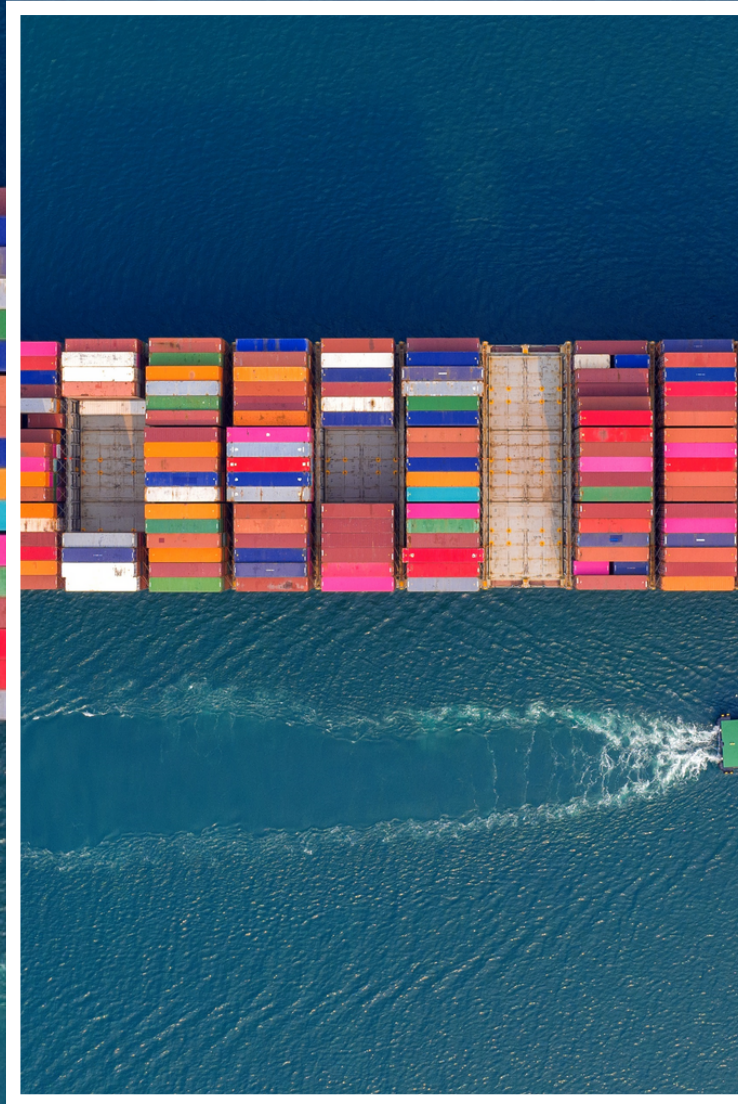


World of Shipping Portugal



MARITIME EDUCATION AND TRAINING DURING COVID-19 PANDEMIC: AN ASSESSMENT

Ana Cristina Paixão Casaca and Maria Amélia Ramos Loja

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MARITIME EDUCATION AND TRAINING DURING COVID-19 PANDEMIC: AN ASSESSMENT

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ABSTRACT

Portuguese educators have been subject to pedagogic training for many years, which had to be revalidated every five years. Through these continuous training programmes, they gained new knowledge and pedagogic competencies to improve their performance. As information technology/information systems evolved, these courses could be taken in class or distance learning formats, including online. However, in the latter option, the final assessment was carried out in class. Although much emphasis has been put on educators' training and the importance of being acquainted with the new technologies, at least in Portugal, educators still delivered their lecturing and training in a classroom context. Nevertheless, changes occurred with the COVID-19 Pandemic that emerged in January 2020 due to the revolution it caused at socio-economic and health levels. As the disease spread worldwide, countries were forced into confinement, transferring almost all professional activities from a physical environment to a remote one. This transfer also applied to all lecturing and training activities, including primary, basic, and secondary schools, vocational and professional training, and university education. Suddenly, trainers, instructors, tutors, teachers, lecturers, and professors worldwide were faced with the urgent need to get acquainted with various supporting tools, including platforms that allow virtual meetings, classes, and webinars. Driven by this sudden change, the authors decided to investigate the online training novelties and supporting tools available in the market. Faced with the information gathered, the authors questioned how maritime education and training was prepared to 1) deal with the shift mentioned above and 2) incorporate the vast range of available online resources to keep their education and training activities. In order to answer both questions, an online survey questionnaire was developed to study the integration of online education and training in the global maritime education and training context and provide an overall picture of the experience gained to identify possible strategies that foster more online maritime education and training. The outcome suggests that the transition of maritime education and training from an in-class environment to an online one is already underway albeit at different speeds. Besides, there is need to focus on 1) the development of national maritime education and training policies, 2) the development of effective strategies to put in place countries' maritime education and training policies, 3) human resources and 4) students' acceptance.

Keywords: Maritime Education and Training, COVID-19, Distance Learning, e-Learning, Online Learning, Challenges, Pitfalls.

1. INTRODUCTION

The Merriam-Webster online dictionary defines education as the knowledge, skill, and understanding people get from attending a school, college, or university (Merriam-Webster, 2021a)¹, usually within a classroom or other educational environment. Consequently, education is the process of facilitating learning and refers to the broad acquisition of knowledge, skills, values, morals, beliefs, and habits, which tend to be more theoretical.

¹ Merriam-Webster (2021a). Education. *Merriam-Webster*. Retrieved from: <https://www.merriam-webster.com/dictionary/Education> [accessed 09 September 2021].

Education includes various methods, for instance, teaching, training, storytelling, discussion and directed research. Furthermore, it promotes an inherent and permanent change in people's thinking and capacity to do things, allowing them to develop reasoning and judgment surrounding broad topics. Overall, people seek out and pay for education to secure future employment or advance along a career path. Eventually, education aims to promote human capital accumulation to improve human productivity and enhance individuals' living standards (Khandelwal, n.d.)².

The Cambridge English Dictionary (2021)³ defines training as learning skills and knowledge to do a particular job or activity; on the other hand, Globerson and Korman (2001)⁴ consider training as “*the act of teaching individuals the knowledge they need to function properly on the job*”. The purpose of training is to improve performance and productivity among employees since it allows them to do their job correctly, effectively, and conscientiously. Therefore, it is assumed that the definition provided by Cambridge (2021) focuses on specific skills (and consequently on-the-job-training) rather than on generic skills since the later are not expected to guarantee perpetual returns due to enhanced productivity (Khandelwal, n.d.)⁵. This explains why training is more specific than education. However, the most striking difference between education and training rests in timing. While education generally occurs before employment to secure future employment or advance along a career path, training occurs after employment has already been secured and is usually paid by the employer, even though in certain professional areas this responsibility tends to fall on employees. This also clarifies why training courses 1) have a shorter duration when compared with education ones because of their specificity and 2) take place in various settings; for instance, training can occur within a classroom, but frequently it takes place ‘*on the job*’ or ‘*in the field*’. Therefore, education differs from training.

Still, against some old misconceptions, both education and training are continuous processes. They take place in different stages of people's life due to the ever-changing nature of workplaces or because people simply decide to change the course of their professional life. Overall, it can be said that training falls under the education umbrella as both focus on acquiring knowledge, but training is more task-oriented and skills-based. For instance, implementing new technologies, manufacturing processes, or business procedures may force people to learn about them, as the knowledge and skills learned will improve businesses' overall effectiveness and efficiency. Industries that depend on cutting-edge technology force employees to embark on continuous learning processes since their acquired knowledge and skills may quickly become outdated. The added value of training is that it very much expands employees' employment opportunities and companies' adaptability to changing market conditions (Khandelwal, n.d.)⁶. Important to say that the concepts presented above cut across all education and training areas; however, their applicability depends on the specificities of each education and training area.

Maritime education and training provide knowledge and skills about the maritime industry and are very specific. Like in other industries, such as aviation, the maritime industry requires all industry players to hold a range of competencies, i.e., knowledge, skills, and abilities to perform their sea and shore jobs. This situation is particularly critical for masters, officers, and watches personnel since their professional certificates must be revalidated subject to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW Convention) and Standards of Training, Certification and Watchkeeping for Seafarers Code (STCW-2010 Code) provisions. For this revalidation to occur, they must undergo various courses, some of which are more specific than others. This is the case of the STCW Certificates of Proficiency issued for those seafarers assigned with safety, security and pollution prevention duties and serving on certain ships such as tankers and passenger ships (EduMaritime, 2021)⁷. Furthermore, the changing environment that the maritime industry has been going through over the last decades derived from regulatory changes, market needs

² Khandelwal, A. (n.d.). *Vocational Education and Training: A review of Theory, Evidence and Policy Recommendations*. Retrieved from: https://www.ndeavours.org/assets/files/Ndev_Econ_Lit.pdf [accessed 28 September 2022].

³ Cambridge English Dictionary (2021). Training. *Cambridge English Dictionary*. Retrieved from: <https://dictionary.cambridge.org/dictionary/english/training> [accessed 09 September 2021].

⁴ Globerson, S. and Korman, A. (2001). The use of just-in-time training in a project environment. *International Journal of Project Management*, 19(5), pp.279-285. [https://doi.org/10.1016/S0263-7863\(00\)00012-0](https://doi.org/10.1016/S0263-7863(00)00012-0) [accessed 07 November 2021].

⁵ Khandelwal, A. (n.d.). *Vocational Education and Training: A review of Theory, Evidence and Policy Recommendations*. Retrieved from: https://www.ndeavours.org/assets/files/Ndev_Econ_Lit.pdf [accessed 28 September 2022].

⁶ Khandelwal, A. (n.d.). *Vocational Education and Training: A review of Theory, Evidence and Policy Recommendations*. Retrieved from: https://www.ndeavours.org/assets/files/Ndev_Econ_Lit.pdf [accessed 28 September 2022].

⁷ EduMaritime (2021). What are the Types of STCW Certificates and CoC for Seafarers? *EduMaritime*. Retrieved from: <https://www.edumaritime.net/stcw/certification-general-requirements> [accessed 17 September 2021].

and vessel specialisation, and is expected to go through over the next years with its decarbonisation pathway, indicates that the acquisition of competencies is even more critical than before and explains the need for maritime companies and professionals to embark on lifelong knowledge and skill acquisition. According to a study commissioned by the United Nation's Maritime Just Transition Task Force, about 800,000 seafarers will need to be trained on new fuels and technologies by 2050 (Maritime Executive, 2022)⁸, meaning that the industry as a whole, unions, businesses owners and organizations, must be prepared to develop and implement them, and eventually shipping companies must be prepared to pay for them.

As a rule, maritime education and training have been delivered in an in-class environment. While allowing more interaction between trainers, instructors, tutors, teachers, lecturers, and professors (from now on, educators), students can meet face-to-face and develop better teamwork. Moreover, for many students, an in-class environment becomes more stable since they are given more structured learning. Moreover, it allows relationship development, an essential aspect of the maritime industry that builds upon relationships due to its professional context. However, while this in-class environment is not so critical for maritime business-oriented education and training, it is fundamental for seafarers-oriented education and training as the latter requires practical work. For example, to comply with the minimum training standards requested by the STCW Convention and STCW-2010 Code, nautical schools must have a range of training facilities with state-of-the-art equipment, such as simulators.

The COVID-19 Pandemic that emerged in January 2020 profoundly disturbed all public and economic activities; overall, it caused a revolution at socioeconomic and health levels not seen before. As the disease spread worldwide, and to reduce its transmission, most countries, in one way or another, established a range of measures to prevent and control the infection by limiting contact between people. Measures such as physical and social distancing, movement restrictions, and even basic health and hygiene practices such as improved ventilation and filtration, handwashing, and wearing masks became the norm. Only those workers considered essential were allowed in the streets. Most countries were forced into lockdowns to prevent the movement of people across borders and, consequently, the spread of the disease; almost all professional activities were transferred from a physical environment to a remote one.

Commerce activities were affected since most shops closed, forcing them to investigate new distribution channels. Only those considered essential such as supermarkets, pharmacies, and telecommunications shops, were allowed to open. The impact on the service industry was also severe as restaurants, pubs, cinemas, and theatres were shut. Tourism stopped as people were prevented from travelling. World airlines were forced to land their aeroplanes; only a few people were allowed to fly if they demonstrated that need; from a training perspective, the aviation industry was also obliged to close their flight simulator centres (AviationPros, 2020)⁹. On the other hand, the air cargo market flourished, and many passenger aeroplanes were converted into cargo aeroplanes, initially to keep the supply of medical equipment and later to become an alternative to the severe port congestions being witnessed worldwide.

In all this abnormal situation, only the shipping industry appeared to benefit from it while keeping the world connected so that no territory was left behind despite its peripherality. However, this unexpected benefit was neither straightforward nor applied to all markets. The cruise shipping market was the most affected during the pandemic, even though other markets were also considerably affected by it; this is the case with the refrigerated cargo and roll-on roll-off markets (European Maritime Safety Agency, 2022)¹⁰. Between March and June 2020, the world witnessed the three main shipping markets, i.e., tanker, dry and container market segments, being affected, albeit subject to different impact levels. The container shipping market suffered mostly, and its recovery would only occur to levels not seen before, from June 2020 onwards, due to a rise in

⁸ Maritime Executive (2022). Up to 800,000 Seafarers Will Need Training on Zero-Carbon Fuels. *Maritime Executive*. 8 November 2022. Retrieved from <https://maritime-executive.com/article/up-to-800-000-seafarers-will-need-training-on-zero-carbon-fuels> [accessed 09 November 2021].

⁹ AviationPros (2020). Flight simulator sales ramp up with AR and VR integration. *Future market insights*. Retrieved from: <https://www.aviationpros.com/education-training/simulator-training/press-release/21139115/future-market-insights-flight-simulator-sales-ramp-up-with-ar-and-vr-integration-global-airline-closure-due-to-covid-19-pandemic-temporarily-arrests-demand-growth> [accessed 17 October 2022].

¹⁰ European Maritime Safety Agency (2022). COVID-19 – impact on shipping. *European Maritime safety Agency*. Retrieved from: <https://www.emsa.europa.eu/newsroom/latest-news/download/7103/4712/23.html> [accessed 17 October 2022].

American consumer spending (Millefiori et al., 2021¹¹; Baltic and International Maritime Council, 2021a¹²). Electronic commerce (e-commerce) gained a new dimension as the number of orders for durable goods and others less durable increased exponentially.

Certain trade lanes witnessed increasing volume growth, causing major direct and indirect supply chain disruptions worldwide due to a lack of hinterland capacity to accommodate the increasing demand for goods during the pandemic's peak. This was the case of the Far East to North America West Coast trade lane, in which the United States West Coast ports, in particularly Los Angeles and Long Beach twin ports, were severely congested, reaching a peak on 9 January 2022 when 109 container vessels waited in the queue outside the ports to be served (Littlejohn, 2022)¹³. In order to overcome further operational constraints and possible disruptions derived from the ongoing negotiations between the International Longshore and Warehouse Union and Pacific Maritime Association, container shipping lines were forced to redo their overall logistics. The option was to deliver the United States-bound cargo through the East Coast ports and use sweeper vessels to reposition empty containers at the origin for further loadings.

Another shipping segment witnessing a positive impact from the COVID-19 pandemic was the dry bulk one, with freight rates swiftly moving from \$3,000/day and top at over \$35,000/day in June 2020 due to strong iron ore demand from China to which should be added crew replacement issues, port congestions in China (S&P Global Platts, 2020)¹⁴ and the Chinese zero-COVID-19 policy to prevent the coronavirus spread among the community. If this was not enough, the March 2021 Suez Canal blockage due to the grounding of Ever Given contributed to further supply chain disruptions and freight rates increase, with the world population setting eyes on this maritime chokepoint to see when the ship would be released.

With the COVID-19 Pandemic, hundreds of educational institutions opted to cancel face-to-face classes, including laboratory work and other learning experiences. All training activities, including primary, basic, and secondary school, vocational and professional training, and university education, moved into an online environment (Ali, 2020¹⁵; Crawford et al., 2020¹⁶; Huang et al., 2020¹⁷). Maritime education and training were no exception, and like other education and training activities, they also moved online. A survey carried out by the International Association of Maritime Universities (2020)¹⁸ indicated that 93% of its member universities' normal educational activities went online, while 83% of member universities shifted to full-time online/distance learning.

The way training activities were delivered depended much on maritime educational and training institutions' guidelines. This emergency remote teaching, which concerned a "*temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances*" and differs from proper online learning,

¹¹ Millefiori, L. M., Braca, P., Zissis, D., Spiliopoulos, G., Marano, S., Willett P. K. and Carniel S. (2021). COVID-19 impact on global maritime mobility. *Scientific Reports*, 11, Article ID: 18039. <https://doi.org/10.1038/s41598-021-97461-7> [accessed 17 October 2022].

¹² Baltic and International Maritime Council (2021a). Container shipping emerges triumphant from a disrupted 2020. *Baltic and International Maritime Council*. Retrieved from: https://www.bimco.org/News/Market_Analysis/2021/20210217_Container_shipping_emerges_triumphant_from_a_disrupted_2020 [accessed 17 October 2022].

¹³ Littlejohn, D. (2022). Los Angeles, Long Beach Ports Hail Supply Chain Progress. Los Angeles Daily News, 15 august. Retrieved from: <https://www.tnews.com/articles/los-angeles-long-beach-ports-hail-supply-chain-progress> [accessed 09 November 2022].

¹⁴ S&P Global Platts (2020). Dry bulk shipping: Traversing the pandemic times. *S&P Global Platts*. Retrieved from: <https://www.spglobal.com/commodityinsights/en/market-insights/podcasts/focus/090820-capesize-panamax-supramax-dry-bulk-coronavirus> [accessed 17 October 2022].

¹⁵ Ali, W. (2020). Online and Remote Learning in Higher Education Institutes: A Necessity in Light of COVID-19 Pandemic. *Higher Education Studies*, 10(3), pp.16-25. Retrieved from: <https://eric.ed.gov/?id=EJ1259642> [accessed 02 September 2022].

¹⁶ Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., Magni, P. A. and Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of applied Learning and Teaching*, 3(1), pp.09-28. <https://doi.org/10.37074/jalt.2020.3.1.7> [accessed 02 September 2022].

¹⁷ Huang, R. H., Liu, D. J., Guo, J., Yang, J. F., Zhao, J. H., Wei, X. F., Knyazeva, S., Li, M., Zhuang, R. X., Looi, C. K., and Chang, T. W. (2020). *Guidance on Flexible Learning during Campus Closures: Ensuring course quality of higher education in COVID-19 outbreak*. Smart Learning Institute of Beijing Normal University. Retrieved from: <https://iite.unesco.org/publications/guidance-on-flexible-learning-during-campus-closures-ensuring-course-quality-of-higher-education-in-covid-19-outbreak/> [accessed 02 September 2022].

¹⁸ International Association of Maritime Universities (2020). Summary results of the survey on the impact of and response to COVID-19 by IAMU member universities. *International Association of Maritime Universities*. Retrieved from: <https://iite.unesco.org/publications/guidance-on-flexible-learning-during-campus-closures-ensuring-course-quality-of-higher-education-in-covid-19-outbreak/> [accessed 27 September 2022].

resulted from a considerable amount of improvisation in which educators adopted the strategies that they thought better in the context of their teaching activities (Hodges et al., 2020¹⁹; Rapanta et al., 2020²⁰). The speed at which this change occurred cannot be compared to any other in the history of education and training. Moreover, it was performed under the stigma that online learning is of lower quality than face-to-face one despite research showing otherwise (Hodges et al., 2020)²¹. Despite all these efforts, the International Maritime Organisation (2020)²² claimed that maritime education and training and the supply of qualified and certificated seafarers were areas of industry concern. Furthermore, the impossibility of carrying out crew changes by forcing crews to stay on board beyond their labour agreements has negatively impacted the industry. As a result, some seafarers left the industry while the situation deterred a new generation of younger people from entering the industry.

Educators and students were faced with the urgent need to get acquainted with various supporting tools and platforms such as Zoom and CiscoWebex. Institutions implemented learning management systems like Moodle and educational blogs to support their educational activities. Given the revolution underway, the World Bank (2020)²³ claimed that a large-scale transition from face-to-face to online learning environments was a very difficult and highly complex task for the existing educational systems. Some universities offered asynchronous classes, while others opted for synchronous learning (Aguilera-Hermida, 2020)²⁴; seminars became webinars. The online environment became the meeting point for the population to overcome the confinement's isolation. The number of webinars announced on LinkedIn, the world's largest professional social network on the Internet, highlights just that.

However, this sudden change was not straightforward, as educators suddenly had to change their pedagogic approaches. Educators were forced to leave behind the education and training pedagogic methods they had used for many years. Most educators were not psychologically prepared for such a sudden change, were not acquainted with the available technologies, and lacked a proper working space at home. Furthermore, working from home surrounded by family members, including children, made delivering online learning difficult, given the required concentration level. From students' perspective, this transition was an even more stressful period. Depending on countries' economic conditions and educational policies, many students and educators from the different educational programmes lacked equipment, including computers, and had lower digital literacy, not to mention the lack of internet connectivity. Many of the so-called digital natives showed a lack of computer skills and show limitations in the use of technology. Numerous educators and students even had to deal with a lack of internet availability, bandwidth quality, device availability and compatibility. Finally, traditional maritime education and training like many other educational areas were not prepared for online learning. Overall, this adaptation process resulted in stressful online learning and difficulties, at least during the first weeks of confinement.

Driven by this sudden change, the present work arises from the need to characterise the impact of this situation on the new paradigm of teaching and learning processes under the multiple associated aspects. The authors decided to investigate the online training novelties and supporting tools available in the market. Faced with the information gathered, the authors questioned the extent to which maritime education and training was

¹⁹ Hodges, C., Moore, S., Lockee, B., Trust, T. and Bond, A. (2020). The Difference Between Emergency Remote Teaching and Online Learning, *Educause Review*, 27 March 2020. Retrieved from: <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning> [accessed 05 November 2022].

²⁰ Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L. and Koole, M. (2020). Online university teaching during and after the Covid-19 crisis: refocusing teacher presence and learning activity. *Postdigital Science and Education*, 2(3), pp.923-945. <https://doi.org/10.1007/s42438-020-00155-y> [accessed 04 September 2022].

²¹ Hodges, C., Moore, S., Lockee, B., Trust, T. and Bond, A. (2020). The Difference Between Emergency Remote Teaching and Online Learning, *Educause Review*, 27 March 2020. Retrieved from: <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning> [accessed 05 November 2022].

²² International Maritime Organisation (2020). *The impact of COVID-19 on maritime education and training*, Maritime Safety Committee, MSC 102/INF.25, 14 October 2020. *Internal Chamber of Shipping*. Retrieved from: <https://www.ics-shipping.org/wp-content/uploads/2021/03/MS-102-INF-25-The-impact-of-COVID-19-on-maritime-education-and-training-ICS-and-IAMU.pdf> [accessed 17 October 2022].

²³ World Bank (2020). Rapid response briefing note: Remote Learning & COVID-19 Outbreak (revised draft: 16 March 2020). *World Bank*. Retrieved from: <https://documents1.worldbank.org/curated/en/266811584657843186/pdf/Rapid-Response-Briefing-Note-Remote-Learning-and-COVID-19-Outbreak.pdf> [accessed 02 September 2022].

²⁴ Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, 1, Article ID: 100011. <https://doi.org/10.1016/j.ijedro.2020.100011> [accessed 02 September 2022].

prepared to 1) deal with the shift mentioned above and 2) incorporate the vast range of available online resources to keep education/training moving. In order to achieve these objectives, this research work was structured into seven sections. The current Section puts the work into context. Section 2 addresses the broad concept of distance education and given the scope of the research, it focuses on online education. Section 3 reviews the body of the literature. Section 4 presents the methodology. Section 5 analysis the outcome of the online survey questionnaire. Section 6 deals with the implications of the analysis. Finally, Section 7 concludes.

