 3 |
| B.9 Maritime environmental issues | 33 (14 %) | 69 (29.4 %) | 65 (27.7 %) | 54 (23 %) | 14 (6 %) | 3 |
| B.10 Maritime security issues ε, η | 48 (20.4 %) | 72 (30.6 %) | 59 (25.1 %) | 39 (16.6 %) | 17 (7.2 %) | 2 |
| B.11 Maritime quality management σ, ε, η | 61 (26 %) | 81 (34.5 %) | 62 (26.4 %) | 22 (9.4 %) | 9 (3.8 %) | 2 |
| B.12 Maritime human resources management | 49 (20.9 %) | 63 (26.8 %) | 78 (33.2 %) | 30 (12.8 %) | 15 (6.4 %) | 3 |
| B.13 Maritime culture issues | 70 (29.8 %) | 70 (29.8 %) | 52 (22.1 %) | 31 (13.2 %) | 12 (5.1 %) | 2 |

Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age; α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies)

**Table II.** Frequency of use of information resources for maritime students

| | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| Valid Responses N = 235 | 1 | 2 | 3 | 4 | 5 | Median |
| C.1 Professors | 29 (12.3 %) | 68 (28.9 %) | 71 (30.2 %) | 53 (22.6 %) | 14 (6 %) | 3 |
| C.2 Fellow students φ | 33 (14 %) | 52 (22.1 %) | 59 (25.1 %) | 58 (24.7 %) | 33 (14 %) | 3 |

| | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| C.3 Department's webpage φ | 19 (8.1 %) | 25 (10.6 %) | 59 (25.1 %) | 72 (30.6 %) | 60 (25.5 %) | 4 |
| C.4 E-class platform α | 1 (0.4 %) | 10 (4.3 %) | 32 (13.6 %) | 68 (28.9 %) | 124 (52.8 %) | 5 |
| C.5 Search engines α | 0 (0.0 %) | 7 (3 %) | 15 (6.4 %) | 52 (22.1 %) | 161 (68.5 %) | 5 |
| C.6 Maritime blogs η, α | 20 (8.5 %) | 42 (17.9 %) | 62 (26.4 %) | 56 (23.8 %) | 55 (23.4 %) | 3 |
| C.7 Maritime social media σ, ε, η | 55 (23.4 %) | 54 (23 %) | 43 (18.3 %) | 43 (18.3 %) | 40 (17 %) | 3 |
| C.8 Government webpages σ, ε, η | 92 (39.1 %) | 68 (28.9 %) | 41 (17.4 %) | 24 (10.2 %) | 10 (4.3 %) | 2 |
| C.9 Library's digital repository σ, ε, η | 127 (54 %) | 53 (22.6 %) | 35 (14.9 %) | 17 (7.2 %) | 3 (1.3 %) | 1 |
| C.10 Maritime web portals σ, ε | 85 (36.2 %) | 74 (31.5 %) | 46 (19.6 %) | 19 (8.1 %) | 11 (4.7 %) | 2 |
| C.11 Maritime scientific e-journals σ, ε, η | 85 (36.2 %) | 62 (26.4 %) | 63 (26.8 %) | 12 (5.1 %) | 13 (5.5 %) | 2 |
| C.12 Maritime databases σ, ε, η | 86 (36.6 %) | 67 (28.5 %) | 46 (19.6 %) | 20 (8.5 %) | 16 (6.8 %) | 2 |
| C.13 Maritime e-proceedings σ | 116 (49.4 %) | 57 (24.3 %) | 38 (16.2 %) | 13 (5.5 %) | 11 (4.7 %) | 2 |
| C.14 Maritime digital archives σ, ε, α | 121 (51.5 %) | 61 (26 %) | 35 (14.9 %) | 13 (5.5 %) | 5 (2.1 %) | 1 |
| C.15 Maritime e-news η | 35 (14.9 %) | 44 (18.7 %) | 64 (27.2 %) | 42 (17.9 %) | 50 (21.3 %) | 3 |
| Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age; α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies) | | | | | | |