2. CHARACTERISING THE ONLINE EDUCATION

2.1. Distance Learning

Online education and training are a type of distance education. The body of literature identifies several definitions of distance education, also known as distance study or distance learning. The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) defined distance education as “*education conducted through a combination of the postal services, radio, television, telephone or newspaper, with limited face-to-face contact between learners and teachers. Teaching is carried out principally through the medium of specially prepared printed, audio-visual or other materials transmitted to individuals or learning groups. Learner’s progress is monitored through written or taped exercises, sent to a tutor, who corrects and returns them with criticisms and advice*” (UNESCO, 1986)²⁵. Later, in 2008, the European Centre for the Development of Vocational Training (CEDEFOP) defined distance education as “*education and training imparted at a distance through communication media: books, radio, TV, telephone, correspondence, computer or video*” (CEDEFOP, 2008)²⁶. Overall, it can be said that distance education is a form of education in which educators and students are physically apart since students are not in a classroom, and lectures and learning materials are sent by mail or over the internet. In other words, distance education lacks mutual and face-to-face interaction (Wang et al., 2013²⁷; Schlosser and Anderson, 1994)²⁸.

Distance education can be traced as far back as the 1700s (Admin, 2019)²⁹, and initially, it was carried out by correspondence. Students would receive all the printed-based learning materials by mail and respond with assignments or questions to their educators. As all the correspondence was carried out by mail, students would take several weeks to have their educators’ feedback and several months to accomplish the courses. One of the earliest examples of distance learning dates from a 1728 advertisement printed in the Boston Gazette for “*Caleb Phillips, Teacher of the new method of Short Hand*”, seeking students willing to learn through weekly mailed lessons (Diehl, 2019)³⁰. At the beginning of the 1800s, correspondence courses were the main delivery method in distance education (Wang et al., 2013)³¹. In 1840, short-hand correspondence courses would be taught in the United Kingdom by Sir Isaac Pitmon (Diehl, 2019)³²; in the 1990s, Tutorship, the Institute of Chartered Shipbrokers distance-learning programme, worked this way.

²⁵ United Nations Educational, Scientific and Cultural Organisation (1987). *Glossary of Educational Technology Terms*. United Nations Educational, Scientific and Cultural Organisation: Paris. Retrieved from: <https://unesdoc.unesco.org/ark:/48223/pf0000071833> [accessed 07 July 2022].

²⁶ European Centre for the Development of Vocational Training (2008). *Terminology of European education and training policy. A selection of 100 key terms*. Retrieved from: https://www.cedefop.europa.eu/files/4064_en.pdf [accessed 07 July 2022].

²⁷ Wang, C. H., Shannon, D. M., and Ross, M. E. (2013). Students’ characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, 34(3), pp.302–323. <https://doi.org/10.1080/01587919.2013.835779> [accessed 02 September 2022].

²⁸ Schlosser, C. A. and Anderson, M. L. (1994). Distance education: Review of the literature. *Institute of Education Sciences*. Retrieved from: <https://files.eric.ed.gov/fulltext/ED382159.pdf> [accessed 02 September 2022].

²⁹ Admin (2019). The Evolution of Distance Learning. *Florida National University*. Retrieved from: <https://www.fnu.edu/evolution-distance-learning/> [accessed 17 September 2021].

³⁰ Diehl, W. C. (2019). Distance Education Timeline. *American Center for the Study of Distance Education. The Pennsylvania State University*. Retrieved from: <https://sites.psu.edu/acde/2019/02/02/distance-education-timeline/> [accessed 25 July 2022].

³¹ Wang, C. H., Shannon, D. M., and Ross, M. E. (2013). Students’ characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, 34(3), pp.302–323. <https://doi.org/10.1080/01587919.2013.835779> [accessed 02 September 2022].

³² Diehl, W. C. (2019). Distance Education Timeline. *American Center for the Study of Distance Education. The Pennsylvania State University*. Retrieved from: <https://sites.psu.edu/acde/2019/02/02/distance-education-timeline/> [accessed 25 July 2022].

Almost two decades later, the idea of distance learning would also be grasped by universities. In 1858, the University of London started offering distance learning degrees. Other universities followed this strategy. In 1911, the University of Queensland in Australia established the Department of Correspondence Studies, relying on Australia's postal system (Admin, 2019)³³. In 1984, the National Technological University in the United States established the first accredited virtual university. It started by delivering its courses via videotape, but two years later, courses would be broadcasted by satellite on a single analogue channel. In 1989, also in the United States, Phoenix University, founded in Arizona in 1976, was a pioneer in the field. It launched a fully online college institution offering bachelor's and master's degrees for the first time. Later, in 1996, Glen R. Jones established Jones International University, the first accredited and fully web-based university. Today numerous universities worldwide are engaged in distance learning. Aside from the credited courses, they also offer massive online open courses to students who want to learn more about specific topics, even though they do not receive credits (Admin, 2019)³⁴.

Needless to say, that technological advancements played a critical role in distance learning, and computer scientists' contributions to education and training pose challenges for educational institutions (Admin, 2019³⁵; Sangrà et al., 2012³⁶). Radio allowed universities to broadcast information and courses to students, while television allowed educational institutions to increase their geographic coverage, supplying an equal learning opportunity to a broader audience. In the 1920s, radio was used to deliver distance education courses (Wang et al., 2013)³⁷. In 1922, the Pennsylvania State College broadcasted courses across radio networks for the first time in distance learning history. From the early 1930s, television would follow next. A decade later, the University of Iowa employed television as a learning tool (Admin, 2019)³⁸. An example of a successful distance learning initiative is the case of the cable television network Mind Extension University, later known as Knowledge TV, established by Glen R. Jones in 1987. Mind Extension University broadcasted courses from over 30 universities and colleges to an audience of 30,000 students (CareerProfiles.info, 2022)³⁹; this cable television network closed in 2000. However, radio and television became outdated as new technologies emerged, even though, during the COVID-19 pandemic, at least in Portugal, television was used to deliver classes to primary and secondary school levels.

The beginning of online learning and web-based courses as distance education delivery options dates from 1993 when Graziadei introduced an online computer-delivered lecture that, with the help of computer programs, allowed students and educators to use computers as virtual classroom settings (Wang et al., 2013)⁴⁰. Consequently, the traditional definition of distance learning has been eroding slowly as new technological developments enter the market and challenge educators to enforce the idea of lifelong learning. Today, distance learning implies the use of technology. The electronics revolution of the eighties changed the landscape of distance learning by allowing face-to-face teaching at a distance. The advent of the personal computer with internet capabilities revolutionised distance learning, and independently of the technology used, McIsaac and Gunawardena (2001)⁴¹ claimed it to be the fastest-growing form of domestic and international education.

³³ Admin (2019). The Evolution of Distance Learning. *Florida National University*. Retrieved from: <https://www.fnu.edu/evolution-distance-learning/> [accessed 17 September 2021].

³⁴ Admin (2019). The Evolution of Distance Learning. *Florida National University*. Retrieved from: <https://www.fnu.edu/evolution-distance-learning/> [accessed 17 September 2021].

³⁵ Admin (2019). The Evolution of Distance Learning. *Florida National University*. Retrieved from: <https://www.fnu.edu/evolution-distance-learning/> [accessed 17 September 2021].

³⁶ Sangrà, A., Vlachopoulos, D. and Cabrera, N. (2012). Building an Inclusive Definition of E-Learning: An Approach to the Conceptual Framework, *The International Review of Research in Open and Distance Learning*, 13(2), pp.145-159. <https://doi.org/10.19173/irrodl.v13i2.1161> [accessed 06 November 2022].

³⁷ Wang, C. H., Shannon, D. M., and Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, 34(3), pp.302–323. <https://doi.org/10.1080/01587919.2013.835779> [accessed 02 September 2022].

³⁸ Admin (2019). The Evolution of Distance Learning. *Florida National University*. Retrieved from: <https://www.fnu.edu/evolution-distance-learning/> [accessed 17 September 2021].

³⁹ CareerProfiles.info, (2022). Jones International University, *CareerProfiles.info*. Retrieved from: <https://www.careerprofiles.info/jones-international-university.html> [accessed 25 July 2022].

⁴⁰ Wang, C. H., Shannon, D. M., and Ross, M. E. (2013). Students' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning. *Distance Education*, 34(3), pp.302–323. <https://doi.org/10.1080/01587919.2013.835779> [accessed 02 September 2022].

⁴¹ McIsaac, M. S. and Gunawardena, C. N. (2001). 13. Distance Education. *The Handbook of Research for Educational Communications and Technology*. The Association for Educational Communications and Technology. Retrieved from: <http://members.aect.org/edtech/ed1/13/index.html> [accessed 17 September 2021].

Traditionally, distance learning has focused on (and has been particularly beneficial to) non-traditional students, such as full-time workers, military personnel, and non-residents or individuals that are not financially, physically, or geographically able to obtain traditional education in a classroom environment or full-time courses to fulfil with their educational aspirations. However, this audience has changed as the number of universities providing distance learning opportunities increased. In the autumn of 2009, in the United States higher education alone, more than 5.6 million university students enrolled in at least one online course, up from 1.6 million in 2002, and massive online open courses development contributed much to this growth (Admin, 2019)⁴². Despite the boom of recent years, prospective students need to consider distance education's advantages and disadvantages when deciding to embark on a new learning process.

It is widely accepted that distance learning offers numerous advantages; the most immediate one is easy access to education. However, these advantages need to be seen from the perspectives of students, educators, and institutions. From a student's perspective, they can match their professional and home life responsibilities with their studies. Furthermore, students 1) can choose their preferred educational institution, independently where they are located and determine their study schedules; 2) are encouraged to be self-disciplined as their success depends on how well organised they are in their studies; 3) determine their learning speed, which is particularly relevant for slow learners; 4) can get in touch with international experts who contribute to expanding their knowledge in particular subjects while offering new learning experiences not possible in traditional classrooms; 5) benefit from time and costs savings as and students do not have to pay for travel and accommodation, particularly when they choose universities away from home. Finally, distance education can be seen as a viable alternative for lifelong learning, allowing students to enrol in informal courses, professional development tutorials and full degree programs, and an opportunity for students with disabilities (Kent, 2016)⁴³.

Educators also benefit from the time and cost savings above-mentioned, mainly if they can perform the work fully remotely or hybrid. These time savings allow educators more time to prepare their learning materials. Educators can work, and students can study in the comfort of their homes, even though distance learning requires that educators and students have technological support, for instance, a computer and an internet connection, to participate in lectures and discussions. Furthermore, educators and students will be forced to improve their digital literacy, including computer skills, as they become more familiar with the technology. From an institutional perspective, distance education allows institutions to add students and significant cost savings as they prevent costs associated with constructing infrastructures for classrooms, information technology labs, other support services, and student accommodation. Moreover, the courses delivered can be tailored to suit students' diverse educational needs.

Despite the above advantages, distance learning also presents some disadvantages. The most immediate one is that it implies more planning activities and a tight schedule, meaning that educators and students may have to sacrifice some activities they enjoy getting things done in time. From a student's perspective, distance education is not suitable for everyone. It places an enormous responsibility on students to learn and understand, although they benefit from their educators' remote support (Tan, 1999)⁴⁴. The chances of students being distracted are high, and the risk of students not following through with the curriculum and losing track of deadlines and motivation are also high. In addition, the lack of immediate feedback can foster this situation as students must wait for educators to review their work. As a result, distance education requires proper time management, a tight working schedule, and much discipline if students want to succeed.

Moreover, distance education prevents social interaction. Face-to-face communication is absent, preventing students from developing their oral communication skills as verbal interaction with educators and other students is very limited since distance education limits students to their learning materials. In this regard, Chen

⁴² Admin (2019). *The Evolution of Distance Learning*. Florida National University. Retrieved from: <https://www.fnu.edu/evolution-distance-learning/> [accessed 17 September 2021].

⁴³ Kent, M. (2016). *Access and Barriers to Online Education for People with Disabilities*. Report submitted to the National Centre for Student Equity in Higher Education (NCSEHE), Curtin University: Perth. Retrieved from <https://www.ncsehe.edu.au/wp-content/uploads/2016/05/Access-and-Barriers-to-Online-Education-for-People-with-Disabilities.pdf> [accessed 05 September 2022].

⁴⁴ Tan, D. G. (1999). *The virtual classroom afloat: maritime education and training in the 21st century: an investigation into the feasibility and practicability of distance learning via the satellite communications system*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/423 [accessed 25 July 2022].

et al. (2017)⁴⁵ and Pipchenko and Kovtunen (2020)⁴⁶ claim that the lack of emotional communication among students and between students and educators lowers learning performance. Linked to this lack of social interaction is social isolation since students will be studying alone. Besides, there are some hidden costs. Students enrolling in distance education programs need to invest in a range of equipment, for instance, desk computers, laptops, webcams, stable internet connections or any other technology and incur additional expenses with electricity, internet service provider, ink for printers, printing paper. The lack of proper conditions (including technology) hampers the students learning progress. As part of this investment, students need to be computer literate to sort out any emerging technical problems.

From an institutional perspective, educational institutions must invest more to deliver high-quality distance learning. Distance education relies heavily on technology, namely printed materials, radio broadcast, television broadcast, computer conferencing, electronic mails, interactive videos, satellite telecommunications and multimedia, to promote student-educator interaction and provide necessary feedback to students at a distance (Satir and Deniz, 2014)⁴⁷. Moreover, not all the courses offered by educational institutions are suitable for distance education, which limits their offers. For instance, there is an inherent difficulty in delivering distance education that requires laboratory work or practical training. If educational institutions are willing to proceed with this option, they must create simulation labs, design serious games, and/or implement intermediate assessments, for instance in the form of quizzes, for students to practice, which comes at a cost.

Furthermore, some courses are not accredited, and some employers may refuse distance education qualifications. Besides, distance education is often not considered a serious form of education since, for many employers, it lacks quality despite its convenience and affordability. Therefore, the names of the educational institutions behind these distance learning programmes, and their marketing campaigns can minimise this negative impact, even though at a cost, which explains why some online courses are expensive. Today there are hundreds of distance education courses offered by public and private organizations and institutions; distance learning has become an established part of the educational world, with trends pointing to ongoing growth.

2.2.1. Delivery Methods and Electronic Learning

From a pedagogic perspective, technology in distance learning has expanded the methods and modes of delivering it. By delivery method is meant how distance learning is carried out. The main delivery methods include correspondence, radio and television, and electronic learning (e-learning).

Correspondence learning is where students receive their learning materials, for instance, books, study guides, assignments, and other study materials, by post. Students will work at their time and pace and may contact their tutor or instructor by e-mail, telephone, instant messaging, or post. Radio and television learning refers to the broadcast of lectures and/or programs to help students to learn from home at designated times. For many years this has been the preferred method to deliver general basic education; however, as it does not allow two-way communication, it has become less relevant; this type of learning is defined as linear learning. However, while the correspondence, radio and television learning definitions are clear, according to Hadjerrouit (2007)⁴⁸, there is no clear-cut definition of e-learning.

⁴⁵ Chen, X., Bai, X. and Xiao, Y. (2017). The Application of E-learning in Maritime Education and Training in China. *TransNav, The International Journal on Marine Navigation and Safety of Sea Transportation*, 11(2), pp.349-354. Retrieved from: <https://dx.doi.org/10.12716/1001.11.02.19> [accessed 30 July 2022].

⁴⁶ Pipchenko, O. D. and Kovtunen, D. (2020). A Suggestion of an Application of Blended Learning in MET Through a Harmonized STCW Model. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 14(3), pp.545-548. <https://doi.org/10.12716/1001.14.03.04> [accessed 30 July 2022].

⁴⁷ Satir, T. and Deniz, C. (2014). Distance learning at the Turkish maritime education. *15th Annually General Assembly of International Associations of Maritime Universities (IAMU), Tasmania, Australia*, 27 - 29 October 2014, pp.260-266. Retrieved from: https://www.researchgate.net/publication/291301933_Distance_learning_at_the_Turkish_maritime_education [accessed 25 July 2022].

⁴⁸ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

The term e-learning, as it is known today, was coined by Elliot Masie for the first time in November 1999 during his intervention at the TechLearn Conference (Vuong, 2021)⁴⁹. Masie, an American educational technology expert, defined e-learning as “*the use of network technology to design, distribute, select, administer and share learning*” (Cinema8, 2021)⁵⁰. At a later stage, Hartley (2001)⁵¹ and Craig et al. (2008)⁵² provided similar definitions. Hartley acknowledged that e-learning is a teaching and learning approach that delivers teaching materials to students using the internet or other computer network media, while Craig et al. (2008)⁵³ defined e-learning as a set of learning processes and interactions between students and educators supported by information and communication technologies.

However, despite the clear-cut definition provided by Masie, Hadjerrouit (2007)⁵⁴ says that some definitions provided in the literature are partially exclusive and sometimes even contradictory and vague. Sangrà et al. (2012)⁵⁵ further acknowledged that it is difficult “*devising a single, inclusive definition of e-learning that would be accepted by the majority of the scientific community due to the existence of different perspectives on this concept based on authors’ professional and academic profiles*”. For instance, the definition provided by Chen et al. (2017)⁵⁶ that e-learning is “*a new training learning mode, which is completely different from the traditional training and learning*” does not provide any insight into what e-learning is. Concerning this difference, Galić et al. (2020)⁵⁷ claimed that some features distinguish conventional in-class teacher-student environments from e-learning. The latter requires quality and thoroughly developed programs, high-quality web-based content and learning methods and a set of adequate tools for self-assessment. Moreover, Galić et al. (2020)⁵⁸ also claimed that e-learning is dependent on five factors, namely “*advice providing or consulting, content, technology, services and support*”.

Consequently, different authors present e-learning definitions from different perspectives. For instance, Guri-Rosenblit (2005)⁵⁹ and Hadjerrouit (2007)⁶⁰ defined e-learning from a technology-focused perspective, Koohang and Harman (2005)⁶¹ addressed it from a delivery approach-driven perspective, and Bermejo (2005)⁶² focused on a communication perspective. Moreover, the numerous definitions of e-learning originated from

⁴⁹ Vuong, N. H. (2021). *Improving e-learning in maritime education and training: action research in the Vietnam maritime context*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1760/ [accessed 25 July 2022].

⁵⁰ Cinema8, (2021). The History and Methods of Online Education. *Cinema8*. Retrieved from: <https://cinema8.com/blog/the-history-and-methods-of-online-education> [accessed 25 July 2022].

⁵¹ Hartley, D. E. (2001). *Selling E-Learning*, American Society for Training & Development: United States.

⁵² Craig, A., Goold, A., Coldwell, J. and Mustard, J. (2008). Perceptions of Roles and Responsibilities in Online Learning: A Case Study. *Interdisciplinary Journal of E-Learning and Learning Objects*, 4(1), pp.205-223. Informing Science Institute. Retrieved from <https://www.learntechlib.org/p/44856/> [accessed 04 September 2022].

⁵³ Craig, A., Goold, A., Coldwell, J. and Mustard, J. (2008). Perceptions of Roles and Responsibilities in Online Learning: A Case Study. *Interdisciplinary Journal of E-Learning and Learning Objects*, 4(1), pp.205-223. Informing Science Institute. Retrieved from <https://www.learntechlib.org/p/44856/> [accessed 04 September 2022].

⁵⁴ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

⁵⁵ Sangrà, A., Vlachopoulos, D. and Cabrera, N. (2012). Building an Inclusive Definition of E-Learning: An Approach to the Conceptual Framework. *The International Review of Research in Open and Distance Learning*, 13(2), pp.145-159. <https://doi.org/10.19173/irrodl.v13i2.1161> [accessed 06 November 2022].

⁵⁶ Chen, X., Bai, X. and Xiao, Y. (2017). The Application of E-learning in Maritime Education and Training in China. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 11(2), pp.349-354. Retrieved from: <https://dx.doi.org/10.12716/1001.11.02.19> [accessed 30 July 2022].

⁵⁷ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39–50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

⁵⁸ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39–50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

⁵⁹ Guri-Rosenblit, S. (2005). ‘Distance education’ and ‘e-learning’: Not the same thing. *Higher Education*, 49(4), pp.467-493. <https://doi.org/10.1007/s10734-004-0040-0> [accessed 25 July 2022].

⁶⁰ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

⁶¹ Koohang, A. and Harman, K. (2005). Open source: A metaphor for e-learning. *Informing Science: The International Journal of an Emerging Transdiscipline*, 8, pp.75-86. <https://doi.org/10.28945/488> [accessed 25 July 2022].

⁶² Bermejo, S. (2005). Cooperative electronic learning in virtual laboratories through forums. *IEEE Transactions on Education*, 48(1), pp.140-149. <https://doi.org/10.1109/TE.2004.837045> [accessed 25 July 2022].

numerous concepts and terminology. As a result, Hadjerrouit (2007)⁶³ claims that it is difficult to distinguish ‘e-learning’ from ‘virtual learning’, ‘network learning’, ‘online learning’, ‘multimedia-based learning’, ‘web-based learning’, ‘internet-enabled learning’, and similar terms.

Despite these definitions, e-learning dates from 1924, when the first electronic learning machine, the Automatic Teacher, was introduced by Sidney Pressey, a professor at Ohio State University (e-Student Organisation, 2019)⁶⁴. In the mid-1960s, Donald L. Bitzer built the first computerised learning system to deliver computer-based education, the ‘*Programmed Logic for Automation Teaching Operations*’ (PLATO), which introduced concepts such as online chat rooms, multiplayer gaming, and e-newsletters (National Inventors Hall of Fame, 2022)⁶⁵. PLATO is often referred to as the direct ancestor of ‘*Web Course Tools*’ (WebCT), one of which is the Blackboard, a virtual learning environment system (e-Student Organisation, 2019)⁶⁶. In 2000, the release of the first free and open-source learning management system, the ‘*Online Learning and Training*’ (OLAT) web application, revolutionised e-learning.

Other learning management systems followed. Learning management systems are a fundamental piece for maintaining and running e-learning programs. For example, the Modular Object-Oriented Dynamic Learning Environment (Moodle)⁶⁷ is probably the most popular e-learning management system globally (Bauk, 2013)⁶⁸. Moodle is a free, open-source learning platform or course management system software package designed to help educators create effective online courses based on sound pedagogical principles. Developing technical standards for eLearning products also contributed to this evolution, namely the ‘*Sharable Content Object Reference Model*’ (SCORM). SCORM provides the communication method and data models that allow e-learning content and learning management systems to work together. This paper adopts e-learning from a technological perspective, following the definition provided by Maise (1999) and the work developed by Hadjerrouit (2007)⁶⁹ and Craig et al. (2008)⁷⁰; e-learning needs information and communications technology for its successful implementation and for students to access the needed information (Galić et al., 2020)⁷¹.

From a technological perspective, e-learning embraces network-based and non-network-based learning (Hadjerrouit, 2007)⁷². Network-based learning means that information is at least partly loaded on and downloaded from the network, i.e., not from a local environment. Therefore, when designing network-based learning, attention must be drawn to 1) high-speed, commonly known as broadband, internet connectivity to make information available since slow-speed connections prevent the use of large size files of materials, 2) information reliability so that information is accurate, and 3) information usability so that it is easy to search and understand (Multisilta, 1997)⁷³. An example of network-based learning is online learning. Non-network-

⁶³ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

⁶⁴ e-Student Organization (2019). The History of E-learning. *e-student.org*. Retrieved from: <https://e-student.org/history-of-e-learning/> [accessed 25 July 2022].

⁶⁵ National Inventors Hall of Fame (2022). Donald L. Bitzer, *National Inventors Hall of Fame*. Retrieved from: <https://www.invent.org/inductees/donald-l-bitzer> [accessed 25 July 2022].

⁶⁶ e-Student Organization. (2019) The History of E-learning. *e-student.org*. Retrieved from: <https://e-student.org/history-of-e-learning/> [accessed 25 July 2022].

⁶⁷ For further information about learning management systems visit the following webpage: <https://elearningindustry.com/directory/software-categories/learning-management-systems> [accessed 25 July 2022].

⁶⁸ Bauk, S. and Radlinger, R. (2013). Concerning Web-based e-learning at a Maritime Higher Education Institution: Case Study. *Transactions on Maritime Science*, 2(2), pp.115-122. <https://doi.org/10.7225/toms.v02.n02.004> [accessed 22 September 2022].

⁶⁹ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

⁷⁰ Craig, A., Goold, A., Coldwell, J. and Mustard, J. (2008). Perceptions of Roles and Responsibilities in Online Learning: A Case Study. *Interdisciplinary Journal of E-Learning and Learning Objects*, 4(1), pp.205-223. Informing Science Institute. Retrieved from <https://www.learnlib.org/p/44856/> [accessed 04 September 2022].

⁷¹ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39–50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

⁷² Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

⁷³ Multisilta, J. (1997). Learning environments on the World Wide Web: experiences from Astronomy On-Line, *Education and Information Technologies*, 2(3) pp.171-177. <https://www.qou.edu/ar/sciResearch/pdf/distanceLearning/learningEnvironments.pdf> [accessed 07 July 2022].

based learning means that information is retrieved from a local-based network, i.e., a local hard disk or compact disc, read-only-memory; an example of non-network-based learning is computer-based learning. Computer-based learning refers to any learning that takes place with the help of computers. It uses computer applications and interactive software elements to support students' learning. It is an interactive instructor-less educational process. Examples of computer-based learning are computer-managed learning, computer-managed instruction, and computer-assisted instruction (Tamm, 2021)⁷⁴. As it is known today, computer-based learning came around the late 80s and early 1990s.

The advantages of e-learning are many; they can be seen from students, educators, and institutional perspectives. From a students' perspective, e-learning allows them to 1) study anytime and anywhere using a variety of terminal equipment to enhance their learning; 2) have their learning materials online 24 hours a day, 7 days a week and access to a wide range of resources; for instance, they can access their education's institution library from their personal computers, laptops, iPads for research articles, e-books content and other material; 3) benefit from worldwide educators' knowledge and a more personalised learning experience; Moreover, students 4) feel at ease than in the classroom because they are not disturbed by bias caused by seating arrangement, gender, race, and age; and 5) are not as isolated as in traditional ('asynchronous') distance learning courses, even though there is a lack of face-to-face communication.

The e-learning environment also makes educators more approachable. Students can talk openly with their educators through online chats, email and newsgroup discussions, and open forums for general impressions and opinions without waiting for office hours. They can also interact with their colleagues through chat rooms, discussion boards, emails and/or video conferencing software. Nevertheless, students 1) are dependent on technology since e-learning relies on the construction of reliable and secure information infrastructure, 2) need a stable and high-speed internet connection, and reliable, high-performance hardware and communication software tools (Coşofreţ and Avram, 2020⁷⁵; Galić et al., 2020)⁷⁶, and 3) must hold a good level of digital literacy. Otherwise, they do not take advantage of the course. Finally, e-learning prepares students for lifelong learning forcing them, sometimes, to learn about the technology behind it.

From an educator's perspective, e-learning allows educators to update course contents more frequently with updated information using different learning materials. However, some issues must be assessed in choosing the different learning materials. First, educators must understand the type of licensing attributed to open educational resources and check the copyrights of resources created by others. Not all open educational resources have been given the Creative Commons Attribution 4.0 (CC BY 4.0)⁷⁷. This license allows sharing/distributing, remixing, adapting, and building upon the material in any medium or format, as long as educators give appropriate credit to the original author(s) and the source.

Next is the issue of open educational resources quality and the time it takes to check the suitability, quality, or validity of their contents so that they fit within the courses being developed. How educators perceive the suitability, quality or validity of online open educational resources prepared by others is essential. Issues to consider may include 1) the alignment of those resources to the learning outcomes, 2) the accuracy or validity of information, 3) their overall quality, 4) the reputation and appropriateness of the source, and 5) the clarity of explanation of the subject matter. In addition, some of these open educational resources are accompanied by test banks, slide decks, and other supplemental materials. Only then can educators decide how to incorporate them into their online-learning activities. Nevertheless, educators are faced with some constraints that they need to overcome. One of them is insufficient knowledge of modern technology, mainly if they are not digital natives and technologically savvy and are not comfortable using new technology equipment. Another is the lack of appropriate technical resources preventing them from implementing e-learning or a lack of policy and guidelines towards its development.

⁷⁴ Tamm, S. (2021). Types of E-Learning. *E-student.org*. Retrieved from: <https://e-student.org/types-of-e-learning/> [accessed 17 September 2021].

⁷⁵ Coşofreţ, D. and Avram, E. R. (2020). Evaluation of the Maritime Higher Education didactic support during the coronavirus pandemic. Case Study. *The 15th International Conference on Virtual Learning ICVL 2020*, 493-499. Retrieved from: https://www.researchgate.net/publication/346075892_Evaluation_of_the_Maritime_Higher_Education_didactic_support_during_the_coronavirus_pandemic_Case_Study [accessed 10 October 2022].

⁷⁶ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39–50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

⁷⁷ To learn more about the Creative Commons licenses, check its website at <https://creativecommons.org/> [accessed 09 November 2022].

From an institutional perspective, e-learning allows institutions to 1) have access to a larger geographical area, 2) reduce the cost of training delivery; costs linked to training infrastructures are considerably reduced, 3) solve the problem of classroom inadequacy (Behzadi and Ghaffari, 2011)⁷⁸, 4) manage better their available resources. However, institutions are forced to deal with the security and quality of internet connection to guarantee the seamless flow of e-learning (Zhao, 2020)⁷⁹ and protect their staff and students' data. The issue of cyber-security is becoming ever more critical as the number of cyber-attacks increase. According to Brooks (2022)⁸⁰, in 2021, the average number of cyberattacks and data breaches increased by 15.1% relative to 2020. Moreover, Brooks claims that an increase in attacks from social engineering and ransomware is only expected during 2022 and 2023 due to misconfigurations, human error, poor maintenance, and unknown assets. Currently, in 2022, according to Anchore (2022)⁸¹, attacks on supply chains are impacting 62 percent of organizations.

Over the years, e-learning has become a widespread form of education since different end-users, including primary and secondary schools, universities, businesses, governments, and vocational segments, have benefited from it. Schinas and Thalassinou (2003)⁸² claimed that the importance of e-learning increases as the technology matures and people get used to working, learning, and buying remotely. The COVID-19 pandemic highlighted the role of e-learning and positively impacted e-learning revenue, even though there is still a lack of consensus about the actual value of the e-learning market. While Global Market Insights (2022)⁸³ claimed that in 2021, the global e-learning market surpassed USD 315 billion, other consultancy houses, such as Straits Research (2022)⁸⁴, estimated that the same market was worth USD 215 billion. Such a difference is significant since it influences market expectations for the next years. While Global Market Insights (2022)⁸⁵ claimed that the e-learning market is expected to grow at a compound annual growth rate of about 20%, reaching USD 1 trillion for the period 2022 to 2028, Straits Research (2022)⁸⁶ expects the e-learning market to reach a much lower value of USD 645 billion by 2030 at a compound annual growth rate of about of 13% during the forecast period (2022–2030). While the outcome suggests high- and low-revenue scenarios, what is clear is that this growth is not uniform throughout the globe as the different regions of the world, i.e., North America, Europe, Asia Pacific, Latin America, Middle East, and Africa, will be subject to different growth drivers (Global Market Insights, 2022)⁸⁷.

The spread of mobile technology, such as smartphones, laptops, tablets, and notebooks, is leading to the development of mobile learning (m-learning), i.e., learning through mobile devices, since it can take place anywhere (Marc and Pechuel, 2012)⁸⁸. Clark (2007)⁸⁹ claims that m-learning allows students to interact with

⁷⁸ Behzadi, Z. and Ghaffari, A. (2011). Characteristics of online education and traditional education. *Life Science Journal*, 8(3), pp.54-58. <https://www.dx.doi.org/10.7537/marslsj080311.11> [accessed 25 July 2022].

⁷⁹ Zhao, Y. (2020). Social Learning and Learning to Be Social: From Online Instruction to Online Education. *American Journal of Education*, 127(1), 137–142. <https://doi.org/10.1086/711017> [accessed 25 July 2022].

⁸⁰ Brooks, C. (2022). Alarming Cyber Statistics For Mid-Year 2022 That You Need To Know. *Forbes*, 3 June 2022. Retrieved from: <https://www.forbes.com/sites/chuckbrooks/2022/06/03/alarming-cyber-statistics-for-mid-year-2022-that-you-need-to-know/?sh=31dd22f27864> [accessed 14 November 2022].

⁸¹ Anchore (2022). 2022 Security Trends: Software Supply Chain Survey. *Anchore*. 19 January 2022. Retrieved from: <https://anchore.com/blog/2022-security-trends-software-supply-chain-survey/> [accessed 14 November 2022].

⁸² Schinas, O. and Thalassinou, E. (2003). Adjusting Basic Maritime Training in an E-Learning Environment. *European Research Studies*, 6(3–4), pp.237–256. Retrieved from <https://www.ersj.eu/journal/112> [accessed 25 July 2022].

⁸³ Global Market Insights (2022). *E-Learning Market Size. Global Market Insights*. Retrieved from: <https://www.gminsights.com/industry-analysis/elearning-market-size> [accessed 25 July 2022].

⁸⁴ Straits Research (2022). *E-Learning Market: Information by Delivery Mode (Packaged Content), Learning Mode (Self-Paced), Function (Training, Testing), End-Users (Higher Education), and Region — Forecast till 2030*. Straits Research. Retrieved from: <https://straitresearch.com/report/e-learning-market> [accessed 25 July 2022].

⁸⁵ Global Market Insights (2022). *E-Learning Market Size. Global Market Insights*. Retrieved from: <https://www.gminsights.com/industry-analysis/elearning-market-size> [accessed 25 July 2022].

⁸⁶ Straits Research (2022). *E-Learning Market: Information by Delivery Mode (Packaged Content), Learning Mode (Self-Paced), Function (Training, Testing), End-Users (Higher Education), and Region — Forecast till 2030*. Straits Research. Retrieved from: <https://straitresearch.com/report/e-learning-market> [accessed 25 July 2022].

⁸⁷ Global Market Insights (2022). *E-Learning Market Size. Global Market Insights*. Retrieved from: <https://www.gminsights.com/industry-analysis/elearning-market-size> [accessed 25 July 2022].

⁸⁸ Marc, B. and Pechuel, R. (2012). Acceptance, chances, and problems of mobile learning in vocational education in enterprises. *CEUR-WS.org Workshop Proceedings*, 955, pp.190-196. Retrieved from: http://ceur-ws.org/Vol-955/papers/paper_37.pdf [accessed 30 July 2022].

⁸⁹ Clark, J. D. (2007) *Learning and Teaching in the Mobile Learning Environment of the Twenty-First Century*. Austin, Texas: Austin Community College. Retrieved from <https://www.austinctc.edu/jdclark/mobilelearningenables.pdf> [accessed 04 September 2022].

learning resources when they are not at a fixed, pre-determined location, i.e., away from their traditional (specific) physical learning environment or when students benefit from mobile technology. Behera (2013)⁹⁰ and Galić et al. (2020)⁹¹ advocate that m-learning is an evolution of the present e-learning methods due to a shift of technology onto mobile devices. Therefore, m-learning complements traditional learning and e-learning and their combination results in digital learning, which results from a combination of technology, digital content, and instruction (Basak et al., 2018)⁹².

Beutner and Pechuel (2012)⁹³ also claim that m-learning is a promising education and training segment, although its success will depend upon several factors. According to UNESCO (2011)⁹⁴, affordability, leadership, content, and support from educators and parents, among other factors, contribute to its success. Beutner and Pechuel (2012)⁹⁵, in addressing vocational education and training, even suggest that its success depends upon its level of acceptance by prospective students and companies' decision-makers. m-Learning disadvantages still outweigh its advantages, and how it can meet prospective students' and companies' decision makers expectations is not fully clear (Beutner and Pechuel, 2012)⁹⁶. Nevertheless, independently of the challenges that m-learning needs to overcome, it will certainly enlarge the distance learning education and training market. This research is focused on online learning and acknowledges that students access their classes and learning materials online, for instance, via desktops and laptops.

2.2.2. Traditional Delivery Modes and Blended Learning

By mode of delivery is meant the way distance education, and consequently, e-learning, is delivered to students. The main delivery modes include synchronous and asynchronous distance education.

According to the Merriam-Webster online dictionary, synchronous means doing something simultaneously (Merriam-Webster, 2021b)⁹⁷. Therefore, synchronous learning happens in real-time and implies live communication. It refers to a physical learning event in a training room (typically in an office, classroom, or conference room) or an online learning event involving a group of participants (educators and students) engaged in learning at the same time (Priscila, 2021)⁹⁸ which allows them to interact with each other. Synchronous learning is also a synonym for instructor-led training, where more than one educator can participate. Educators teach their skills or deliver the expected course contents through lectures, presentations,

⁹⁰ Behera S. K. (2013). E- and M-Learning: A comparative study. *International Journal on New Trends in Education and Their Implications*, 4(3), pp.65–78. Retrieved from: <http://www.ijonte.org/FileUpload/ks63207/File/08.behera.pdf> [accessed 30 July 2022].

⁹¹ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39–50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

⁹² Basak, S. K., Wotto, M. and Bélanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. *E-Learning and Digital Media*, 15(4), pp.191-216. Retrieved from: <https://doi.org/10.1177/2042753018785180> [accessed 25 July 2022].

⁹³ Beutner, M. and Pechuel, R. (2012). Acceptance, Chances, and Problems of Mobile Learning in Vocational Education in Enterprises. In: *Marcus Specht, Mike Sharples and Jari Multisilta (eds) of Proceedings of the 11th International Conference on Mobile and Contextual Learning 2012*, Helsinki, Finland, 16-18 October 2012, pp.190-196. Retrieved from: http://ceur-ws.org/Vol-955/papers/paper_37.pdf [accessed 04 September 2022].

⁹⁴ United Nations Educational, Scientific and Cultural Organisation (2011). *UNESCO Mobile Learning Week Report*, 12-16 December 2011. United Nations Educational, Scientific and Cultural Organisation: Paris. Retrieved from: <https://www.yumpu.com/en/document/read/11269819/unesco-mobile-learning-week-report> [accessed 04 September 2022].

⁹⁵ Beutner, M. and Pechuel, R. (2012). Acceptance, Chances, and Problems of Mobile Learning in Vocational Education in Enterprises. In: *Marcus Specht, Mike Sharples and Jari Multisilta (eds) of Proceedings of the 11th International Conference on Mobile and Contextual Learning 2012*, Helsinki, Finland, 16-18 October 2012, pp.190-196. Retrieved from: http://ceur-ws.org/Vol-955/papers/paper_37.pdf [accessed 04 September 2022].

⁹⁶ Beutner, M. and Pechuel, R. (2012). Acceptance, Chances, and Problems of Mobile Learning in Vocational Education in Enterprises. In: *Marcus Specht, Mike Sharples and Jari Multisilta (eds) of Proceedings of the 11th International Conference on Mobile and Contextual Learning 2012*, Helsinki, Finland, 16-18 October 2012, pp.190-196. Retrieved from: http://ceur-ws.org/Vol-955/papers/paper_37.pdf [accessed 04 September 2022].

⁹⁷ Merriam-Webster (2021b). Synchronous. *Merriam-Webster*. Retrieved from: <https://www.merriam-webster.com/dictionary/synchronous> [accessed 09 September 2021].

⁹⁸ Priscila (2021). Synchronous vs. asynchronous learning: what's the difference. *EasyLMS*. Retrieved from: <https://www.easy-lms.com/knowledge-center/lms-knowledge-center/synchronous-vs-asynchronous-learning/item10387> [accessed 17 September 2021].

demonstrations, and discussions (MindTools Content Team, 2022)⁹⁹. In synchronous distance education, students will be learning from a distance. They are required to log in and virtually attend several classes at specific times each week as if they were in a physical class environment. The class has a firm weekly time commitment that cannot be rescheduled. In this regard, synchronous distance education proves less flexible than asynchronous distance education, preventing students from learning at their own pace. Students must meet with their educators and sometimes their colleagues at pre-scheduled times.

Asynchronous distance education is the opposite of synchronous distance education. Education delivery does not happen in real-time, thus allowing students to learn on their schedule; this aspect highlights why Finol (2020)¹⁰⁰ considered asynchronous learning a student-centred teaching style typically involved in online courses. Likewise, asynchronous learning is also a synonym for self-paced learning, which means students can learn in their own time and schedule. They do not need to complete the same assignments or learn at the same time as others. According to Accuray Research LLP (2019), cited in Galić et al. (2020)¹⁰¹, the self-paced learning mode was the largest e-learning market segment accounting for over 77% of the total market share in 2017 and expected to reach US\$ 10960 million by 2027, from US\$ 6312.7 million in 2020, at a compound annual growth rate of 8.2% during 2021-2027 (Industry Research, 2021)¹⁰².

Table 1: Differences between synchronous and asynchronous distance learning

Synchronous learning	Asynchronous learning
Traditional Virtual classroom	Recorded class
Instant messaging	E-mail
Immediate feedback from instructor and peers	Sending a question and waiting for an answer
Phone call	Recorded voice message
In-person training	Online training courses (without live video)
Live webinar	Recorded webinar
Group-paced	Self-paced
Same time	Different times
Discuss less complex issues	Reflecting on complex issues

Source: Adapted from Priscila (2021)¹⁰³

With asynchronous distance education, students can learn in a self-paced manner, access and complete lectures, readings, homework, and other learning materials at any time. They can also proceed from one topic or segment to the next at their speed (IGI Global, 2022)¹⁰⁴, during a pre-determined timeframe, for instance, a one- or two-week period since some asynchronous learning requires students to finish their activities within a specific timeframe. Educators may prescribe a learning order, but students may choose a different one, including how much or little time they spend in each study area (Wintemute, 2021)¹⁰⁵. Flexibility is the biggest advantage of asynchronous distance learning. However, because of this inherent feature, the planning of asynchronous distance education is more detailed and burdensome. Asynchronous distance education often

⁹⁹ MindTools Content Team (2022). Instructor-Led Training. Creating an Effective Learning Experience. *MindTools*. Retrieved from: <https://www.mindtools.com/pages/article/instructor-led-training.htm> [accessed 25 July 2022].

¹⁰⁰ Finol, M. O. (2020). Asynchronous vs Synchronous Learning: A Quick Overview. *Bryn Mawr College*. Retrieved from: <https://www.brynmawr.edu/news/asynchronous-vs-synchronous-learning-quick-overview> [accessed 25 July 2022].

¹⁰¹ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39–50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

¹⁰² Industry Research (2021). *Global and Japan Self-Paced E-Learning Market Size, Status and Forecast 2021-2027*. Industry Research. Retrieved from: <https://www.industryresearch.biz/global-and-japan-self-paced-e-learning-market-18683075> [accessed 25 July 2022].

¹⁰³ Priscila (2021). Synchronous vs. asynchronous learning: what's the difference. *EasyLMS*. Retrieved from: <https://www.easy-lms.com/knowledge-center/lms-knowledge-center/synchronous-vs-asynchronous-learning/item10387> [accessed 17 September 2021].

¹⁰⁴ IGI Global (2022). What is Self-Paced Learning. *IGI Global*. Retrieved from: <https://www.igi-global.com/dictionary/self-paced-learning/26257> [accessed 25 July 2022].

¹⁰⁵ Wintemute, D. (2021). Synchronous vs. Asynchronous Classes: What's the Difference? *TheBestSchools*. Retrieved from: <https://thebestschools.org/resources/synchronous-vs-asynchronous-programs-courses/> [accessed 17 September 2021].

includes short videos teaching key concepts, reading materials, and assessment quizzes before the learning process starts. Table 1 presents the differences between synchronous and asynchronous distance learning.

Nevertheless, there is a third option, blended (or hybrid) education, that Shvetsova et al. (2021)¹⁰⁶ describe as a more innovative teaching and learning approach to substitute the traditional face-to-face education and training in brick-and-mortar schools. The body of the literature presents several definitions of blended learning, even though Shvetsova et al. (2021)¹⁰⁷ claim that the literature does not provide a coherent definition. For example, Garrison and Kanuka’s (2004)¹⁰⁸ define blended learning as “*the thoughtful integration of classroom face-to-face learning experiences with online learning experiences*” while Singh and Reed (2001)¹⁰⁹ describe blended learning as “*learning program where more than one delivery mode is being used with the objective of optimizing the learning outcome and cost of program delivery*”. Overall, blended learning allows students to use traditional learning aids, such as books, and more modern technology, such as websites and apps, on computer technology (Harmer, 2012)¹¹⁰. However, these resources are not meant to replace face-to-face learning but to enhance and build upon concepts discussed in the classroom (Singh et al., 2021)¹¹¹.

Table 2: Types of Distance Education by Methods and Modes of Delivery

		Modes of Delivery				
		Synchronous	Asynchronous	Blended		
Delivery methods	Correspondence learning		-----	* Correspondence courses	-----	
	Radio and Tele-learning		* Radio courses * Tele-courses	-----	-----	
	Electronic learning	Network-based learning (for instance, online-based learning)		* Fixed Time Online Courses * Webinars * Videoconferencing	* Open Schedule Online Courses	* Fixed Time Online Courses * Open Schedule Online Courses * Webinars * Videoconferencing
		Non-network-based learning (or computer-based learning)		-----	* Computer-based training * Computer-managed learning * Integrated learning systems * Electronic performance support system	-----

Source: Authors based on MIT School of Distance Education (2019)¹¹²

Fadde and Vu (2014)¹¹³ go on to say that blended learning can be split into traditional and online blended learning. While in traditional blended education, asynchronous online instruction is added to the face-to-face classroom via a learning management system, blended online education adds synchronous online education

¹⁰⁶ Shvetsova, I., Fediaieva, V. and Moroz, O. (2021). Education and professional training: blended learning in maritime English teaching. *Laplage in Journal*, 7(3D), pp.175-188. <https://doi.org/10.24115/S2446-6220202173D1705p.175-188> [accessed 25 July 2022].

¹⁰⁷ Shvetsova, I., Fediaieva, V. and Moroz, O. (2021). Education and professional training: blended learning in maritime English teaching. *Laplage in Journal*, 7(3D), pp.175-188. <https://doi.org/10.24115/S2446-6220202173D1705p.175-188> [accessed 25 July 2022].

¹⁰⁸ Garrison, D. R. and Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), pp.95-105. <https://doi.org/10.1016/j.iheduc.2004.02.001> [accessed 17 September 2021].

¹⁰⁹ Singh, H. and Reed, C. (2021). *A White Paper: Achieving Success with Blended Learning*. Retrieved from: <https://maken.wikiwijs.nl/userfiles/f7d0e4f0bd46619984Iede3eea221261.pdf> [accessed 19 July 2022].

¹¹⁰ Harmer, J. (2012). *Essential Teacher Knowledge*. Harlow: Pearson Education

¹¹¹ Singh, J., Steele, K., and Singh, L. (2021). Combining the Best of Online and Face-to-Face Learning: Hybrid and Blended Learning Approach for COVID-19, Post Vaccine, & Post-Pandemic World. *Journal of Educational Technology Systems*, 50(2), pp.188-204. <https://doi.org/10.1177/0743915620902148> [accessed 07 November 2022].

¹¹² MIT School of Distance Education (2019). Different Types of Distance Learning. *MIT School of Distance Education*. Retrieved from: <https://blog.mitsde.com/different-types-of-distance-learning/> [accessed 17 September 2021].