**Table III.** Importance of digital competencies of maritime students – D.1 Information and data literacy

| Valid Responses N = 235 | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| D.1 Information and data literacy | 1 | 2 | 3 | 4 | 5 | Median |
| D.1.1 Software use σ | 4 (1.7 %) | 19 (8.1 %) | 34 (14.5 %) | 67 (28.5 %) | 111 (47.2 %) | 4 |
| D.1.2 Finding/Evaluating maritime information using search engines σ, η | 0 (0.0 %) | 6 (2.6 %) | 31 (13.2 %) | 72 (30.6 %) | 126 (53.6 %) | 5 |
| D.1.3 Finding/evaluating maritime information in social media/webpages/blogs σ | 30 (12.8 %) | 45 (19.1 %) | 57 (24.3 %) | 59 (25.1 %) | 44 (18.7 %) | 3 |
| D.1.4 Finding/evaluating scholarly files on online professional content hosting services φ | 45 (19.1 %) | 59 (25.1 %) | 51 (21.7 %) | 49 (20.9 %) | 31 (13.2 %) | 3 |
| D.1.5 Finding/evaluating scholarly documents in scientific databases σ | 23 (9.8 %) | 44 (18.7 %) | 48 (20.4 %) | 55 (23.4 %) | 65 (27.7 %) | 4 |
| Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age; α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies) | | | | | | |

**Table IV.** Importance of digital competencies of maritime students – D.2 Communication and collaboration

| Valid Responses N = 235 | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| D.2 Communication and collaboration | 1 | 2 | 3 | 4 | 5 | Median |
| D.2.1 Use of management software | 13 (5.5 %) | 35 (14.9 %) | 58 (24.7 %) | 68 (28.9 %) | 61 (26 %) | 4 |
| D.2.2 Collaboration through open platforms | 4 (1.7 %) | 5 (2.1 %) | 30 (12.8 %) | 64 (27.2 %) | 132 (56.2 %) | 5 |
| D.2.3 Use of videoconference software φ, σ, ε, η | 14 (6 %) | 37 (15.7 %) | 54 (23 %) | 60 (25.5 %) | 70 (29.8 %) | 4 |
| D.2.4 Use of daily task management software φ, δ | 36 (15.3 %) | 42 (17.9 %) | 62 (26.4 %) | 50 (21.3 %) | 45 (19.1 %) | 3 |
| D.2.5 Participation in professional/scientific digital networks for sharing ideas | 44 (18.7 %) | 49 (20.9 %) | 67 (28.5 %) | 41 (17.4 %) | 34 (14.5 %) | 3 |
| D.2.6 Participation in seminars/workshops | 18 (7.7 %) | 43 (18.3 %) | 65 (27.7 %) | 53 (22.6 %) | 56 (23.8 %) | 3 |
| D.2.7 Use of AI technology σ | 72 (30.6 %) | 51 (21.7 %) | 47 (20 %) | 26 (11.1 %) | 39 (16.6 %) | 2 |
| D.2.8 Identifying hostile online messages/activities | 82 (34.9 %) | 55 (23.4 %) | 45 (19.1 %) | 24 (10.2 %) | 29 (12.3 %) | 2 |
| Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age; α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies) | | | | | | |

**Table V.** Importance of digital competencies of maritime students – D.3 Digital content creation

| Valid Responses N = 235 | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| D.3 Digital content creation | 1 | 2 | 3 | 4 | 5 | Median |
| D.3.1 Creating maritime content/posts on social networks φ | 38 (16.2 %) | 50 (21.3 %) | 46 (19.6 %) | 67 (28.5 %) | 34 (14.5 %) | 3 |
| D.3.2 Creating maritime audiovisual content φ | 60 (25.5 %) | 63 (26.8 %) | 55 (23.4 %) | 34 (14.5 %) | 23 (9.8 %) | 2 |
| D.3.3 Creating infographics using applications/software | 68 (28.9 %) | 58 (24.7 %) | 62 (26.4 %) | 20 (8.5 %) | 27 (11.5 %) | 2 |
| D.3.4 Understanding of ethics in sharing maritime information | 47 (20 %) | 43 (18.3 %) | 76 (32.3 %) | 45 (19.1 %) | 24 (10.2 %) | 3 |
| D.3.5 Knowledge of programming languages ε | 84 (35.7 %) | 62 (26.4 %) | 51 (21.7 %) | 20 (8.5 %) | 18 (7.7 %) | 2 |
| Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age; α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies) | | | | | | |