¹¹³ Fadde, P. J. and Vu, P. (2014). Chapter 3: Blended Online Learning: Benefits, Challenges and Misconceptions. In: *Patrick R. Lowenthal, Cindy S. York and Jennifer C. Richardson. Online Learning: Common Misconceptions, Benefits and Challenges*, pp33-48.

activities such as web conferencing to asynchronous online courses. Fadde and Vu even claimed that the challenge of blended online education is finding a combination of synchronous and asynchronous activities within educators' capabilities to satisfy learners' preferences. A type of blended education is the flipped classroom in which students are given more ownership over their learning process; they are introduced to content at home and use class time for practice working, i.e., small group activities and individual attention for clarification purposes, to apply the concepts learned. This is the opposite of the more common practice of introducing new content at school and assigning homework and projects to be completed by the students independently at home (TeachThought Staff, 2022)¹¹⁴.

Table 2 combines the three main delivery methods (correspondence, radio and tele-learning, and e-learning) and the three main distance education delivery modes (synchronous, asynchronous, and blended) to identify the learning alternatives distance learning offers. From an e-learning perspective, four possible types of e-learning can be identified: 1) the pure network-based synchronous courses, 2) the pure network-based asynchronous courses, 3) the network-based blended courses, and 4) the pure non-network-based asynchronous courses. However, each type cannot be seen in isolation; for instance, computer-based learning technologies can be used as simulation training in network-based e-learning (West et al., 2009)¹¹⁵.

2.2. Online Based Learning

As a distance education delivery method, online learning occurs through a network (Hadjerrouit, 2007)¹¹⁶, meaning that students are still physically distant from their educators. Introduced in the 1990s with the creation of the internet, online learning has shown significant growth over the last decade as the opportunity to gain new skills rises. Important to say that technology mediates students' and educators' interaction in online learning (Aguilera-Hermida, 2020)¹¹⁷. Therefore, different types of online learning emerge, and to understand them, it is important to understand the different services provided by the Internet (see Figure 1). Besides the world wide web, the Internet offers other services such as instant messaging, chat rooms, email, file transfers, news groups, peer-to-peer networks, and forums (Hadjerrouit, 2007¹¹⁸; Teach-ICT.com, 2022¹¹⁹). Therefore, internet-based learning is broader than web-based learning and email learning is another type of online learning. The simple reason is that the Internet and the world wide web are different things. The Internet is a global network of networks, while the world wide web is a collection of information accessed via the Internet. Putting it simply, "*the Internet can be viewed as a big book store while the Web can be viewed as a collection of books on that store*" (GeeksforGeeks, 2022)¹²⁰.

Online learning has revolutionised education; it has become a viable and valuable option to meet the needs of people who may not enrol full-time in a traditional educational institution and attend face-to-face courses (Stan, 2014)¹²¹. Underlying online learning is the virtual classroom concept, in which educators and students use technology to communicate and discuss different learning topics via chat or voice. The significance of online learning has been fully demonstrated during the confinement days of the COVID-19 pandemic. It was

¹¹⁴ TeachThought Staff (2022). What Is the Definition Of The Flipped Classroom?. *TeachThought University*. Retrieved from: <https://www.teachthought.com/learning/definition-flipped-classroom/> [accessed 7 July 2022].

¹¹⁵ West, C., Slatin, C., Sanborn, W. and Volicer, B. (2009). Computer-Based Simulation in Blended Learning Curriculum for Hazardous Waste Site Worker Health and Safety Training. *International Journal of Information and Communication Technology Education*, 5(1), pp.62-73. <https://doi.org/10.4018%2Fijcte.2009010105> [accessed 02 September 2021].

¹¹⁶ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

¹¹⁷ Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, 1, Article ID: 100011. <https://doi.org/10.1016/j.ijedro.2020.100011> [accessed 02 September 2022].

¹¹⁸ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

¹¹⁹ Teach-ICT.com (2022). What is the Internet?. *Teach-ICT.com*, Retrieved from: https://www.teach-ict.com/gcse_new/internet/internet_www/miniweb/pg2.htm [accessed 02 September 2022].

¹²⁰ GeeksforGeeks (2022). What's difference between The Internet and The Web? GeeksforGeeks. Retrieved from: <https://www.geeksforgeeks.org/whats-difference-internet-web/> [accessed 09 November 2022].

¹²¹ Stan, L. C. (2014). Online Teaching Technique in Maritime Learning Process, *Procedia - Social and Behavioral Sciences*, 116, pp.4517-4520, <https://doi.org/10.1016/j.sbspro.2014.01.977> [accessed 07 July 2022].

the most efficient way to cope with the lecturing problem caused by such disruption and overcome the devastating disorder that the pandemic brought to the educational system worldwide (Aguilera-Hermida, 2020¹²²; Shi et al., 2021)¹²³. According to ResearchandMarkets (2019)¹²⁴, the United States leads the global online education market, and both China and India are major markets for online education due to governments' digital initiatives, smartphone user base, and internet penetration. Overall, the global online education market is expected to reach US\$ 350 billion globally by 2025 (ResearchandMarkets, 2019)¹²⁵.

Figure 1: Services provided by the Internet



Source: Adapted from Hadjerrouit (2007)¹²⁶, Teach-ICT.com (2022)¹²⁷

As per Table 2, online-based learning comprehends synchronous, asynchronous, and blended delivery modes. The choice of each of these delivery modes depends on the extent to which the subject/learning activities being delivered require instant feedback and discussion. The elements that sustain each of these delivery modes are detailed in Table 3. The elements making part of blended learning are greater than those for synchronous and asynchronous learning, thus giving educators a wide range of options when delivering education and training and carrying out assessments.

Table 4 presents the advantages and disadvantages that each delivery mode offers. When considering synchronous online learning, the advantages and disadvantages are very similar to the ones encountered by educators and students in a face-to-face classroom environment. From an educator's perspective, synchronous

¹²² Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, 1, Article ID: 100011. <https://doi.org/10.1016/j.ijedro.2020.100011> [accessed 02 September 2022].

¹²³ Shi, X., Wang, Y., Zhuang, H. and Zhang, Z. (2021). Development of online education and its application in Shanghai Maritime University. In Pazaver, A., Manuel, M. E., Bolmsten, J., Kitada, M., Bartuseviciene, I. (Eds.), *Proceedings of the International Maritime Lecturers' Association. Seas of transition: setting a course for the future* (pp. 218-225). World Maritime University. Retrieved from: <https://commons.wmu.se/imla2021/24/> [accessed 07 July 2022].

¹²⁴ ResearchandMarkets (2019). *Online Education Market & Global Forecast, by End User, Learning Mode (Self-Paced, Instructor Led), Technology, Country, Company*. Retrieved from: <https://www.researchandmarkets.com/reports/4876815/online-education-market-and-global-forecast-by> [15 September 2021].

¹²⁵ ResearchandMarkets (2019). *Online Education Market & Global Forecast, by End User, Learning Mode (Self-Paced, Instructor Led), Technology, Country, Company*. Retrieved from: <https://www.researchandmarkets.com/reports/4876815/online-education-market-and-global-forecast-by> [15 September 2021].

¹²⁶ Hadjerrouit, S. (2007). Applying a System Development Approach to Translate Educational Requirements into E-Learning. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 3, pp.107-134. <https://doi.org/10.28945/389> [accessed 17 September 2021].

¹²⁷ Teach-ICT.com (2022). What is the Internet?. *Teach-ICT.com*. Retrieved from: https://www.teach-ict.com/gcse_new/internet/internet_www/miniweb/pg2.htm [accessed 02 September 2022].

online learning is less burdensome. Depending on educators working plan, synchronous online learning allows educators to revise and update their lectures whenever necessary, thus giving students more updated information. This added value is not found in asynchronous online learning unless asynchronous online learning materials are constantly revised and updated.

Table 3: Elements of synchronous, asynchronous, and blended online learning education

Synchronous learning	Asynchronous learning	Blended learning
Virtual classes Web conferencing Webinars Instant messaging Polls Surveys Quizzes Phone calls Shared documents	Self-guided lessons Recorded classes/Pre-recorded videos Webinar recordings Short videos Audio files Podcasts Online resource links Discussion Boards Message Boards Forums and Blogs Quizzes Email	Virtual classes Self-guided lessons Recorded classes/Pre-recorded videos Web conferencing Webinars Webinar recordings Short videos Instant messaging Polls Surveys Quizzes Phone calls Shared documents Audio files Podcasts Online resource links Discussion Boards Message Boards Forums and Blogs Email

Source: Adapted from MIT School of Distance Education (2019)¹²⁸

The advantages and disadvantages of asynchronous and blended online learning are very similar to traditional distance learning ones. The success of asynchronous and blended online learning rests on the elaboration of materials, either in written, video or any other forms that draw the students’ attention and enhance their learning experience (Aguilera-Hermida, 2020¹²⁹). For this reason, the preparation of asynchronous and blended online learning courses is very burdensome; they require time to prepare, which depends upon the number of learning hours, the complexity of the subjects being taught, and the number of educators involved since the number of hours spent writing handbooks and recording can be countless. Furthermore, educators must spend time carrying out additional tasks such as preparing resources, including website links that must be updated regularly, preparing all the assessments expected in advance, organising quizzes, et cetera. From a student’s perspective, synchronous online learning allows students to benefit from educators’ guidance, as if they were in a traditional classroom, which is not so straightforward in asynchronous and blended online learning, where students work on their own despite being able to contact their educators. In all situations, technological knowledge influences the learning process. Educators’ and students’ success depends on previous online learning experiences and may require training and assistance to learn about learning tools and platforms before starting their learning process (Aguilera-Hermida, 2020¹³⁰), which obliges educators to elaborate dedicated handbooks to deal with them.

For delivering online learning, numerous synchronous and asynchronous technologies are currently available. Examples of synchronous technologies include live video, audio, and shared access to electronic documents at scheduled times. On the other hand, asynchronous technologies include web-based course-management systems that incorporate digital reading materials, podcasts (recorded sessions for electronic listening or viewing at the student’s leisure), e-mail, threaded (linked) discussion forums, chat rooms, and test-taking functionality in virtual (computer-simulated) classrooms. All of them can be of a closed or open-source nature. In addition, synchronous and asynchronous tools can be supported by shared social spaces such as blogs and wikis. Finally, incorporating polls, quizzes, discussions, debates, and tests in online learning allows

¹²⁸ MIT School of Distance Education (2019). Different Types of Distance Learning. MIT School of Distance Education. Retrieved from: <https://blog.mitsde.com/different-types-of-distance-learning/> [accessed 17 September 2021].

¹²⁹ Aguilera-Hermida, A. P. (2020). College students’ use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, 1, Article ID: 100011. <https://doi.org/10.1016/j.ijedro.2020.100011> [accessed 02 September 2022].

¹³⁰ Aguilera-Hermida, A. P. (2020). College students’ use and acceptance of emergency online learning due to COVID-19. *International Journal of Educational Research Open*, 1, Article ID: 100011. <https://doi.org/10.1016/j.ijedro.2020.100011> [accessed 02 September 2022].

educators to assess students as they progress their learning pathway in a synchronous, asynchronous, and blended way.

Table 4: Advantages and Disadvantages of the Different Online Delivery Modes

	Advantages	Disadvantages
Synchronous online learning	<ul style="list-style-type: none"> * Greater interaction between participants. * Spontaneous thinking. * Immediate feedback/responses. * Dynamic learning opportunities. * Exchange of knowledge and experience between participants. * Real-time feedback for the educator. * Direct communication with educators. * Training happens on a fixed schedule. * Structured as in classrooms. 	<ul style="list-style-type: none"> * Classes are scheduled and cannot be rescheduled. * Needs a quiet space to log on. * Can be hard to speak up. * Requires good equipment, particularly the webcam and the microphone, and a strong internet connection. * Susceptible to technical difficulties.
Asynchronous online learning	<ul style="list-style-type: none"> * Schedule flexibility since participants can learn in their own time and schedule. * Individually dictated pace. * More democratic. * More accessible. * More time with the material. * Less work for educators when the courses are running. * Promotes critical thinking in the discussion forums. 	<ul style="list-style-type: none"> * The preparation of courses is burdensome. * There is a lack of spontaneous interaction. * Challenges with procrastination. * Disconnected social environment. * Independent learning difficulties. * More distractions. * Requires good equipment and a strong internet connection. * Susceptible to technical difficulties.
Blended online learning	<ul style="list-style-type: none"> * Some interaction with participants. * Schedule flexibility since participants can learn in their own time and schedule. * Individually dictated the pace. * More democratic. * More accessible. * More time with the material. * Some work for educators when the courses are running. * Promotes critical thinking in the discussion forums and intuitive thinking in the live virtual classroom. 	<ul style="list-style-type: none"> * The preparation of courses is burdensome. * Spontaneous interaction is limited. * Challenges with procrastination. * Disconnected social environment. * Independent learning difficulties. * More distractions. * Requires good equipment, particularly the webcam and the microphone, and a strong internet connection. * Susceptible to technical difficulties.

Source: Authors based on Fadde and Vu (2014)¹³¹, MIT School of Distance Education (2019)¹³², Priscila (2021)¹³³, and Wintemute (2021)¹³⁴.

From a content perspective, online-based learning can be further classified as 1) fixed online learning, 2) adaptive online learning, 3) interactive online learning, 5) individual online learning, and 6) collaborative online learning (Tamm, 2021)¹³⁵; the difference between them can be seen in Table 5.

As the trend toward online education and training increases, educational institutions are being asked to design, develop, and implement online programmes, whether short- or long-term ones. However, the development of online courses is not an easy task. These programmes’ design, development, and implementation require planning and time, often unavailable, leading to stressful processes that may negatively

¹³¹ Fadde, P. J. and Vu, P. (2014). Chapter 3: Blended Online Learning: Benefits, Challenges and Misconceptions. In: *Patrick R. Lowenthal, Cindy S. York and Jennifer C. Richardson. Online Learning: Common Misconceptions, Benefits and Challenges*, pp.33-48.

¹³² MIT School of Distance Education (2019). Different Types of Distance Learning. *MIT School of Distance Education*. Retrieved from: <https://blog.mitsde.com/different-types-of-distance-learning/> [accessed 17 September 2021].

¹³³ Priscila (2021). Synchronous vs. asynchronous learning: what's the difference. *EasyLMS*. Retrieved from: <https://www.easy-lms.com/knowledge-center/lms-knowledge-center/synchronous-vs-asynchronous-learning/item10387> [accessed 17 September 2021].

¹³⁴ Wintemute, D. (2021). Synchronous vs. Asynchronous Classes: What’s the Difference? *TheBestSchools*. Retrieved from: <https://thebestschools.org/resources/synchronous-vs-asynchronous-programs-courses/> [accessed 17 September 2021].

¹³⁵ Tamm, S. (2021). Types of E-Learning. *E-student.org*. Retrieved from: <https://e-student.org/types-of-e-learning/> [accessed 17 September 2021].

impact online offerings' quality (Udermann, 2019)¹³⁶. Online education and training programmes require months of planning, preparation, implementation, examination, and evaluation (Shi et al., 2021)¹³⁷. This is critical in asynchronous and blended learning, where educators must record classes or videos to allow students a continuous learning process.

Table 5: Classification of Online-based Learning from a Content Perspective

Type of Online Learning	Definition
Fixed Online Learning	The contents delivered and the learning materials used in the learning process do not change from their original state. All students receive the same information, and the materials are predetermined by the educators and not adapted to students' preferences.
Adaptive Online Learning	The learning materials used in the learning process can be adapted and redesigned for each learner. This allows education to become more individualised and student-centred than ever before.
Interactive Online Learning	It allows trainers and students to develop two-way communication. As a result, trainers and students can change their teaching and learning methods.
Individual Online Learning	Students study on their own to meet their learning goals. Unfortunately, it prevents the development of communication skills and teamwork abilities.
Collaborative Online Learning	In this case, students learn and achieve their learning objectives together as a group. It is assumed that students develop their knowledge better when interacting and learning from each other.

Source: Adapted from Tamm (2021)¹³⁸

Based on authors lecturing and training experience Figure 2 presents an online course development timeline that can be used as a guideline in all distance courses' development. The proposed timeline indicates each step running from course overview (Step 1) to evaluation (step 6). Out of these steps, the course instructional design (step 3) is critical since it directly impacts student learning and performance; its outcome determines the course structure and how the different modules interact so that students benefit from previous learning and be prepared for the learning that follows. The following paragraphs discuss some of the issues educators involved in online-based learning should bear before embarking on such an adventure (Udermann, 2019)¹³⁹.

Step 1 is 'Course Overview', sometimes defined as 'Course Content' (see University of California San Diego, 2022)¹⁴⁰. During this step, educators focus on at least four specific aspects, namely 1) the course title, 2) the scope of the course, 3) the course main and specific learning objectives and 4) the topics to be covered in the course. In defining the course topics, which will constitute the syllabus, educators often adopt a forward design approach; they start with the syllabus planning, then move to methodological issues and assess learning outcomes (Richards, 2013)¹⁴¹. Traditionally, they would investigate the syllabus of similar courses and/or the contents of textbooks to define their course content. Despite being a valid option, educators must be open to

¹³⁶ Udermann, B. (2019). Seven Things to Consider Before Developing Your Online Course. *Faculty Focus*. Retrieved from: <https://www.facultyfocus.com/articles/online-education/online-course-design-and-preparation/seven-things-to-consider-before-developing-your-online-course/> [accessed 17 September 2021].

¹³⁷ Shi, X., Wang, Y., Zhuang, H. and Zhang, Z. (2021). Development of online education and its application in Shanghai Maritime University. In Pazaver, A., Manuel, M. E., Bolmsten, J., Kitada, M., Bartuseviciene, I. (Eds.), *Proceedings of the International Maritime Lecturers' Association. Seas of transition: setting a course for the future*, pp.218-225. World Maritime University. Retrieved from: <https://commons.wmu.se/imla2021/24/> [accessed 07 July 2022].

¹³⁸ Tamm, S. (2021). Types of E-Learning. *E-student.org*. Retrieved from: <https://e-student.org/types-of-e-learning/> [accessed 17 September 2021].

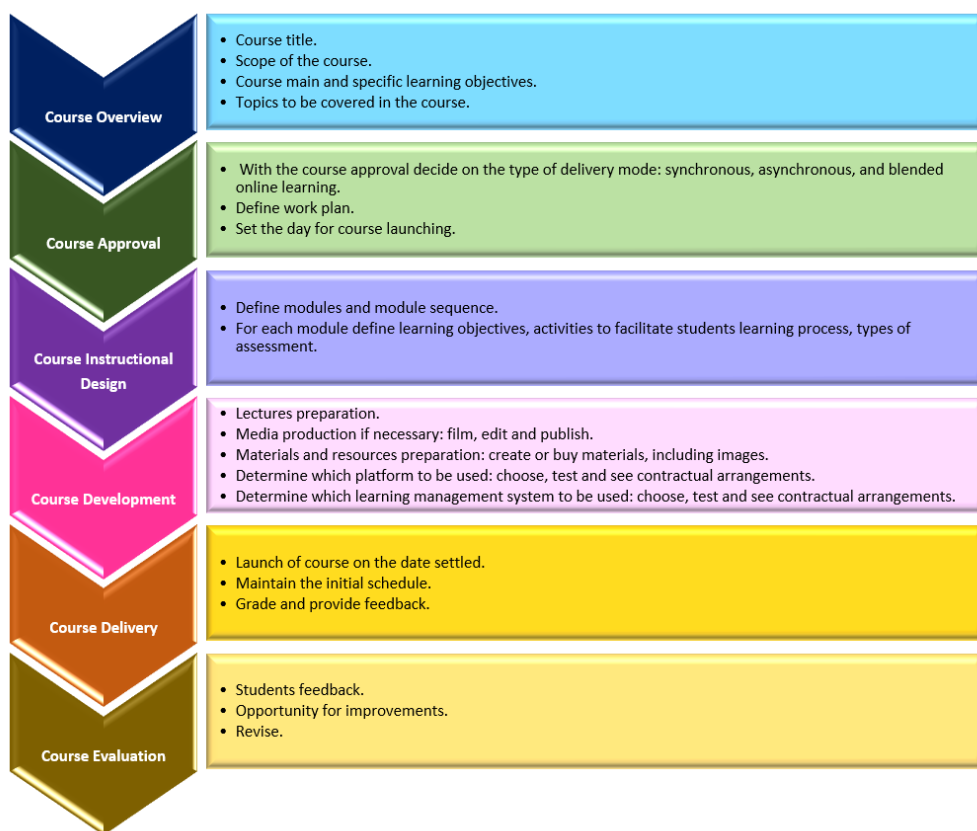
¹³⁹ Udermann, B. (2019). Seven Things to Consider Before Developing Your Online Course. *Faculty Focus*. Retrieved from: <https://www.facultyfocus.com/articles/online-education/online-course-design-and-preparation/seven-things-to-consider-before-developing-your-online-course/> [accessed 17 September 2021].

¹⁴⁰ University of California San Diego (2022). Policies and Guidelines for Online Courses and Programs. *University of California San Diego*. Retrieved from: <https://digitallearning.ucsd.edu/instructors/resources/guidelines-for-online.html> [accessed 01 August 2022].

¹⁴¹ Richards, J. C. (2013). Curriculum Approaches in Language Teaching: Forward, Central, and Backward Design. *RELC Journal*, 44(1), pp.5-33. Retrieved from: <https://doi.org/10.1177%2F0033688212473293> [accessed 17 September 2021].

using different sources. They also have a wide range of online open educational resources such as Khan Academy, College Open Textbooks, OpenStax, MERLOT, MIT Open Courseware Online Textbooks, and Lumen Learning, which are good sources of information. Moreover, the probability of the latter being updated is higher than the traditional printed books.

Figure 2: Online Course Development Timeline



Source: Authors

Against this traditional approach to developing course content, Wiggins and McTighe (2005)¹⁴² suggest the backward design approach; a backward design begins by specifying the learning outcomes before deciding on the methodology (i.e., pedagogical approach) and syllabus (Wiggins and McTighe, 2005)¹⁴³. In dealing with contents, methodology and outcomes, educators will have to investigate the tasks that help students to build knowledge and skills and improve their digital literacy, develop strategies to ensure that students are engaged in online learning, provide access, or create dedicated online resources, decide to use open or closed technologies among other issues. Whether educators use a forward or a backward design approach, they should initially assess education and training needs. An education and training needs assessment may pinpoint specific knowledge, skills and competencies that improve the course content and ease its development since educators will meet students’ needs and expectations about what they learn.

Step 2 concerns ‘Course Approval’. Once the course has been approved, it is necessary to decide on the delivery mode; educators need to define which type of online learning they adopt; Is it synchronous, asynchronous, or blended online learning? This decision will directly influence the costs and the time needed for designing and developing the online program, even though it is assumed that a 6 to 12 months timeframe is recommended if educators are doing most of the work. Establishing a reasonable timeline is critical since most educators may also be responsible for other activities and/or tasks, and an established timeline allows

¹⁴² Wiggins G. and McTighe J. (2005). *Understanding by Design*. Association for Supervision and Curriculum Development: Alexandria, pp.1-34. Retrieved from: <https://goglobal.fiu.edu/assets/docs/whatisbackwarddesign-wigginsmctighe.pdf> [accessed 17 September 2021].

¹⁴³ Wiggins G. and McTighe J. (2005). *Understanding by Design*. Association for Supervision and Curriculum Development: Alexandria, pp.1-34. Retrieved from: <https://goglobal.fiu.edu/assets/docs/whatisbackwarddesign-wigginsmctighe.pdf> [accessed 17 September 2021].

educators to control their work progress. Moreover, it will influence the course's instructional design (Step 3), and development (Step 4). For the above reasons, the work plan and the expected launching day of the course must be set.

The 'Course Instructional Design' follows on Step 3. It is acknowledged that course design determines the extent to which the course can incorporate students with diverse backgrounds (Stone and Springer, 2019)¹⁴⁴. Therefore, instructional design is more than defining course materials; as a rule, it includes several tasks.

The first one concerns defining the modules and their sequence, which ends up being the backbone of the course. The second one defines each module's general and specific objectives; as a rule, these should be aligned with the module's contents bearing in mind that the sum of all modules' main learning objectives contributes to the overall specific learning objectives of the course. The third one identifies which assessments to be carried out. The fourth determines the type of activities students must carry out to facilitate their learning process, knowledge acquisition, engagement, and motivation; according to Cui (2010),¹⁴⁵ the chosen activities will determine students' motivation to achieve their learning objectives. Finally, determine the learning materials and resources that support students' learning process.

Within the scope of online training, the issue of assessment is critical as setting up an electronic assessment system can cost thousands of Euros/American Dollars. Malguri (2021)¹⁴⁶ defines an online assessment as a structured, meticulous evaluation of students' skills, characteristics, knowledge, or expertise in which the test is hosted online via modern web-based technologies. There are several possibilities with which online assessment is concerned. Online assessment can be performed more traditionally. In this case, the option is formative assessments, summative assessments, or both; the choice depends on the modules' purpose. A more formal online assessment implies the submission of essays, case studies, article reviews, proposal writing, and report writing or using automated online assessment (i.e., online quizzes or prior knowledge assessment). However, other possibilities include invigilated online assessments, online interactions, and online group assessments (Ragupathi, 2020)¹⁴⁷.

Supporting online assessment, there is a range of tools for asking questions creating quizzes, survey forms and polls at educators' disposal. Like any assessment in a class environment, an online assessment is administered with a specific intent and presents advantages and disadvantages. For instance, while reducing the administrative burden of organising and running exams and allowing a quicker marking and announcement of the exam results, it requires educators to familiarise themselves with the technology being used, students to get some training by performing mock exams, watching training videos or attend training sessions to feel confident. Moreover, when developing online assessments, educators must draw attention to several issues such as 1) the technology to be used given the wide range of technologies available in higher education, 2) students' level of computer literacy, 3) Internet connectivity to avoid any disruptions, and 4) the need to be more creative; for instance, a possibility is using drag-and-drop, image-based or even audio-based activities (Udermann, 2019)¹⁴⁸.

Technology follows assessment. Determining which technology and how technology will be used in the online course is critical, given the amount of available technology and cost variety. Too much technology can be overwhelming and stressful for both educators and students. Furthermore, as education is transferred from a physical environment to an online one, educators and students must acquire different skills. Finally, both

¹⁴⁴ Stone, C. and Springer, M. (2019). Interactivity, connectedness and 'teacher-presence': Engaging and retaining students online. *Australian Journal of Adult Learning*, 59(2), pp.146-169. Retrieved from <https://ajal.net.au/downloads/interactivity-connectedness-and-teacher-presence-engaging-and-retaining-students-online/> [accessed 02 September 2021].

¹⁴⁵ Cui, Z.-L. (2010). On the Applications of Modern Educational Technology in Maritime English Teaching from the Perspective of Constructivism. *English Language Teaching*, 3(3), pp.244-248. Retrieved from: <https://doi.org/10.5539/elt.v3n3p244> [accessed 07 July 2022].

¹⁴⁶ Malguri, A. (2021). What is an Online Assessment? Here's Everything You Need to Know. *Mercer LLC*. Retrieved from: <https://blog.mettl.com/guide/online-assessment/> [accessed 17 September 2021].

¹⁴⁷ Ragupathi, K. (2020). Designing Effective Online assessments. Resource Guide. *National University of Singapore*. Retrieved from: <https://www.nus.edu.sg/cdtl/docs/default-source/professional-development-docs/resources/designing-online-assessments.pdf> [accessed 17 September 2021].

¹⁴⁸ Udermann, B. (2019). Seven Things to Consider Before Developing Your Online Course. *Faculty Focus*. Retrieved from: <https://www.facultyfocus.com/articles/online-education/online-course-design-and-preparation/seven-things-to-consider-before-developing-your-online-course/> [accessed 17 September 2021].

must familiarise themselves with the technology being used and be prepared to deal with unexpected events in case of technological failure, even on a different scale.

Educators must be prepared to develop strategies promoting students' digital literacy in dealing with technological aspects of online education and training. Such strategies must include activities/tasks where students find, evaluate, and share information using a range of online technologies and tools, the creation of an online resource guide and instructions on how to use the chosen online technologies, and activities requesting students to host a live event or even encouraging learner-generated e-learning content. Also, within the scope of technology, a decision must be made on whether to employ open or closed technologies. Reasons leading to choosing open technologies include reduced costs and simplified operations, direct access to customisable code, improved interoperability, or even enhanced pedagogy (Object Computing, Inc., 2021)¹⁴⁹. Moreover, certain technologies such as video conferencing tools like Zoom and CiscoWebex limit the time of each session if a license is not bought.

Step 4 deals with 'Course Development'; it includes a range of activities such as 1) preparation of lectures, 2) media production, 3) materials and resources preparation, 4) determining the platform to be used and 5) determining the learning management system to be used. Two of these activities stand out: '*media production*' and '*materials and resources preparation*' since they are time-consuming. The type of media used in the course will determine the technology needed to produce it, the time required to produce it and the costs involved in their production. Bertram and Plowman (2020)¹⁵⁰ claimed that implementing e-learning solutions needs cooperation between (digital) training experts and small/medium enterprises; moreover, they also acknowledged that it takes longer than writing a book or an article. For instance, according to Defelice (2021)¹⁵¹, the average time to develop e-learning ranges from a minimum of 38 hours and a maximum of 694 hours, depending on the type of e-learning.

Linked to media production, the proper selection of course materials contribute to developing efficient courses. The use of open educational resources, i.e., teaching, learning, and research materials in the public domain or released under an open license that allows their free use and re-purposing by others (Maureen and Mike Mansfield Library, 2021)¹⁵², offers some advantages. For instance, they 1) reduce students' costs associated with the buying of textbooks, 2) guarantee that students have access to course materials at the same time and at the optimal time, 3) contribute to innovative teaching practices as educators have the opportunity to tailor the course content in new ways to optimise students learning experiences when adapting, adopting, or creating open educational resources, 4) allow educators academic freedom as open educational resources can be edited, revised, modified as they wish and if open educational resources allow them to do that. However, not all learning subjects benefit from open educational resources, forcing educators to develop them.

Within the scope of online course development, the choice of platforms will depend on whether the course is synchronous, asynchronous, or blended on-line learning. While in the synchronous mode, the choice may fall between Zoom, Microsoft Teams, or CiscoWebex, among other possible alternatives, in an asynchronous mode, the choice is more complicated, particularly if educators aim to target a wider audience than the educators' educational institution. The market already holds a range of online learning platforms owned by private companies, for instance, Coursera, edX, Udemy, Khan Academy, and MIT Open Courseware; the one to be chosen depends on the educational institution's objectives. If the course is to be kept in-house, then the choice may fall on which learning management system to use, open or closed, to facilitate online learning, which can take the form of asynchronous learning (where students are not required to be online at the same time and utilize discussion threads and e-mails to complete coursework) or synchronous learning (where students must be online at the same time).

¹⁴⁹ Object Computing, Inc. (2021). Open Source Adoption: 5 Ways Your Organization Will Benefit. *Object Computing, Inc.* Retrieved from: <https://objectcomputing.com/resources/business-insights/5-reasons-to-transition-to-open-source> [accessed 17 September 2021].

¹⁵⁰ Bertram, V. and Plowman, T. (2020). Digital training solutions in the maritime context: Options and costs. *Maritime Technology and Research*, 2(2), pp.52-68. <https://doi.org/10.33175/mtr.2020.190782> [accessed 07 November 2022].

¹⁵¹ Defelice, R. A. (2021). How Long Does It Take to Develop Training? New Question, New Answers. *Association for Talent Development*. Retrieved from: <https://www.td.org/insights/how-long-does-it-take-to-develop-training-new-question-new-answers> [accessed 07 November 2022].

¹⁵² Maureen and Mike Mansfield Library (2021). What are OER?. *University of Montana*. Retrieved from: <https://www.lib.umat.edu/oer/default.php> [accessed 02 August 2022].

Step 5 deals with the course delivery. Educators must be prepared to launch the course on the initially settled date, maintain the initial schedule, grade students' assessments, and provide feedback. Moreover, educators must be prepared to adopt strategies when delivering synchronous, asynchronous, or blended online learning to meet the learning outcomes. Successful implementation of online education is more than a technological issue. Such strategies may include setting clear expectations for the course, creating and maintaining a strong presence throughout the course, regularly checking content resources and applications, making the subjects being taught relevant, highlighting the relevance, or posing questions and giving participants a moment to write. Educators must consider choosing the strategies that better suit the delivery mode chosen, given that each learning approach has different features.

However, not highlighted in Figure 2, administrative aspects also contribute to the successful delivery of an online course. For instance, creating an educators' participation plan helps educators estimate the workload associated with a course, such as posting regular course announcements, offering virtual office hours, providing feedback on assignments or other assessments, responding to student questions, participating in online discussion forums, and offering synchronous exam reviews. Moreover, educators will be called upon to communicate with students, participate in discussion forums, and provide feedback. A possibility to alleviate part of the workload may rest on reusing course announcements, discussion forum summaries, and assessment feedback.

Step 6 on 'Course Evaluation' covers students' feedback, giving course developers and/or educators, if they are the same person, the opportunity to improve by revising the course delivered. This is particularly critical when courses are delivered for the first time, and adjustments must be made. The failure to consider these guidelines or any other that the institutional organisations might have developed to assist the development of online-based learning may affect educators' confidence in their ability to design, develop and implement online-based learning. For instance, numerous reasons/factors may deter the adoption of online-based learning. They include a non-inherent interest in this type of learning, uncertainty about the institutional position on the use of online-based learning, difficulties in planning online-based learning, the lack of knowledge about the online teaching/lecturing tools available, and bandwidth and connectivity issues.

2.3. Online Education in a Maritime Context

Maritime transport is the oldest form of conveying goods. Throughout history, it has promoted the exchange of goods within regions such as the Mediterranean Sea and between regions as the XV century discoveries indicated the presence of new territories. The establishment of trade entrepôts in distant places allowed the traditional maritime nations to expand their commercial relationships, and the world economy prospered. Today, the maritime industry is part of a vast sector, the transport one in which unimodal, multimodal, and intermodal services are delivered, and therefore dependent on a range of stakeholders such as logistics operators, freight forwarders, customs brokers, stevedoring companies, shipbuilding and repair companies, warehouse and drydocks operators, ports and terminals, chandlers among many others to support the needs of importers and exporters.

Maritime transport accounts for over 80% of world trade by volume; in 2021, it accounted for 10.6 billion tons (United Nations Conference on Trade and Development, 2021)¹⁵³. The remaining 20% is split between road, rail, and air transport modes. This difference in market share highlights the importance of shipping, reinforced by the lack of an alternative transport mode capable of moving such big volumes and crossing the oceans as it does so well. While this percentage is expected to be retained over the next years, the industry has nevertheless witnessed a decrease in the number of seafarers making up their crews. Long are the days when ships had crews of around 50 seafarers. The number has decreased throughout the years, with the introduction of contentorisation, after the 1985 crisis and in the wake of technological changes that have been taking place. Today, the same ships can be operated with half of the crew members or even less, depending on their level of automation. Despite this trend, seafarers play and will continue to play, a vital role in the operation of the maritime industry. They are the backbone of the shipping industry and not even the replacement of the existing fleet with fully unmanned vessels will drive them away. A shift is expected to occur with seafarers doing their

¹⁵³ United Nations Conference on Trade and Development (2021). *Review of Maritime Transport 2021*, United Nations Conference on Trade and Development: Switzerland. Retrieved from https://unctad.org/system/files/official-document/rmt2021_en_0.pdf [accessed 28 September 2022].

work from shore stations with the duties of watch-keeping and navigation to guarantee the safety of shipping operations and still working on a watch on/watch off basis.

According to the Seafarer Workforce Report, published in 2021 by the Baltic and International Maritime Council and the International Chamber of Shipping, the shipping industry is supported by 1.89 million seafarers who operate over 74,000 vessels of the world merchant fleet registered in over 150 nations (International Chamber of Shipping, 2022a)¹⁵⁴. While most originate from China, Indonesia, the Philippines, the Russian Federation and Ukraine, the truth is that every worldwide country supplies the industry with seafarers, albeit with different supply levels. Due to them, and at the expense of their personal life, vessels went on plying during the Covid-19 pandemic allowing world trade to flow. However, the restrictions imposed on crew changes to restrain human mobility and the spread of the disease forced seafarers to stay on board for months. As a result, the industry came to the headings of the main media outlets, and a great percentage of the world population got acquainted with an invisible industry for the first time. The situation halted only in December 2021, almost two years after the Covid-19 pandemic, when the International Maritime Organisation adopted a resolution declaring seafarers and other maritime personnel as key workers, even though in December 2020, 46 countries had already agreed to designate seafarers as key workers.

Consequently, maritime education and training are critical for the safety of life and property at sea due to the inherent nature of shipping industry operations. The consequences of accidents and incidents are extensive resulting in the loss of life, valuable cargo, and environmental pollution (Schröder-Hinrichs et al., 2012)¹⁵⁵. The highly risky, hazardous, and complex operations performed on board ships require seafarers to possess technical and non-technical skills. According to Flin et al. (2013)¹⁵⁶, non-technical skills are “*the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance*”. They go beyond the traditional technical skills and knowledge about navigation, seamanship techniques, maritime engines, fluid mechanics, ship stability, among other topics that contribute to their performance at sea and embrace issues such as situation awareness, decision-making communication, teamwork, leadership, task management, and human performance awareness to deal with stress, fatigue, rudeness, and burnout.

Currently, maritime education and training is governed by the STCW Convention and STCW-2010 Code (International Maritime Organisation, 2017)¹⁵⁷. However, it has not always been like this. Historically, international maritime education and training were centred on practical training and maritime expertise in the merchant navy and fleets, thus relying on apprenticeship and informal, unstructured learning (Wai, 2021¹⁵⁸; Renganayagalu et al., 2022¹⁵⁹). However, the level of practical training and maritime expertise delivered to seafarers depended on the countries’ maritime education policies, thus creating uneven maritime and education training levels, resulting in a wide range of standards and procedures. In order to overcome these differences, on 7 July 1978, the International Maritime Organisation adopted the STCW Convention; it entered into force on 28 April 1984.

The Convention aimed to harmonise seafarers’ education and training by setting up mandatory international minimum standards for their proficiency and watchkeeping within the scope of navigation safety, efficiency and effectiveness and marine environmental protection to limit the accidents at sea caused by human element error, including poor competence (Wai, 2021)¹⁶⁰. It focused almost entirely on knowledge. Furthermore, the

¹⁵⁴ International Chamber of Shipping (2022a). Supply chain issues will be compounded by lack of Ukrainian and Russian seafarers, says global body representing international shipping. *International Chamber of Shipping*. Retrieved from <https://www.ics-shipping.org/press-release/supply-chain-issues-will-be-compounded-by-lack-of-ukrainian-and-russian-seafarers-says-global-body-representing-international-shipping/> [accessed 28 September 2022].

¹⁵⁵ Schröder-Hinrichs J. U., Hollnagel, E. and Baldauf, M. (2012). From Titanic to Costa Concordia—a century of lessons not learned. *WMU Journal of Maritime Affairs*, 11(2), pp.151–167. <https://doi.org/10.1007/s13437-012-0032-3> [accessed 05 September 2022].

¹⁵⁶ Flin, R., O’Connor, P. and Crichton, M. (2013). *Safety at the Sharp End: A Guide to Non-technical Skills*. CRC Press: Florida.

¹⁵⁷ International Maritime Organisation (2017). *STCW Convention and STCW Code 2017 Edition*. International Maritime Organisation London.

¹⁵⁸ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*, World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

¹⁵⁹ Renganayagalu, S. K., Mallam, S. and Hernes, M. (2022). Maritime Education and Training in the COVID-19 Era and Beyond. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 16(1), pp.59-69. <http://dx.doi.org/10.12716/1001.16.01.06> [accessed 27 September 2022].

¹⁶⁰ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*, World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

Convention targeted the master, officers, and engineers of seagoing merchant ships to avoid maritime accidents such as the grounding of the Torrey Canyon in 1967 (Praetorius et al., 2020)¹⁶¹. For many years, the human element has been considered the cause of many accidents; Alop (2004)¹⁶² claimed that the rate of the human element in accidents continued to be high. According to Allianz Global Corporate & Specialty (2022)¹⁶³, the so-called human element was still responsible for 75% of all maritime accidents.

Table 6: Amendments to the 1978 STCW Convention throughout the years

Year	Amendments Description	IMO Resolution	Date of entry
1991	Relate to the global maritime distress and safety system (GMDSS) and conduct of trials.	MSC.21(59)	1 December 1992
1994	Concern special training requirements for personnel on tankers.	MSC.33(63)	1 January 1996
1995	Concern 1) the minimum standards that the Parties are required to maintain to give full and complete effect to the provisions of the STCW Convention, and 2) recommended guidance to assist Parties to the STCW Convention and those involved in implementing, applying, or enforcing its measures.	resolution 1 of the 1995 STCW Conference	26 June – 7 July
1997	Relate to the training of personnel on passenger and ro-ro passenger ships.	MSC.66(68) MSC.67(68)	1 January 2003
1998	Concern competence enhancement in cargo handling and stowage, particularly in respect of bulk cargoes.	MSC.78(70)	1 January 2003
2004	Concerns certificates adjustment and endorsing (May) and on-load and off-load devices within the scope of survival craft and rescue boats other than fast rescue boats (December).	MSC.156(78) MSC.180(79)	1 July 2006
2006	Concern new measures about ship security officers.	MSC.209(81)	1 January 2008
2010 ¹⁶⁴	Concern measures about preventing fraudulent practices associated with competency certificates, strengthened medical standards, training in modern technology, and requirements in security training, among other measures.	resolutions 1 and 2 of the 2010 STCW Conference	21-25 June
2014	Update the Code General Provisions and Standards regarding general provisions.	MSC.373(93) MSC.374(93)	1 January 2016
2015	Update the General Provisions, regulations I/1 and I/2 and chapter V and introduce new section V/3	MSC.396(95) MSC.397(95)	1 January 2017
2016	Update chapters I and V, including regulations V/2 and V/4 and sections A-V/2 and A-V/4	MSC.416(97) MSC.417(97)	1 July 2018
2018	Concern Amendments to Part B of the Code ¹⁶⁵	MSC.455(100)	1 January 2019

Source: Adapted from International Maritime Organisation (2022)¹⁶⁶

Since 1978, the STCW Convention has been subject to several amendments in 1991, 1994, 1995, 1997, 1998, 2004, 2006, 2010, 2014, 2015, 2016 and 2018. Subject to the recommendations made in 2010 that the

¹⁶¹ Praetorius G.P., Hult C., Österman C. (2020). Maritime Resource Management: Current Training Approaches and Potential Improvements. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 14(3), pp.573-584, <http://dx.doi.org/10.12716/1001.14.03.08> [accessed 27 September 2022].

¹⁶² Alop, A. (2004), Education and training or training contra education. In: *Proceedings of the 13th International Conference on Maritime Education and Training*, St Petersburg, pp. 5-12. Retrieved from: https://sise.etis.ee/File/DownloadPublic/06f4b723-1668-4520-9dd6-d38a72f51725?type=&name=Fail_Alop_IMLA13_2004.pdf [accessed 10 November 2022].

¹⁶³ Allianz Global Corporate & Specialty (2022). Safety and Shipping Review 2022. Allianz Global Corporate & Specialty <https://www.agcs.allianz.com/news-and-insights/reports/shipping-safety.html> [accessed 30 October 2022].

¹⁶⁴ The amendments to the 1995 STCW Conference adopted the Seafarers' Training, Certification and Watchkeeping (STCW) Code are known as the Manila Amendments.

¹⁶⁵ Amendments to part B of the Code were adopted at the 69th, 72nd, 77th, 80th, 81st, 95th, 97th, 98th and one-hundredth of the Maritime Safety Committee, by means of circular STCW.6 series, in particular, Circ.3 (1998), Circ.4 (1998), Circ.5 (2000), Circ.6 (2003), Circ.7 (2005), Circs. 8 to 10 (2006), Circ.11 (2015), Circ.12 (2016), Circ. 13 (2017)

¹⁶⁶ International Maritime Organisation (2022). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. *International Maritime Organisation*. Retrieved from: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx> [accessed 30 October 2022].

STCW Convention and Code should, to the extent possible, be revised every ten years to address any inconsistencies identified in the interim and keep updated with existing and emerging technologies, a new work plan has been drawn up in April 2022 by the Maritime Safety Committee 105 (Baltic and International Maritime Council, 2022)¹⁶⁷. Therefore, it is only expected that, in the years to come, the STCW Convention and the STCW-2010 Code will suffer a comprehensive revision, given the technological revolution that the industry is going through. Table 6 details each amendment reached so far; the most relevant ones are those of 1995 and 2010.

The 1995 amendments resulted from a comprehensive revision of the 1978 STCW Convention, which started in 1993. The amendments aimed to 1) transfer all detailed technical requirements to an associated code; 2) clarify the skills and competencies required and take into account modern training methods; 3) require the administrations of each country to have direct control over the recognition of the qualifications of masters, officers and communications personnel, to whom they issued authorisation to serve on their ships; 4) make parties to the convention responsible for its proper implementation by ensuring the quality of their training and certification activities; and 5) introducing and making amendments to the convention binding on all parties, with the shortest possible delay (Sardinha, 2022)¹⁶⁸.

These amendments were adopted by resolution 1 of a Conference of Parties to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, which met at the International Maritime Organisation headquarters from 26 June to 7 July 1995 (International Maritime Organisation, 2022)¹⁶⁹. They entered into force on 1 February 1997 under the 1995 Seafarers' Training, Certification and Watchkeeping Code (STCW-95 Code). The STCW-95 Code was developed using the British competency-based training standards model (Emad and Roth, 2008)¹⁷⁰ and has two parts. Part A concerns the mandatory provisions referred to in the STCW Convention Annex; Part B guides the Parties to give the STCW Convention a full and complete effect (International Maritime Organisation, 2022)¹⁷¹.

The STCW Convention and STCW-95 Code focused on competency and practical skills underpinned by theoretical knowledge. Much of the knowledge obtained from educators was theoretical rather than practical (Wai, 2021)¹⁷², and applicants for competency certificates must demonstrate that they can do what they are trained for (Hardin, 2000)¹⁷³. For instance, it determined in its Chapter II (Standards regarding the Master and Deck Department – Section A-II/1) and Chapter III (Standards regarding the Engine Department– Section A-III/1) of the STCW-95 Code that candidates for certification as 1) officers in charge of navigational watches on board ships of 500 gross tonnage or more and/or 2) officers in charge of engineering watches in manned engine rooms or designated duty engineers in periodically unmanned engine rooms of ships powered by main propulsion machinery of 750 kW or more, must complete onboard training to enhance their competencies to obtain their certificate of competency (International Maritime Organisation, 2017)¹⁷⁴. By addressing onboard training, the Convention supported a mix of traditional learning and on-the-job training drawing attention to knowledge, skills, and experience (Wai, 2021)¹⁷⁵.

¹⁶⁷ Baltic and International Maritime Council (2022). IMO to start comprehensive review of STCW Convention and Code. *Baltic and International Maritime Council*, 5 May 2022. Retrieved from: <https://www.bimco.org/insights-and-information/safety-security-environment/20220505-stcw-review> [accessed 10 November 2022].

¹⁶⁸ Sardinha, A. (2022). Cursos e Certificados STCW. *APORMAR*. Retrieved from: <https://www.apormar.com/apormar-pro-certificacao-cursos-stcw> [accessed 10 November 2022].

¹⁶⁹ International Maritime Organisation (2022). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. *International Maritime Organisation*. Retrieved from: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx> [accessed 30 October 2022].