**Table VI.** Importance of digital competencies of maritime students – D.4 Safety

| Valid Responses N = 235 | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| D.4 Safety | 1 | 2 | 3 | 4 | 5 | Median |
| D.4.1 Creating strong passwords and secure data management φ, α | 19 (8.1 %) | 40 (17 %) | 64 (27.2 %) | 52 (22.1 %) | 60 (25.5 %) | 3 |
| D.4.2 Knowledge of installing and use of protection services φ, α | 30 (12.8 %) | 37 (15.7 %) | 63 (26.8 %) | 53 (22.6 %) | 52 (22.1 %) | 3 |
| D.4.3 Detecting suspicious emails (phising) φ | 30 (12.8 %) | 31 (13.2 %) | 61 (26 %) | 49 (20.9 %) | 64 (27.2 %) | 3 |
| D.4.4 Understanding excessive use of digital technology may affect health δ | 20 (8.5 %) | 27 (11.5 %) | 67 (28.5 %) | 51 (21.7 %) | 70 (29.8 %) | 4 |
| Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age; α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies) | | | | | | |

**Table VII.** Importance of digital competencies of maritime students – D.5 Problem solving

| Valid Responses N = 235 | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| D.5 Problem solving | 1 | 2 | 3 | 4 | 5 | Median |
| D.5.1 Use of technological devices | 1 (0.4 %) | 10 (4.3 %) | 20 (8.5 %) | 40 (17 %) | 164 (69.8 %) | 5 |
| D.5.2 Knowledge of digital tools for solving technological problems | 4 (1.7 %) | 16 (6.8 %) | 44 (18.7 %) | 71 (30.2 %) | 100 (42.6 %) | 4 |
| D.5.3 Ability to use assistive tools improving access to information φ | 31 (13.2 %) | 37 (15.7 %) | 45 (19.1 %) | 56 (23.8 %) | 66 (28.1 %) | 4 |
| D.5.4 Understanding the importance of identifying false/misleading news | 7 (3 %) | 18 (7.7 %) | 44 (18.7 %) | 65 (27.7 %) | 101 (43 %) | 4 |
| Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age; α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies) | | | | | | |

**Table VIII.** Informational attitudes of maritime students

| | Measurement scale (1 Not at all, 2 A little, 3 Quite a bit, 4 A lot, 5 Very much) | | | | | |
|---|---|---|---|---|---|---|
| Valid Responses N = 235 | 1 | 2 | 3 | 4 | 5 | Median |
| E.1 Overall satisfaction of maritime information ε | 4 (1.7 %) | 25 (10.6 %) | 72 (30.6 %) | 102 (43.4 %) | 32 (13.6 %) | 4 |
| E.2 Importance of internet use for completing studies σ | 0 (0.0 %) | 6 (2.6 %) | 20 (8.5 %) | 61 (26 %) | 148 (63 %) | 5 |
| E.3 Importance of using social media for maritime information φ | 16 (6.8 %) | 32 (13.6 %) | 67 (28.5 %) | 63 (26.8 %) | 57 (24.3 %) | 4 |
| E.4 Importance of digital behavior/digital competencies seminars for maritime studies φ | 9 (3.8 %) | 19 (8.1 %) | 71 (30.2 %) | 67 (28.5 %) | 69 (29.4 %) | 4 |
| Notes: Mann-Whitney U test and Kruskal-Wallis H-test (φ: $p < 0.05$ sex; η: $p < 0.05$ age;α: $p < 0.05$ English level; σ: $p < 0.05$ level of studies; δ: $p < 0.05$ work. ε: $p < 0.05$ year of studies) | | | | | | |