¹⁷⁰ Emad, G. and Roth, W. M. (2008). Contradictions in the practices of training for and assessment of competency: A case study from the maritime domain. *Education + Training*, 50(3), pp.260-272. <https://doi.org/10.1108/00400910810874026> [accessed 30 October 2022].

¹⁷¹ International Maritime Organisation (2022). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. *International Maritime Organisation*. Retrieved from: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx> [accessed 30 October 2022].

¹⁷² Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*, World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

¹⁷³ Hardin, D. (2000). By the way . . . Editor's point of view. *Proceedings of the Marine Safety Council*, 57(1), p.3.

¹⁷⁴ International Maritime Organisation (2017). *STCW Convention and STCW Code 2017 Edition*. International Maritime Organisation London.

¹⁷⁵ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*, World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

The 2010 amendments aimed to update the STCW Convention and STCW-95 Code in accordance with the existing developments and developments foreseeable in the future. These amendments were adopted by Resolutions 1 and 2, by the Conference of Parties to the STCW Convention during a meeting in Manila, Philippines, from 21 to 25 June 2010 (International Maritime Organisation, 2022)¹⁷⁶, marking a second major revision (Sardinha, 2022)¹⁷⁷. They aimed to improve training and certification requirements applicable to seafarers, shipowners, education and training institutions and maritime administrations by updating and setting the necessary global standards to train and certify seafarers to operate technologically-advanced ships (Wong, 2017)¹⁷⁸. A five-year implementation period of the Manila 2010 amendments was established between 1 January 2012 and 31 December 2016 so that all new requirements set out in the Manila Amendments were introduced by each country's maritime administration.

The 2010 Manila amendments to the STCW Convention and STCW-95 Code introduced several measures (International Maritime Organisation, 2022)¹⁷⁹. Some of these concerns the introduction the prevention of fraudulent practices in respect of certificates, medical standards, security training, including concerning acts of piracy and armed robbery, training in technology-related matters, and requirements for qualified seafarers, establishing new professional profiles, such as that of electro-technical officers (Sardinha, 2022¹⁸⁰; International Maritime Organisation, 2022¹⁸¹). The 2010 Manila Amendments to STCW Convention and STCW-95 Code also require that all seafarers periodically update some components of the mandatory STCW training related to safety (Sardinha, 2022)¹⁸² and ship officers demonstrate competencies in both technical and non-technical skills (Atik and Arslan, 2019)¹⁸³. Moreover, it adopted new requirements to foster effective oral communication among seafarers to reduce the number of maritime accidents worldwide. These measures are particularly relevant for crew members on board multicultural and multilingual ships who are forced to learn and speak a common language (English) other than their own. Data indicates that at least three languages are spoken on the average ship (International Chamber of Shipping, 2022)¹⁸⁴.

English within the scope of the STCW-2010 Code is addressed in Tables A-II/1, A-II/4, A-III/1, A-III/6, and A-IV/ 2 (International Maritime Organisation, 2017)¹⁸⁵, and to support these requests, the International Maritime organisation developed Model Course 3.17 on 'Maritime English'. According to Alfiani (2017)¹⁸⁶, seafarers from various nations operate the world merchant fleet in which multinational and multilingual crews operate most merchant vessels. Ziarati et al. (2011)¹⁸⁷ acknowledged that almost three-quarters of seafarers

¹⁷⁶ International Maritime Organisation (2022). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. *International Maritime Organisation*. Retrieved from: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx> [accessed 30 October 2022].

¹⁷⁷ Sardinha, A. (2022). Cursos e Certificados STCW. *APORMAR*. Retrieved from: <https://www.apormar.com/apormar-pro-certificacao-cursos-stcw> [accessed 10 November 2022].

¹⁷⁸ Wong, R. (2017). STCW Convention: Update. *Skuld*, 5 January 2017. Retrieved from: <https://www.skuld.com/topics/people/crew/stcw-convention-update/> [accessed 10 November 2022].

¹⁷⁹ International Maritime Organisation (2022). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. *International Maritime Organisation*. Retrieved from: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx> [accessed 30 October 2022].

¹⁸⁰ Sardinha, A. (2022). Cursos e Certificados STCW. *APORMAR*. Retrieved from: <https://www.apormar.com/apormar-pro-certificacao-cursos-stcw> [accessed 10 November 2022].

¹⁸¹ International Maritime Organisation (2022). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. *International Maritime Organisation*. Retrieved from: <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx> [accessed 30 October 2022].

¹⁸² Sardinha, A. (2022). Cursos e Certificados STCW. *APORMAR*. Retrieved from: <https://www.apormar.com/apormar-pro-certificacao-cursos-stcw> [accessed 10 November 2022].

¹⁸³ Atik, O. and Arslan, O. (2019). Use of Eye Tracking for Assessment of Electronic Navigation Competency in Maritime Training. *Journal of Eye Movement Research*, 12(3), Article ID: 2. <https://doi.org/10.16910/jemr.12.3.2> [accessed 04 November 2022].

¹⁸⁴ International Chamber of Shipping (2020). ICS launches global diversity tracker for shipping industry. *International Chamber of Shipping*. Retrieved from: <https://www.ics-shipping.org/press-release/ics-launches-global-diversity-tracker-for-shipping-industry/> [accessed 14 May 2022].

¹⁸⁵ International Maritime Organisation (2017). *STCW Convention and STCW Code 2017 Edition*. International Maritime Organisation London.

¹⁸⁶ Alfiani, D. S. (2017). *Multinational and Multicultural Seafarers and MET Students: A Socio-Cultural Study for Improving Maritime Safety and the Education of Seafarers*, Unpublished MSc. Thesis 425. World Maritime University. https://commons.wmu.se/all_dissertations/425/ [accessed 04 November 2022].

¹⁸⁷ Ziarati, M., Ziarati, R., Bigland, O. and Acar, U. (2011). Communication and practical training applied in nautical studies. In: *Proceedings of International Maritime English Conference 23*, Constanta Maritime University, Romania, pp.41-51. Retrieved from https://www.pfri.uniri.hr/bopri/IMEC_Proceedings/PDF/IMEC23.pdf [accessed 02 September 2021].

working on multicultural vessels and their cultural differences impact the level of communication onboard. In 2005, Yang and Gu¹⁸⁸ had already claimed that cultural differences had become one of the main obstacles in maritime communication, often leading to misunderstanding, communication failures, distrust and even conflicts.

However, according to Wai (2021)¹⁸⁹, competency-based training is no longer enough to implement training programs to upgrade seafarers' training standards to cope with evolving technologies. Competency-based learning refers to “*systems of instruction, assessment, grading, and academic reporting that are based on students demonstrating that they have learned the knowledge and skills they are expected to learn as they progress through their education*” (Great Schools Partnership, 2014)¹⁹⁰. Technological improvement in the shipping industry is changing fast. Digitalisation and a high level of automation will lead to unmanned ship operations and will change the shipping industry's operating landscape and seafarers' role. According to Demirel (2020)¹⁹¹, such changes will demand highly skilled and specialised crews capable of adapting to evolving technologies. In order to deal with these changes, the shipping industries must adopt new learning approaches to grant seafarers the opportunity to continuously upgrade their competencies. Moreover, seafarers are, in practice, the enforcers of all maritime regulations, conventions, guidelines, and standards established by the different maritime organisations and governments. For these reasons, they need to continuously upgrade their competencies throughout their working life.

For some years, nautical schools have incorporated simulator-based training in their learning programmes. Simulator-based training offers practical instruction by creating real-life situations that enable students to practice high-risk tasks under different conditions in a safe environment, i.e., under controlled conditions created by the simulator. From a general perspective, maritime simulators are machines designed to provide a realistic imitation of ships' operations or other offshore equipment holding a set of similar controls that replicate the real world (Bhaskaran, 2018)¹⁹². For example, in what concerns navigation manoeuvring, either in the open sea or in confined waters, the use of radar simulators provides existing and future officers of watch with the competencies and confidence to execute the necessary manoeuvres whenever there is a risk of collision or any other situation, for instance, bad weather, that endangers the safety of the ship, crew, and cargo.

Initially, maritime education and training were restricted to using bridge simulators¹⁹³; these included radar plotting, passage planning and basic ship-handling simulators. Then, in the 1980s, engine room simulators were introduced, followed by specific cargo handling simulators, such as cargo control room simulators (Renganayagalu et al., 2022)¹⁹⁴. Today, the range of simulators is wide; these include bridge and engine simulators, electronic chart display and information system simulators, global maritime distress and safety system radio suites, engineering workshops with power tools, fire houses and firefighting areas, engine (marine propulsion) laboratories, electrical laboratories, seaman workshops, and swimming pools, among others. Depending on the nautical schools' infrastructure, simulators vary. They include the ship bridge simulator, the cargo handling simulator, the vessel traffic simulator, the dynamic positioning simulator, the global and

¹⁸⁸ Wang, Y. and Gu, P. (2005). Reducing intercultural communication barriers between seafarers with different cultural backgrounds, in: *Proceedings of the International Association of Maritime Universities (IAMU) 6th Annual General Assembly and Conference*, Malmö, Sweden, pp.341-348. Retrieved from http://archive.iamu-edu.org/download/aga-6-proceedings/?wpdmdl=6720&refresh=636d9bcd1aa1c1668127693&ind=1633515078499&filename=40_Reducing%20intercultural%20communication%20barriers%20between%20seafarers%20with%20different%20cultural%20backgrounds.pdf [accessed 10 November 2022].

¹⁸⁹ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*, World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

¹⁹⁰ Great Schools Partnership (2014). Competency-Based Learning. *The Glossary of Education Reform*. Retrieved from: <https://www.edglossary.org/competency-based-learning/> [accessed 25 July 2022].

¹⁹¹ Demirel, E. (2020). Maritime Education and Training in the Digital Era. *Universal Journal of Educational Research*, 8(9), pp.4129-4142. <https://doi.org/10.13189/ujer.2020.080939> [accessed 25 July 2022].

¹⁹² Bhaskaran, B. (2018). Importance of Simulators in Maritime Training. *International Journal of Research and Analytical Reviews* 5(4), pp.6-8. Retrieved from http://ijrar.com/upload_issue/ijrar_issue_20542123.pdf [accessed 07 November 2022].

¹⁹³ The ship bridge simulators can be classified as class A (full mission), class B (multi-task), class C (limited task), and class S (special task) depending on their capabilities.

¹⁹⁴ Renganayagalu, S. K., Mallam, S. and Hernes, M. (2022). Maritime Education and Training in the COVID-19 Era and Beyond. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 16(1), pp.59-69. <http://dx.doi.org/10.12716/1001.16.01.06> [accessed 27 September 2022].

maritime distress safety system simulator, and the search and rescue simulator (Kim et al., 2021)¹⁹⁵. According to Čalić et al. (2022)¹⁹⁶, simulation-based training is a bridge between theory and practice; still, it is not enough.

The latest STCW-2010 Code amendments also allow flag States to use new learning approaches, namely distance learning and e-learning, besides onboard training and assessment, to boost seafarers' competence and knowledge. However, these new approaches are subject to the training and assessment standards set in STCW-2010 Code Section B-1/6 Paragraphs 6, 7, 9, 10 and 11 (International Maritime Organisation, 2017, pp305-306)¹⁹⁷. Furthermore, the 2017 IMO Model Course 6.09 "Training course for Instructors" includes new learning approaches: computer-based training, distance learning/e-learning, blended teaching, and massive open online courses. According to Wai (2021)¹⁹⁸, distance learning and e-learning will enhance seafarers' competencies to improve maritime safety and efficiency while protecting the marine environment. Furthermore, with ships, shipping companies, manufacturers, shipyards, and other players now being connected by information technology, and seafarers being granted the right to mandatory social connectivity, including internet access, for their well-being, within the scope of the updates to the Maritime Labour Convention 2006 (Chambers, 2022)¹⁹⁹, the conditions for online data transfer are present thus enlarging the opportunities for the development of maritime distance learning/e-learning. The Covid-19 pandemic also highlighted how relevant these new training approaches are and why they must be considered in maritime education and training programmes to facilitate seafarers' continuum learning process and acquire and maintain their competency certificates.

From a seafarers' perspective, e-learning has been provided by some private companies; examples are 1) Videotel and Seagull AS (now part of Ocean Technologies Group²⁰⁰), 2) Shipgaz (now part of Seably²⁰¹), and 3) Lloyds Register Training²⁰². However, unlike other economic sectors, e-learning is not so ubiquitous in the maritime sector (Allan, 2013)²⁰³. Allen even claimed that e-learning is slowly entering the maritime sector. Allen justifies this slow entrance speed due to the maritime industry-specific requirements and because some of its skills can only be taught face-to-face. Galić et al. (2020)²⁰⁴ reinforce this delay by stating that the maritime industry is one of the most controlled industries, subject to several international and national complex regulations, guidelines and standards covering the different aspects of ship operations. Moreover, according to The Union of International Associations (2020) cited in Wai (2021)²⁰⁵, most maritime training and education institutions have inadequate facilities to accommodate the new technologies and inappropriate equipment and teaching materials to keep students up to date on the latest knowledge and skills required to operate ships safely, effectively, and reliably. In addition, many seafarers in the maritime industry are from developing countries with low levels of digital literacy and whose maritime training and education institutions lack the capital to carry out the necessary investments to bring them up to date (Galić et al., 2012)²⁰⁶.

¹⁹⁵ Kim, T-e, Sharma, A., Bustgaard, M., Gyldensten, W. C., Nymoen, O. K., Tusher, H. M. and Nazir, S. (2021). The continuum of simulator-based maritime training and education, *WMU Journal of Maritime Affairs*, 20(2), pp.135-150. <https://doi.org/10.1007/s13437-021-00242-2> [accessed 04 September 2022].

¹⁹⁶ Čalić, A., Stazić, L. and Pavlović, I. (2022). Improvement of Student's Engine Room knowledge and operational skills during Simulator training. In: *Proceedings of the 9th International Scientific Conference*. Retrieved from: https://www.bib.irb.hr/1215025/download/1215025.Calic_TIE.pdf [accessed 04 November 2022].

¹⁹⁷ International Maritime Organisation (2017). *STCW Convention and STCW Code 2017 Edition*. International Maritime Organisation: London.

¹⁹⁸ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

¹⁹⁹ Chambers, S. (2022). MLC updates bring internet access for all. *Splash247*, 17 May 2022. Retrieved from: <https://splash247.com/mlc-updates-bring-internet-access-for-all/> [accessed 25 July 2022].

²⁰⁰ See <https://oceanng.com/>

²⁰¹ See <https://www.seably.com/>

²⁰² See <https://www.lr.org/en/training/>

²⁰³ Allan, C., Symes, M. and Downing, J. (2013). Identifying e-learning principles for maritime education through the e-initiatives project: a design-based approach, *30th Ascilite Conference, Macquarie University, Sydney*, pp.1-4. Retrieved from: <https://www.ascilite.org/conferences/sydney13/program/papers/Allan.pdf> [accessed 25 July 2022].

²⁰⁴ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39-50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

²⁰⁵ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

²⁰⁶ Galić, S., Lušić, Z. and Pušić, D. (2012). Seafarers Market. *International Journal of New Trends in Arts, Sports & Science Education*, 1(3), pp.33-39. Retrieved from: <http://www.ijtase.net/index.php/ijtase/article/view/293> [accessed 25 July 2022].

At a moment when technological advancements are occurring in different areas, namely, automation of knowledge work, advanced robotics, autonomous vehicles, artificial intelligence, virtual and augmented reality, the internet of things, cloud and edge computing, 3D printing and additive engineering, blockchain, quantum computing, digital security, and mobile internet, voice assistance, fifth-generation technology (Leonhard, 2015²⁰⁷; Sanchez-Gonzalez et al., 2019²⁰⁸) due to the Fourth Industrial Revolution (i.e., Industry 4.0), more advanced maritime education and training equipment is likely to emerge. Simmons and McLean (2020)²⁰⁹ claim that maritime education and training institutions must deliver education and training programmes offering new skills and continued lifelong learning that can accommodate these technological advancements using non-traditional teaching methods to deliver multi-skilled, flexible, and problem-solving mind seafarers that they defined as “*Industry 4.0 seafarer*”.

Unlike previous industrial revolutions, the Fourth Industrial Revolution requires individuals in general, and seafarers in particular, to hold new skill levels to deal with emerging technologies (Baum-Talmora and Kitada, 2022)²¹⁰. This will ultimately impact all individuals’ career development paths and force maritime education and training institutions to adopt lifelong learning approaches and shipowners into higher investments in education and training that may result in higher seafarers’ retention rates. For many years shipowners used to bear the costs of maritime education and training. However, the 1985 crisis changed this overall picture forcing seafarers to pay for their maritime education and training (including certificates’ renewals) while giving them the liberty to jump from one shipping company to another for payment and career advancement purposes.

In this context, some advancements are already being made. For instance, within the scope of artificial intelligence, Sharma et al. (2022)²¹¹ propose using chatbots to assist maritime students and trainees in learning about collision avoidance regulations. Furthermore, simulators based on virtual reality and augmented reality and game-based learning with simulation are expected to be used in maritime education and training (Markopoulos and Luimula, 2020)²¹² despite their limitations (Mallam et al., 2019)²¹³. They are cost-effective and offer a realistic experience of the working environment allowing students to participate in immersive learning environments. Virtual reality in maritime education and training on board and ashore appears to be very promising, particularly in diverse maritime safety training areas, including extreme situations such as firefighting (Markopoulos and Luimula, 2020²¹⁴; Makransky and Klingenberg, 2022²¹⁵; Braun et al., 2022²¹⁶). According to these authors, virtual reality offers no limitations in designing and learning content and allows creating comprehensive training scenarios, including hazardous environments with minimal risk that are difficult and expensive or impossible to reproduce in the real world.

²⁰⁷ Leonhard, G. (2015). The digital transformation of business and society, and its impact on the shipping, ports and maritime industries by 2030. In: *29th World Port Conference 2015*, Hamburg. Retrieved from: <https://www.transnetnationalportsauthority.net/Media%20Room/Documents/Gerd%20Leonhard-%20The%20digital%20transformation%20of%20business%20and%20society.pdf> [accessed 25 July 2022].

²⁰⁸ Sanchez-Gonzalez, P.-L., Díaz-Gutiérrez, D., Leo, T., and Núñez-Rivas, L. (2019). Toward Digitalization of Maritime Transport? *Sensors*, 19(4), pp.926-947. <https://doi.org/10.3390/s19040926> [accessed 25 July 2022].

²⁰⁹ Simmons, E. and McLean, G. (2020). Understanding the paradigm shift in maritime education: The role of 4th Industrial Revolution technologies: an industry perspective. *Worldwide Hospitality and Tourism Themes*, 12(1), pp.90-97. <https://doi.org/10.1108/WHATT-10-2019-0062> [accessed 26 September 2022].

²¹⁰ Baum-Talmora, P. and Kitada, M. (2022). Industry 4.0 in shipping: Implications to seafarers' skills and training. *Transportation Research Interdisciplinary Perspectives*, 13, Article ID: 100542. <https://doi.org/10.1016/j.trip.2022.100542> [accessed 26 September 2022].

²¹¹ Sharma, A. Undheim, P. E. and Nazir, S. (2022). Design and implementation of AI chatbot for COLREGs training. *WMU Journal of Maritime Affairs*. <https://doi.org/10.1007/s13437-022-00284-0> [accessed 05 September 2022].

²¹² Markopoulos, E. and Luimula, M. (2020). Immersive Safe Oceans Technology: Developing Virtual Onboard Training Episodes for Maritime Safety, *Future Internet*, 12(5), pp.80-91. <https://doi.org/10.3390/fi12050080> [accessed 05 September 2022].

²¹³ Mallam, S. C., Nazir S. and Renganayagalu, S. K. (2019). Rethinking maritime education, training, and operations in the digital era: applications for emerging immersive technologies. *Journal of Marine Science and Engineering*, 7(12), Article ID: 428. <https://doi.org/10.3390/jmse7120428> [accessed 05 September 2022].

²¹⁴ Markopoulos, E. and Luimula, M. (2020). Immersive Safe Oceans Technology: Developing Virtual Onboard Training Episodes for Maritime Safety, *Future Internet*, 12(5), pp.80-91. <https://doi.org/10.3390/fi12050080> [accessed 05 September 2022].

²¹⁵ Makransky, G. and Klingenberg, S. (2022). Virtual reality enhances safety training in the maritime industry: An organizational training experiment with a non-WEIRD sample. *Journal of Computer Assisted Learning*, 38(4), pp.1127-1140. <https://doi.org/10.1111/jcal.12670> [accessed 04 November 2022].

²¹⁶ Braun, P., Grafelmann, M., Gill, F., Stolz, H., Hinckeldeyn, J. and Lange, A.-K. (2022). Virtual reality for immersive multi-user firefighter-training scenarios, *Virtual Reality & Intelligent Hardware*, 4(5), pp.406–417. <https://doi.org/10.1016/j.vrih.2022.08.006> [accessed 05 November 2022].

Makransky and Klingenberg (2022)²¹⁷, when conducting a pilot study, demonstrated that while virtual reality allows training students in maritime procedures, such as a mooring operation, it also offers a highly engaging environment as it offers a high level of psychological presence. The other possibility includes cloud-based simulation, in which educators and students run their simulation exercises using web browsers. Such technological advancements were considered by Renganayagalu et al. (2022)²¹⁸ when claiming that emerging technologies such as virtual reality and web-based training simulators are expected to play an important role in future maritime education and training. Still, the implementation of these technologies is lagging in the maritime sector; the industry has not widely accepted them, despite the COVID-19 pandemic; according to Markopoulos et al. (2002)²¹⁹, industry stakeholders such as classification and certification societies have not been ready to follow this technological change.

These education market segments are so important that Allied Market Research (2020)²²⁰ valued the world virtual training and simulation market in 2019 at US\$204.41 billion and expects it to reach US\$601.85 billion by 2027, at a compound annual growth rate of 13.7% from 2020 to 2027. Therefore, upgrading maritime training and education institutions' facilities is a primary condition if they intend to offer seafarers a lifelong learning approach (Wai, 2021)²²¹ since all the elements mentioned above are directly related to the maritime industry, and all are applicable on board. Moreover, incorporating new technologies reduces training costs, as Freifeld (2021)²²² demonstrated. Although the total training expenditures, in 2021, in the United States increased to US\$92.3 billion relative to 2020, which accounted US\$82.5 billion, training expenditures in travel, facilities and equipment decreased from US\$29.4 billion (in 2020) to US\$15.5 billion (in 2021). These are promising figures when considering the continuous training programmes that seafarers must accomplish to maintain their certificates.

In what concerns distance learning maritime business-oriented courses, the situation is not so critical, still not as advanced as in some training sectors such as economics, management, marketing, and logistics. For instance, no maritime business-oriented courses can be found on Coursera, edX, Udemy, Khan Academy, Future Learn, MIT Open Courseware, or other well-known education platforms. The massive open online courses concept is yet to be implemented, and the industry is yet to benefit from their added value. As non-credit courses, massive open online courses allow students to create a preliminary knowledge base or deepen specific topics (Sandeen, 2013)²²³. Furthermore, until recently, only a few specialised companies provided such training. The main educational institutions providing maritime business e-learning are 1) Lloyd's Maritime Academy²²⁴, 2) Lloyd's Register Training, 3) CoracleOnline (now under Marine Society)²²⁵, 4) the Institute of Chartered Shipbrokers (ICS Online Academy)²²⁶, 5) the Baltic and International Maritime Council²²⁷, and 6) universities such as the World Maritime University and the Texas A&M University.

However, this market is becoming appealing due to the increased number of online maritime training programmes and players entering it, and a revolution is taking place. Small-medium organisations are

²¹⁷ Makransky, G. and Klingenberg, S. (2022). Virtual reality enhances safety training in the maritime industry: An organizational training experiment with a non-WEIRD sample. *Journal of Computer Assisted Learning*, 38(4), pp.1127-1140. <https://doi.org/10.1111/jcal.12670> [accessed 04 November 2022].

²¹⁸ Renganayagalu S. K., Mallam, S. and Hernes, M. (2022). Maritime Education and Training in the COVID-19 Era and Beyond. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 16(1), pp.59-69. <http://dx.doi.org/10.12716/1001.16.01.06> [accessed 27 September 2022].

²¹⁹ Markopoulos, E., Nordholm, A., Iliadi, S., Markopoulos, P., Faraclas, J. and Luimula, M. (2022). A Certification Framework for Virtual Reality and Metaverse Training Scenarios in the Maritime and Shipping industry. In: *Evangelos Markopoulos, Ravindra S. Goonetilleke and Yan Luximon (eds) Creativity, Innovation and Entrepreneurship. AHFE (2022) International Conference*, 31. AHFE International, United States. <https://doi.org/10.54941/ahfe1001505> [accessed 08 November 2022].

²²⁰ Allied Market Research (2020). Virtual Training and Simulation Market Insights – 2027. Allied Market Research. Retrieved from <https://www.alliedmarketresearch.com/virtual-training-and-simulation-market> [accessed 05 September 2022].

²²¹ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*, World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

²²² Freifeld, L. (2021). Training Industry Report, *Training*, November, pp.18-33. <https://cdn.coverstand.com/20617/727569/f1436333509017ba66e760da0e66e114ebbd349.4.pdf> [accessed 04 November 2022].

²²³ Sandeen, C. (2013). Integrating MOOCs into traditional higher education: The emerging "MOOC 3.0" era. *Change: The Magazine of Higher Learning*, 45(6), pp.34-39. <https://doi.org/10.1080/00091383.2013.842103> [accessed 08 November 2022].

²²⁴ See <https://informaconnect.com/lloyds-maritime-academy/>

²²⁵ See https://marsocshop.mycoracle.com/catalogue/category/learnsea-for-individuals-new_8/

²²⁶ See <https://icsonline.academy/>

²²⁷ See <https://www.bimco.org/training/types-of-training>

emerging and offering training programmes; this is the case with the Maritime Training Academy²²⁸ and World Maritime Academy²²⁹. Other disparate players, such as MareForum, are also entering the online education and training market by establishing strategic partnerships, in this case, with the Business College of Athens. At a European Union level, funding has been given to developing online maritime education and training under Erasmus+ and European Maritime and Fisheries Fund, and some projects are currently underway.

While competition is good for keeping educational and training quality, it is unsure whether this proliferation of maritime education and training contributes to it or not. High-quality e-learning education and training can be very expensive and complex (Morris et al., 2020)²³⁰. Therefore, how the market will react to these multiple offers depends on the quality of the training programmes. Furthermore, the extent to which the existing training providers can create barriers preventing the emergence of new training institutions determines how the market evolves. For instance, keeping the most recognised trainers provides them with a competitive edge; however, this has a cost.

Nevertheless, this per se is not sufficient as the new generations are more informed and dependent on technology. This constant renovation and adaptability of the courses, which may integrate serious gaming to make a clear market differentiation, is an appealing option for future consideration. In this regard, Romero et al. (2015)²³¹ claim that serious games can be considered one of the tools to develop new skills for the 21st century, even though the current serious games have not been primarily created to develop them. Furthermore, according to Romero et al. (2015)²³², not all serious games can develop the same new skills (for instance, communication, collaboration, information, and communication technology literacy, and social and/or cultural skills); depending on the game characteristics, some games are better than others to develop collaboration, competition, strategy, and tactical support. Subject to this, and in the long run, market satisfaction will remove those maritime education and training providers that cannot meet the expected quality and satisfaction. The relationship between course fees and course expectations will determine the removal of inadequate market offers. Dumping strategies in a maritime education and training context will only contribute to accelerating their market exit.

3. LITERATURE REVIEW

The body of literature dealing with maritime education and training is vast. Throughout the years, the research community has been addressing maritime education and training from broad (Manuel, 2017²³³; Saeed et al. 2017²³⁴), regional/country (Rosenstein et al. (1978)²³⁵; Gold (1990)²³⁶; Hull, 2011²³⁷; Ruggunan, 2016²³⁸;

²²⁸ See <https://maritimetrainingacademy.com/>

²²⁹ See <https://e-wma.com/>

²³⁰ Morris, N. P., Ivancheva, M., Coop, T., Mogliacci, R. and Swinnerton, B. (2020). Negotiating growth of online education in higher education. *International Journal of Educational Technology in Higher Education*, 17, Article ID:48. <https://doi.org/10.1186/s41239-020-00227-w> [accessed 26 September 2022].

²³¹ Romero, M., Usart, M., and Ott, M. (2015). Can Serious Games Contribute to Developing and Sustaining 21st Century Skills? *Games and Culture*, 10(2), pp.148-177. <https://doi.org/10.1177/1555412014548919> [accessed 07 November 2022].

²³² Romero, M., Usart, M., and Ott, M. (2015). Can Serious Games Contribute to Developing and Sustaining 21st Century Skills? *Games and Culture*, 10(2), pp.148-177. <https://doi.org/10.1177/1555412014548919> [accessed 07 November 2022].

²³³ Manuel, M. E. (2017). Vocational and academic approaches to maritime education and training (MET): Trends, challenges and opportunities. *WMU Journal of Maritime Affairs*, 16(3), pp.473-483. <https://doi.org/10.1007/s13437-017-0130-3> [accessed 26 September 2022].

²³⁴ Saeed, F., Wall, A., Roberts, C., Riahi, R. and Bury, A. (2017). A proposed quantitative methodology for the evaluation of the effectiveness of Human Element, Leadership and Management (HELM) training in the UK. *WMU Journal of Maritime Affairs*, 16(1), pp.115-138. <https://doi.org/10.1007/s13437-016-0107-7> [accessed 26 September 2022].

²³⁵ Rosenstein, E., Manneheim, B. and Nutes-Kinberg, S. (1978). Nautical training systems and the occupational behaviour of seamen: the Israeli experience. *Maritime Policy & Management*, 58(1), pp.5-18. <https://doi.org/10.1080/03088837800000002> [accessed 08 November 2022].

²³⁶ Gold, E. (1990). Canadian marine training: time to change course? A comparative comment. *Maritime Policy & Management*, 17(3), pp.177-188 <https://doi.org/10.1080/03088839000000025> [accessed 08 November 2022].

²³⁷ Hull, D. (2011). A Targeted National Maritime Training Strategy (January 1, 2011). UNSW Australian School of Business Research Paper No. 2011-IRRC-03, *University of New South Wales*, Sydney. <https://dx.doi.org/10.2139/ssrn.1786003> [accessed 07 November 2022].

²³⁸ Ruggunan, S. (2016) An exploratory study of the training of South African officers in the merchant navy. *Maritime Policy & Management*, 43(3), pp.309-328. <https://doi.org/10.1080/03088839.2015.1040861> [accessed 08 November 2022].

Kiplimo and Ikuu, 2017²³⁹; Castells et al., 2017²⁴⁰; de Geus-Moussault et al., 2022²⁴¹) and gender (Azirh, 2016)²⁴² perspectives without losing focus on maritime education and training peculiarities. From a narrow perspective, the research community has addressed different education and training areas, such as navigation and seamanship, including bridge and engine resource management (Yang et al., 2020²⁴³; Fjeld and Tvedt, 2020²⁴⁴; Röttger et al., 2016²⁴⁵), manoeuvrability/ship-handling including anchoring (Geng et al., 2021²⁴⁶; Kunieda et al., 2022²⁴⁷) ‘Maritime English’ (Ahmed, 2021²⁴⁸; Fan et al., 2017²⁴⁹; Tenieshvili, 2021²⁵⁰; Jeon et al., 2022²⁵¹), liquified natural gas operations (Tokić et al., 2021)²⁵², seaports (Paixão Casaca, 2006²⁵³; Martin et al., 2011²⁵⁴; Urciuoli, 2016²⁵⁵); cruise industry (Wang and Wei, 2020)²⁵⁶, ship recycling (Gunbeyaz et al.,

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- ²³⁹ Kiplimo, R. and Ikuu, B. W. (2017). Maritime Education Training in East Africa Region: Current Status. *Procedia Engineering*, 194, pp.351-355. <https://doi.org/10.1016/j.proeng.2017.08.156> [accessed 06 November 2022].
- ²⁴⁰ Castells, M., Osés, F. X. M., Lapa, K. and Nikolić, D. (2017). A Proposal to Modernize and Harmonize Maritime Curricula in Montenegro and Albania. *NAŠE MORE: znanstveni časopis za more i pomorstvo*, 64(1), pp.14-19. <https://doi.org/10.17818/NM/2017/1.3> [accessed 06 November 2022].
- ²⁴¹ de Geus-Moussault, S., Kooij, C. and Koelman, H. (2022). Innovative Maritime Design Education at NHL Stenden University of Applied Sciences. In: *Proceedings of the SNAME 14th International Marine Design Conference*, Vancouver, Canada, 26-30 June. <https://doi.org/10.5957/IMDC-2022-260> [accessed 06 November 2022].
- ²⁴² Azirh, N. T. (2016). Roles of Maritime Education and Training (MET) Institutions – How Can They Support Women Seafarers in West Africa? *Research Journal of Social Science and Management*, 5(12), pp.52-63.
- ²⁴³ Yang, S., Xinya, P. and Zexuan, D. (2020). Maritime Education Training Assessment Based Electronic Chart Display and Information System. *Advances in Applied Sciences*, 5(2), pp.28-34. <https://doi.org/10.11648/j.aas.20200502.12> [accessed 04 September 2022].
- ²⁴⁴ Fjeld, G. P. and Tvedt, S. D. (2020). How do BRM-training participants understand non-technical skills? *WMU Journal of Maritime Affairs*, 19(2), pp.235–269. <https://doi.org/10.1007/s13437-020-00198-9> [accessed 26 September 2022].
- ²⁴⁵ Röttger, S., Vetter, S. and Kowalski, J. T. (2016). Effects of a classroom-based bridge resource management training on knowledge, attitudes, behaviour and performance of junior naval officers. *WMU Journal of Maritime Affairs*, 15(1), pp.143–162. <https://doi.org/10.1007/s13437-014-0073-x> [accessed 26 September 2022].
- ²⁴⁶ Geng, H., Wang, B., Wang, D. and Jiang, X. (2021). Simulated Training System of Ship Anchoring Operation Based on Virtual Reality. *International Journal of Transportation Engineering and Technology*, 7(1), pp.12-18. <http://dx.doi.org/10.11648/j.ijtet.20210701.12> [accessed 05 September 2022].
- ²⁴⁷ Kunieda, Y., Dee, S., Hosomi, T. and Kashima, H. (2022). Effects of Introducing Ship Handling Training for Collision Avoidance in Anchoring Training - Effects of Ship Handling Training for Collision Avoidance by Group Work, *Journal of Traffic and Transportation Engineering*, 10(1), pp.1-9. <http://dx.doi.org/10.17265/2328-2142/2022.01.001> [accessed 07 June 2022].
- ²⁴⁸ Ahmed, R. (2021). A framework for Maritime English language planning in Bangladeshi maritime education and training institutes. *SN Social Sciences*, 1, Article ID 168. <https://doi.org/10.1007/s43545-021-00188-5> [accessed 17 October 2022].
- ²⁴⁹ Fan, L., Fei, J., Ulf, S. and Fan, S. (2017). A critical examination of the seafaring English education and training in China. *Marine Policy*, 86, pp.56-63. <https://doi.org/10.1016/j.marpol.2017.09.013> [accessed 07 November 2022].
- ²⁵⁰ Tenieshvili, A. (2021). Role of General English and Maritime English in Raising Cultural Awareness in the Students of Maritime Education and Training Institutions. *Language Education & Technology (LET Journal)*, 1(1), pp.29-39.
- ²⁵¹ Jeon, T.-Y., Kim, B.-G., Kim, N. and Lee, Y.-C. (2022). Have Non-Native English-Speaking Marine Cadet Engineers Been Educated Appropriately? *Journal of Maritime Science and Engineering*, 10(8), Article ID: 1018. <https://doi.org/10.3390/jmse10081018> [accessed 06 November 2022].
- ²⁵² Tokić, T., Frančić, V., Hasanspahić, N. and Rudan, I. (2021). Training Requirements for LNG Ship-to-Ship Transfer. *Pomorski zbornik*, 60(1), pp.49-63. <https://doi.org/10.18048/2021.60.03> [accessed 28 September 2022].
- ²⁵³ Paixão Casaca, A. C. (2006). Insights into the port training of the new European Union Member-States. *Maritime Policy and Management*, 33(3), pp.203-217. <https://doi.org/10.1080/03088830600783129> [accessed 06 November 2022].
- ²⁵⁴ Martin, J., Bang, H. S and Marintin, S. (2011). The Development of Generic Training Material for Port workers in the Dry Bulk Sector: Terminal Structures and Employment Arrangements, *The Asian Journal of Shipping and Logistics*, 27(1), pp.031-060. [https://doi.org/10.1016/S2092-5212\(11\)80002-7](https://doi.org/10.1016/S2092-5212(11)80002-7) [accessed 04 September 2022].
- ²⁵⁵ Urciuoli, L. (2016) Port security training and education in Europe—a framework and a roadmap to harmonization, *Maritime Policy & Management*, 43(5), pp.580-596. <https://doi.org/10.1080/03088839.2015.1134830> [accessed 06 November 2022].
- ²⁵⁶ Wang, H. and Wei, A.-M. (2020). Talent demand and training strategy of oceangoing cruise company based on customized talent development model. *Journal of Coastal Research*, 106 (SI), pp.233–236. <https://doi.org/10.2112/SI106-055.1> [accessed 06 November 2022].

2019)²⁵⁷, maritime autonomous surface ships (Kunieda et al., 2020²⁵⁸; Bogusławski et al., 2022²⁵⁹), cybersecurity (Stoker et al., 2022)²⁶⁰ and digitalization (Nasaruddin and Emad, 2019²⁶¹; Demirel, 2020²⁶²; Vidal-Balea et al., 2020²⁶³; Scanlan et al., 2021)²⁶⁴. Research addressing simulator-based education and training has also been the research community's focus (Kim et al., 2021²⁶⁵; Ahvenjärvi et al., 2021²⁶⁶; Sellberg et al., 2021²⁶⁷). More recently, the emergence of the metaverse, a collective and virtual shared space combining different technologies such as virtual reality, augmented reality, and the internet, within the scope of maritime training has also drawn the attention of the research community (Luimula et al., 2022)²⁶⁸.

However, studies addressing maritime distance education and training in general, and e-learning are still limited. Masuku (2020)²⁶⁹ acknowledges that limited research has investigated the applicability of blended learning to maritime education and training. Moreover, the continuous interchangeable use of 'e-learning', 'virtual learning', 'network learning', 'online learning', 'multimedia-based learning', 'web-based learning', 'internet-enabled learning', and similar terms prevents having a good insight into the actual studies being performed. Nevertheless, the body of the literature revealed the presence of at least 28 research papers and theses addressing maritime e-learning education and training. An insight into them also revealed that maritime e-learning education and training research had been carried out from four perspectives: generic, subject, technological, and country perspectives. Moreover, three papers covering maritime e-learning education and training during the pandemic were identified. The sub-sections that follow review the existing literature.

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- ²⁵⁷ Gunbeyaz, S. A., Kurt, R. E. and Baumler, R. (2019). A study on evaluating the status of current occupational training in the ship recycling industry in Bangladesh. *WMU Journal of Maritime Affairs*, 18(1), pp.41–59. <https://doi.org/10.1007/s13437-019-00164-0> [accessed 26 September 2022].
- ²⁵⁸ Kunieda, Y., Shimada, A., Kashima, H. and Murai, K. (2020). Education and Training to the Mariner of the Maritime Autonomous Surface Ships (MASS) Era. *Journal of Modern Education Review*, 10(6), pp.365–373. [https://doi.org/10.15341/jmer\(2155-7993\)/06.10.2020/001](https://doi.org/10.15341/jmer(2155-7993)/06.10.2020/001) [accessed 06 November 2022].
- ²⁵⁹ Bogusławski, K., Gil, M., Nasur, J. and Wróbel, K. (2022). Implications of autonomous shipping for maritime education and training: the cadet's perspective. *Maritime Economics & Logistics*, 24(2), pp.327–343. <https://doi.org/10.1057/s41278-022-00217-x> [accessed 08 November 2022].
- ²⁶⁰ Stoker, G., Greer, J., Clark, U., School, C. and Chiego, C. (2022). Considering Maritime Cybersecurity at a Non-Maritime Education and Training Institution. In: *2022 Proceedings of the EDSIG Conference*, 2-5 November, Clearwater, Florida. Retrieved from: <https://proc.iscap.info/2022/pdf/5775.pdf> [accessed 07 November 2022].
- ²⁶¹ Nasaruddin, M. M. and Emad, G. R. (2019). Preparing maritime professionals for their future roles in a digitalized era: Bridging the blockchain skills gap in maritime education and training. In: *Proceedings of the 2019 Annual General Assembly of the International Association of Maritime Universities*, 30 October - 1 November, Tokyo, Japan. Retrieved from http://iamu-edu.org/wp-content/uploads/2019/11/IAMUC2019_Proceedings-1.pdf [accessed 07 November 2022].
- ²⁶² Demirel, E. (2020). Maritime Education and Training in the Digital Era. *Universal Journal of Educational Research*, 8(9), pp.4129-4142. <https://doi.org/10.13189/ujer.2020.080939> [accessed 25 July 2022].
- ²⁶³ Vidal-Balea, A., Blanco-Novoa, O., Fraga-Lamas, P., Vilar-Montesinos, M. and Fernández-Caramés, T. M. (2020). A Collaborative Augmented Reality Application for Training and Assistance during Shipbuilding Assembly Processes. *Proceedings*, 54(1):4. <https://doi.org/10.3390/proceedings2020054004> [accessed 06 November 2022].
- ²⁶⁴ Scanlan, J., Hopcraft, R., Cowburn, R., Trøvåg, J. M. and Lützhöft, M. (2022). Maritime Education for a Digital Industry. *NECESSE. Royal Norwegian Naval Academy. Monographic Series*, 7(1), pp.23-33. Retrieved from: <https://fhs.brage.unit.no/fhs-xmlui/bitstream/handle/11250/3001473/Neccesse%20VOL%207%20Issue%201.pdf?sequence=1> [accessed 06 November 2022].
- ²⁶⁵ Kim, T-e, Sharma, A., Bustgaard, M., Gyldensten, W. C., Nymoen, O. K., Tusher, H. M. and Nazir, S. (2021). The continuum of simulator-based maritime training and education. *WMU Journal of Maritime Affairs*, 20(2), pp.135-150. <https://doi.org/10.1007/s13437-021-00242-2> [accessed 04 September 2022].
- ²⁶⁶ Ahvenjärvi S., Lahtinen J., Löytökorpi M., Marva M. M. (2021). ISTLAB – New Way of Utilizing a Simulator System in Testing & Demonstration of Intelligent Shipping Technology and Training of Future Maritime Professionals. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 15(3), pp.569-574. <http://dx.doi.org/10.12716/1001.15.03.09> [accessed 17 October 2022].
- ²⁶⁷ Sellberg, C., Lindwall, O. and Rystedt, R. (2021). The demonstration of reflection-in-action in maritime training. *Reflective Practice*, 22(3), pp.319-330. <https://doi.org/10.1080/14623943.2021.1879771> [accessed 07 November 2022].
- ²⁶⁸ Luimula, M., Haavisto, T., Pham, D., Markopoulos, P., Aho, J., Markopoulos, E. and Saarinen, J. (2022). The use of metaverse in maritime sector – a combination of social communication, hands on experiencing and digital twins. In: *Evangelos Markopoulos, Ravindra S. Goonetilleke and Yan Luximon (eds) Creativity, Innovation and Entrepreneurship. AHFE (2022) International Conference. AHFE Open Access*, 31. AHFE International, USA. <http://doi.org/10.54941/ahfe1001513> [accessed 17 October 2022].
- ²⁶⁹ Masuku, M. B. (2020). *Enhancing maritime education through online distance learning in developing environments*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1448/ [accessed 25 July 2022].

3.1. Maritime Distance Education and Training from a Generic Perspective

Some authors have addressed maritime distance education and training from a generic perspective to demonstrate the added value of this alternative education and training method. Within this scope, 11 papers have been identified.

Swapp (2001)²⁷⁰ presents an overview of the available technologies that can be used in distance learning and focuses on the extent to which offering STCW courses distance (including online) learning are cost-effective and guarantee the same quality assurance expected in a classroom environment. In addition, the study provides a cost analysis for hosts and users. Finally, it indicates the need to choose suitable media, technology and approach and that maritime education and training institutions must be prepared to overcome challenges such as quality standards systems, costs, and the acceptance of online distance STCW courses.

Schinas and Thalassinou (2003)²⁷¹ present the outcome of two projects, EQUADIL and TRIAINA. EQUADIL delivered computer-based training in a shipbuilding and heavy industry context. The project showed that participants getting involved in the ‘Programmable Logic Controllers’ and the ‘Hygiene and Safety at Workplace’ course encountered difficulties due to the lack of computer skills despite enhancing their educational capabilities. TRIAINA aimed to create a virtual education professional centre for training newcomers to the maritime industry. The project comprised three modules on information technology, management, and environmental issues within the scope of the maritime industry, which were developed using different approaches according to their objectives. The outcome highlighted 1) a shift from the traditional training approach forcing students to create knowledge from the data and information gathered, 2) the need to create courses that meet the existing academic diversity and educational approaches, and 3) the importance of e-learning in the maritime industry. Finally, the paper contextualises the role of education and training within the maritime industry. In doing so, the paper highlights the labour requests of shipping and related companies and the dangers that result from language barriers and educational gaps.

Also, within the scope of computer-based training, Ellis et al. (2005)²⁷² investigated seafarers’ perceptions and attitudes towards computer-based training on board ships. The authors acknowledged that younger seafarers are prone to use computers more efficiently despite the general positive overview of the benefits that computer-based training offers.

Bauk and Radlinger (2013)²⁷³ addressed the introduction of a web-based e-learning study program at the Faculty of Maritime Studies of Kotor to meet the needs of prospective and existing seafarers with the support of three projects covering distance learning, e-learning methods and tools and implementation via Moodle platform. Moreover, through a survey questionnaire, they examined students’ perceptions of the advantages and disadvantages of the web-based e-learning study program.

Haynan (2016)²⁷⁴ envisages blended learning in a maritime education and training context. He considers the successful application of blended learning in elementary and middle schools and, based on their outcome, establishes a set of assumptions about why blended learning is also applicable in maritime education and training. Haynan (2016)²⁷⁵ also claims that it is not enough to rely on e-learning only since those courses cannot be the primary teaching tool; instead, blended courses must be used to enhance students’ understanding of specific knowledge.

²⁷⁰ Swapp, E. D C. (2001). *Approaches to Distance Learning: An Evaluation of Current Methodologies, Technologies and Operational Costs as an Alternate Means of Course Delivery for Developing Country Academies*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/286/ [accessed 25 July 2022].

²⁷¹ Schinas, O. and Thalassinou, E. (2003). Adjusting Basic Maritime Training in an E-Learning Environment. *European Research Studies*, 6(3–4), pp.237–256. Retrieved from: <https://www.ersj.eu/journal/112> [accessed 25 July 2022].

²⁷² Ellis, N., Sampson, H., Aguado, J. C., Baylon, A., Del Rosario, L., Lim, Y.F. and Veiga, J. (2005). *What Seafarers think of CBT*. Seafarers International Research Centre: Cardiff. Retrieved from <https://www.sirc.cf.ac.uk/Uploads/In%20House/CBT%20Report.pdf> [accessed 04 September 2022].

²⁷³ Bauk, S. and Radlinger, R. (2013). Concerning Web-based e-learning at a Maritime Higher Education Institution: Case Study. *Transactions on Maritime Science*, 2(2), pp.115-122. <https://doi.org/10.7225/toms.v02.n02.004> [accessed 22 September 2022].

²⁷⁴ Haiyan, Y. (2016). Blended Learning Will Be Applicable in Maritime Education and Training. *Journal of Shipping and Ocean Engineering*, 6(1), pp.31-34. <https://doi.org/10.17265/2159-5879/2016.01.004> [accessed 25 July 2022].

²⁷⁵ Haiyan, Y. (2016). Blended Learning Will Be Applicable in Maritime Education and Training. *Journal of Shipping and Ocean Engineering*, 6(1), pp.31-34. <https://doi.org/10.17265/2159-5879/2016.01.004> [accessed 25 July 2022].

Bhardwaj (2019)²⁷⁶ refers to digitalisation in education and claims that digital training solutions encompass a wider choice of training techniques than the ones used in e-learning. Moreover, he considers that changes in training and assessment methodologies must be well thought out because shipping, a high-risk workplace with high safety levels, requires seafarers to have balanced cognitive, affective, and psychomotor skills. Therefore, using digitalisation in maritime education can be problematic and must be considered carefully when applied in the domain of shipping operations as they are safety-critical, skills and competency-based.

Alop (2019)²⁷⁷ considers the situation of maritime education and training given the transformation that digitalisation is expected to make in the shipping industry in the coming years. Like in the past, maritime education and training need to adapt to the innovations and challenges that digitalisation as part of the fourth industrial revolution is promoting; however, the level of adaptation needs to be faster than before. Speed, scope, and systemic impact differentiate the fourth industrial revolution from the previous three because the fourth industrial revolution is developing exponentially rather than linearly. Therefore, questions such as what and how to teach?, and who the teachers are?, become critical since smart shipping development will require investments in education and new skills to deal with the new technologies.

Demirel (2020)²⁷⁸ discusses how to improve education systems to prepare the future young seafaring officers and benefit from digitalisation to appreciate our teaching and learning activities. Using qualitative research data in the content analysis, the study 1) wants to understand the impact of technological development on the maritime sector, 2) evaluates new knowledge, skills, and competency requirements for seafaring office, 3) analyses the reflection of existing and future requirements for an academic program and 4) revises MET academic programmes without overloading class hours (the courses to be added, deleted or reshaped).

Galić et al. (2020)²⁷⁹ analyse learning methodologies, namely computer-mediated communication, constructive learning, collaborative learning available to distance learning, highlights the potential growth of the e-learning industry, and identify the learning market segments by learning mode (Self-paced learning vs Instructor-led training), by function (training vs testing segments), and by end-user type, (primary school, secondary school university, corporate, government and vocational segments). Moreover, the paper analysis the existing e-learning and the future trends in the maritime industry, drawing attention to the use of computer-aided games and simulations using virtual reality and augmented reality technologies. It concludes that e-learning cannot fully replace traditional seafarers' education and training forms, which is aligned with Haynan (2016)²⁸⁰ assumptions. Moreover, there are some barriers related to the introduction of e-learning in the maritime industry to overcome the shortage of qualified training personnel and safe jobs for instructors, financial restrictions, fast digitisation, and rapid development of technologies in the maritime industry, but also the attractiveness of seafaring jobs for future generations.

Wai (2021)²⁸¹ addresses blended learning, its advantages, disadvantages, and best practices to identify the blended learning modality that suits maritime training institutions and how it can be implemented and optimised. In order to achieve this, this research uses a mixed research approach; it reviews the body of the literature and performs eight online semi-structured interviews with instructors located in six different countries. The author indicates blended learning within a maritime education and training context includes face-to-face, simulator-based, practical, and online learning. Maritime education and training institutions are slowly adopting blended learning even though the COVID-19 Pandemic accelerated its introduction. Moreover, some instructors prefer a mix of online learning for theoretical concepts and face-to-face practical sessions. Other concerns relative to blended learning include the initial cost, time zone difference between

²⁷⁶ Bhardwaj, S. (2019). Digitalization of maritime education and training. *IIRE Journal of Maritime Research & Development*, 3(2), pp.55-61. Retrieved from: https://www.imrc2022.com/files/ugd/724c33_7ddb523260274461abb49a029826e92b.pdf

²⁷⁷ Alop, A. (2019). The Challenges of the Digital Technology Era for Maritime Education and Training. *2019 European Navigation Conference (ENC) 2019*, pp.1-5, Retrieved from: <https://ieeexplore.ieee.org/document/8714176> [accessed 25 July 2022].

²⁷⁸ Demirel, E. (2020). Maritime Education and Training in the Digital Era. *Universal Journal of Educational Research*, 8(9), pp.4129-4142. <https://doi.org/10.13189/ujer.2020.080939> [accessed 25 July 2022].

²⁷⁹ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39-50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

²⁸⁰ Haiyan, Y. (2016). Blended Learning Will Be Applicable in Maritime Education and Training. *Journal of Shipping and Ocean Engineering*, 6(1), pp.31-34. <https://doi.org/10.17265/2159-5879/2016.01.004> [accessed 25 July 2022].

²⁸¹ Wai, H. O. (2021). *Examining the use of blended learning in maritime education and training*, World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1697/ [accessed 25 July 2022].

lecturers and students, lack of clear legal basis, e.g., guidelines, lack of teacher training, cheating at online examinations, poor digital literacy, and technical infrastructure such as poor internet connection.

Zhang et al. (2021)²⁸² proposed the development of a training platform for shipping compound talents, which they describe as interdisciplinary, multi-level professionals having knowledge background or work experience. The platform rests on developing three training bases, namely a college-enterprise cooperation talent training base, an enterprise-set training base, and an open training base for industries, supported by two resource databases targeting experts and a course resource library.

3.2. Maritime Distance Education and Training from a Subject Perspective

Other authors addressed maritime distance education and training from a subject perspective. In this regard, most focus has been given to the teaching of ‘*Maritime English*’. In generic terms, the body of literature highlights that there has been an attempt to use e-learning to improve ‘*Maritime English*’ knowledge that seafarers must have to perform the different tasks, whether onboard or ashore. However, despite their focus on language acquisition, the authors also bring different pedagogical approaches and available technologies into the research. The focus on the English language rests on the importance it has to the maritime industry; Shipping needs ship officers with adequate knowledge of the English language to perform their duties in a multilingual crew, enabling them to use the available nautical publications, including nautical charts, understand meteorological information and messages covering ships’ safety and operations, communicate with other ships, coast stations, and vessel traffic systems centres, and carry out cargo operations when in port among many other tasks performed by crews (Jeon, 2022)²⁸³

Moreover, Safety of Life at Sea Convention Chapter V, regulation 14 on Ship’s Manning, Paragraph 4 determines that “*English shall be used on the bridge as the working language for bridge-to-bridge and bridge-to-shore safety communications as well as for communications on board between the pilot and bridge watchkeeping personnel unless those directly involved in the communication speak a common language other than English*” (International Maritime Organisation, 2014)²⁸⁴. Still, from a labour market perspective, the more English employees know and speak, the more desirable they become in the labour market. Wang and Wei (2022)²⁸⁵ claim that ship owners prefer to contract Indian and Filipino crews rather than Chinese because of their ability to speak the language. Five papers were identified within the scope of distance learning from a subject perspective; they demonstrate the effectiveness of blended learning when teaching ‘*Maritime English*’.

Cui (2010)²⁸⁶ investigated the state of the art of ‘*Maritime English*’ teaching and the impact of modern educational technology on ‘*Maritime English*’ teaching and proposed a more suitable English teaching model for training seafarers in China. Although the author acknowledged that progress has been made in ‘*Maritime English*’ teaching in China since the 1990s, modern educational technology in ‘*Maritime English*’ teaching was still emerging compared to international practices. Furthermore, the author claimed that the need to promote this change rested on the international character of the industry and because modern educational technology eliminates the deficiencies and problems encountered in traditional education and training. Finally, the author advocated that an Internet-based education eliminates the time and distance constraints and allows students to control their learning.

²⁸² Zhang, Y., Chen, X., Zhang, Q. and Tao, D. (2021). Construction of Interdisciplinary Training Platform for Shipping Talents, in: *Proceedings of the International Conference on Economics, Law and Education Research (ELER 2021)*, *Advances in Economics, Business and Management Research*, 170, pp.360-367. <https://dx.doi.org/10.2991/aebmr.k.210320.060> [accessed 04 September 2022].

²⁸³ Jeon, T.-Y., Kim, B.-G., Kim, N. and Lee, Y.-C. (2022). Have Non-Native English-Speaking Marine Cadet Engineers Been Educated Appropriately? *Journal of Maritime Science and Engineering*, 10(8), Article ID: 1018. <https://doi.org/10.3390/jmse10081018> [accessed 06 November 2022].

²⁸⁴ International Maritime Organisation (2014). *SOLAS Consolidated Edition*. International Maritime Organisation: London.

²⁸⁵ Wang, H. and Wei, A. (2022). Construction of a Knowledge Map Based on Text CNN Algorithm for Maritime English Subjects. *Journal of Function Spaces*, Article ID: 6578682. <https://doi.org/10.1155/2022/6578682> [accessed 04 September 2022].

²⁸⁶ Cui, Z.-L. (2010). On the Applications of Modern Educational Technology in Maritime English Teaching from the Perspective of Constructivism, *English Language Teaching*, 3(3), pp.244-248. Retrieved from: <https://doi.org/10.5539/elt.v3n3p244> [accessed 07 July 2022].

Ferreira (2014)²⁸⁷ started by describing the teaching approach used in the foundational ‘*Maritime English*’ course delivered at a naval (military) academy and the constraints faced in delivering oral practical examinations due to a lack of time, thus preventing students from showing their capacity in doing the job. In order to overcome this issue, the school implemented a small private online course on Moodle platform because they favour blended learning, hybrid learning or flipped classroom; the course consisted of 5 chapters, including short videos, quizzes, and rapid learning activities such as flashcards, interactive exercises, and 3D illustrations. Overall, the course proved to be a success, with students finalising it 100% before the first face-to-face class and classroom work proved to be more fruitful because there was more time to carry out pair work and simulated conversations. As part of this exercise, the authors indicate the specific tools used for each activity, which is an added value as it guides course designers and implementers through the process.

Sukomardojo and Ratnaningsih (2020)²⁸⁸ investigated the use of e-learning in ‘*Maritime English*’ by employing a survey questionnaire to improve the vocabulary skills of cadets at Surabaya Shipping Polytechnic and identify barriers that might occur when using e-learning in this context. The outcome has shown that students lacked ‘*Maritime English*’ terminology, and the work to be performed requires clear communication in oral and written forms between crew members as they have become multinational whether the ships are at sea, in port, or a dry-docking process besides emergencies such as collisions, grounding, fire, men/women overboard et cetera.

Shvetsova et al. (2021)²⁸⁹ claim that future seafarers’ English language training is far from achieving its objectives since there are still discrepancies between the minimum required standard of training and their readiness to perform their professional duties in English and so the need to use new learning and teaching technologies and approaches. To overcome this situation, and given the constraints imposed by the COVID-19 pandemic, the possibility of developing an online course in ‘*Maritime English*’ to be complemented by face-to-face traditional classroom learning arose. This paper describes this course; it consists of five modules implemented in the Moodle learning management system with the training materials necessary for developing and improving English language communication skills. The authors also indicate that the students got more engaged in the studying process since the introduction of online studying materials has provided more flexibility in how, when, and where they can learn.

More recently, Limbong et al. (2022)²⁹⁰ investigated the impact of synchronous learning in teaching ‘*Maritime English*’ through the Marlins platform. Using a survey questionnaire, the authors found that delivering synchronous learning methods through the Marlins platform results in significant learning outcomes for cadets. In addition, the study enforces the need for media to be used during ‘*Maritime English*’ learning.

3.3. Maritime Distance Education and Training from a Technological Perspective

The delivery of maritime distance education and training from a technological perspective has also been the choice of the research community. Within this scope, three papers have been identified.

Tan (1999)²⁹¹ questioned if it would be possible to meet the shipping industry’s requirements imposed by international regulatory bodies such as the International Maritime Organisation for delivering education and training. Tan started by investigating the information technologies available such as satellite communications, the various distance learning methods employing such technologies, and the maritime education and training

²⁸⁷ Ferreira, A. (2014). The Maritime English MOOC: using the MOOC technology to flip the classroom. In: *Proceedings of the International Maritime English Conference 26*, 7-10 July 2014, Maritime Institute Willem Barentsz. Terschelling, The Netherlands, pp.85-101. Retrieved from: <https://hal.archives-ouvertes.fr/hal-03187161/document> [accessed 25 July 2022].

²⁸⁸ Sukomardojo, T. and Ratnaningsih, D. (2020). The Use of E-Learning in Maritime English Learning Can Improve the Vocabulary Skill of Cadets Majoring in Electro-Technical Officer Shipping, *International Journal of Entrepreneurship and Business Development*, 3(4). pp.390-398. <https://doi.org/10.29138/ijebd.v3i4.1200> [accessed 05 November 2022].

²⁸⁹ Shvetsova, I., Fediaeva, V. and Moroz, O. (2021). Education and professional training: blended learning in maritime English teaching. *Laplace in Journal*, 7(3D), pp.175-188. <https://doi.org/10.24115/S2446-6220202173D1705p.175-188> [accessed 25 July 2022].

²⁹⁰ Limbong, S., Jabu, B. and Basri, M. (2022). The Impact of Synchronous Learning of Marlins in Teaching Maritime English, *Journal of Learning and Development Studies*, 2(3), pp.06–13. <https://doi.org/10.32996/jlds.2022.2.3.2> [accessed 05 November 2022].

²⁹¹ Tan, D. G. (1999). *The virtual classroom afloat: maritime education and training in the 21st century: an investigation into the feasibility and practicability of distance learning via the satellite communications system*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/423 [accessed 25 July 2022].

management/administrative practices adopted by institutions employing distance learning. Next, it surveyed Filipino seafarers to assess their receptiveness, willingness, and readiness to new maritime education and training approaches, namely distance learning and calculated the costs/benefits, merits, and demerits of distance learning in the Philippines. The research made recommendations regarding its feasibility and practicability, given that the Philippines lacked any form of distance learning in its maritime education and training system at the time of the research.

Belev and Daskalov (2019)²⁹² considered the use of computer systems and technologies on board ships drawing attention to the types of shipboard computer networks, i.e., shipboard and extended shipboard computer networks, which open the scope for maritime education. The difference between both networks is that extended shipboard computer networks are linked to a shore-based computer or computer network. The paper results from the Erasmus+ “*Diversification of seafarers’ employability paths through collaborative development of competences and certification*” – DivSea project. It 1) analysed the opportunity of implementation for vocational education and training and 2) developed an e-platform for a blended learning system that included for the marine sector comprising soft and technical skills improvement and assessment modules.

More recently, Pipchenko and Kovtunenکو (2020)²⁹³ proposed a blended training framework for maritime education and training supported by software and hardware learning in which computer-based training plays a key role. In proposing such a framework, Pipchenko and Kovtunenکو draw attention to the fact that the existing computer-based training programmes are incompatible when seafarers switch companies obliging them to undergo similar skills training from different educational suppliers due to companies’ policies. Such a lack of industry standards for computer-based training programmes results in a waste of seafarers’ time and efforts and companies’ money which could be used to upgrade their skills.

3.4. Maritime Distance Education and Training from a Country Perspective

Some authors reviewed e-learning from a country perspective. In general, authors consider the situation of their countries and institutions’ policies/strategies regarding e-learning to find the pitfalls and challenges they must deal with to implement it. The general feedback is that maritime education and training is lagging other study areas such as economics, management and even supply chain; Schinas and Thalassinos (2003)²⁹⁴ claim that the maritime transport sector has been reluctant regarding the adoption and application of new learning techniques. Six papers were identified from a country perspective.

Satir and Deniz (2014)²⁹⁵ addressed the applicability of distance learning at Turkish maritime universities and faculties; for that, they compare maritime distance learning in Turkey and the World. The paper describes distance education in Turkey and claims that the chosen courses are suitable for distance learning because they are theoretical. Also, distance courses are more suitable for graduate students than undergraduate ones.

Stan (2014)²⁹⁶ starts by putting online learning into context and highlights its advantages. Next, it describes the online learning training that Constanta Maritime University introduced in its educational system. The proposed online learning training resulted from a European Union-funded project financed under the Leonardo da Vinci Funding Programme; it concerned the establishment of a virtual e-learning platform to overcome

²⁹² Belev, B. C. and Daskalov, S. I. (2019). Computer technologies in shipping and a new tendency in ship’s officers’ education and training. *IOP Conference Series: Materials Science and Engineering. Volume 618, 8th International Scientific Conference “TechSys 2019” – Engineering, Technologies and Systems 16–18 May 2019, Bulgaria*. Retrieved from: <https://iopscience.iop.org/article/10.1088/1757-899X/618/1/012034> [accessed 25 July 2022].

²⁹³ Pipchenko, O. D. and Kovtunenکو, D. (2020). A Suggestion of an Application of Blended Learning in MET Through a Harmonized STCW Model. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 14(3), pp.545-548. <https://doi.org/10.12716/1001.14.03.04> [accessed 30 July 2022].

²⁹⁴ Schinas, O. and Thalassinos, E. (2003). Adjusting Basic Maritime Training in an E-Learning Environment. *European Research Studies*, 6(3–4), pp.237-256. Retrieved from: <https://www.ersj.eu/journal/112> [accessed 25 July 2022].

²⁹⁵ Satir, T. and Deniz, C. (2014). Distance learning at the Turkish maritime education. *15th Annually General Assembly of International Associations of Maritime Universities (IAMU), Tasmania, Australia*, 27 - 29 October 2014, pp.260-266. Retrieved from: https://www.researchgate.net/publication/291301933_Distance_learning_at_the_Turkish_maritime_education [accessed 25 July 2022].

²⁹⁶ Stan, L. C. (2014). Online Teaching Technique in Maritime Learning Process, *Procedia - Social and Behavioral Sciences*, 116, pp.4517-4520. <https://doi.org/10.1016/j.sbspro.2014.01.977> [accessed 25 July 2022].

junior officers' experiential learning (on board the ships) gap. Finally, the paper acknowledges that online teaching techniques are a better solution for seafarers' periodically improvement and updates since seafarers can access the Internet even when the ship is in the middle of the ocean.

Chen et al. (2017)²⁹⁷ defined e-learning, identified its advantages and disadvantages, and assessed its suitability in maritime education and training. Based on this outcome, the authors assessed the problems faced by Chinese maritime education and training and proposed measures to overcome them. Some of these measures are establishing an e-learning repository, using blended learning and an e-learning evaluation system so maritime education and training institutions can promote a lifelong learning platform and the internationalisation of their education.

Masuku (2020)²⁹⁸ and Bauk and Masuku (2022)²⁹⁹ focused on lecturers' and students' awareness regarding the benefits and impediments of e-learning at selected South African maritime higher education institutions that, at the time of the research, had not implemented e-learning programmes, including their readiness to adopt this form of knowledge transfer. A survey questionnaire from lecturers' and students' perspectives was carried out regarding the issue at the Durban University of Technology. The analysis of the survey outcome was carried out using Microsoft Excel and Statistical Package for the Social Sciences (SPSS). In generic terms, the survey showed a need for introducing e-learning in South African maritime higher education institutions even though there is some scepticism about its implementation, for instance, due to students' lack of digital literacy and IT equipment. The research indicated that there are opportunities for developing online distance education. It comes up as an opportunity for seagoing graduates to continue their studies. The research advocates that the COVID-19 Pandemic highlighted the role of e-learning as it offers positive benefits. Masuku (2020)³⁰⁰ also analysed online distance learning, indicating the different types of online learning, and highlighting online distance learning's advantages and disadvantages. Next, it addresses online distance learning in developing countries and analyses South Africa's situation. In doing so, it considers maritime policies and focuses on maritime education and training.

Finally, Vuong (2021)³⁰¹ gained a deeper understanding of the current e-learning implementation and explored innovative online teaching approaches applicable to maritime education and training, contributing to maritime education and training institutions, notably the Ho Chi Minh University of Transport. The study highlights opportunities (perceived advantages and acceptability), needs (knowledge skills and teaching methods), and challenges (distraction, health issues, equipment, Internet Connection, interaction, University support, and information technology skills) that lecturers and students must cope with, and which contribute to a mixture of positive and negative signs for e-learning adaptation. It also indicates new teaching approaches which contribute to better interaction between lecturers and students.

3.5. Maritime Distance Education and Training during the Pandemic

The emergence of the COVID-19 pandemic also led the research community to analyse e-learning from a pandemic perspective. Still, the number of studies is very limited.

Shi et al. (2021)³⁰² described the online teaching system that Shanghai Maritime University developed and implemented to allow about 20,000 students to resume their learning activities despite the COVID-19

²⁹⁷ Chen, X., Bai, X. and Xiao, Y. (2017). The Application of E-learning in Maritime Education and Training in China. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 11(2), pp.349-354. Retrieved from: <https://dx.doi.org/10.12716/1001.11.02.19> [accessed 30 July 2022].

²⁹⁸ Masuku, M. B. (2020). *Enhancing maritime education through online distance learning in developing environments*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1448/ [accessed 25 July 2022].

²⁹⁹ Bauk, S. and Masuku, M. B. (2022). On adopting e-learning in maritime higher education in South Africa. *High Technology Letters*, 28(5), pp.98-113. <http://www.gjstx-e.cn/gallery/9=may2022.pdf> [accessed 25 July 2022].

³⁰⁰ Masuku, M. B. (2020). *Enhancing maritime education through online distance learning in developing environments*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1448/ [accessed 25 July 2022].

³⁰¹ Vuong, N. H. (2021). *Improving e-learning in maritime education and training: action research in the Vietnam maritime context*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1760/ [accessed 25 July 2022].

³⁰² Shi, X., Wang, Y., Zhuang, H. and Zhang, Z. (2021). Development of online education and its application in Shanghai Maritime University. In Pazaver, A., Manuel, M. E., Bolmsten, J., Kitada, M., Bartuseviciene, I. (Eds.), *Proceedings of the International Maritime Lecturers' Association. Seas of transition: setting a course for the future*, World Maritime University, pp.218-225. Retrieved from: <https://commons.wmu.se/imla2021/24/> [accessed 25 July 2022].

disruption. It started by presenting the university; next, it describes the structure of the adopted online education framework and the online teaching model.

Coşofreţ and Avram (2020)³⁰³ investigated the impact that the sudden shift from traditional teaching to an online environment caused on maritime higher education. Using a survey questionnaire, the authors investigated internet connectivity, hardware and communication software tools used in online education, digital teaching resources and the level of support and guidance that students and educators received during online education. The authors identified key points to consider in the future: developing digital teaching resources for each discipline and providing educators with high-performance mobile hardware devices, namely laptops and tablets.

Finally, Renganayagalu et al. (2022)³⁰⁴ investigated if increased blended learning for three specific courses, namely navigation passage planning, bridge organisation and communication course of the Bachelor of Nautical Science in which they were involved impacted students learning. Using a qualitative case study approach, the study indicates that students adapted well to the new learning environment and that the experience paves the way to employing new technological solutions in future maritime education and training.

3.6. Scope of the Current Research

In a post-COVID-19 pandemic, many maritime education and training institutions are now considering e-learning in general and online learning in particular as a viable alternative, even though some worldwide institutions have already implemented it as already acknowledged in Section 2.3. Given the scope of the research carried out so far, the present paper contributes to the body of the literature. To authors' knowledge, no research addressing this research topic has been conducted until today. Eventually, it complements and expands the work performed by Coşofreţ and Avram (2020)³⁰⁵ since it provides a deeper insight into some issues raised by the authors, such as digital literacy, online learning planning and lack of time to understand the technology. Other reasons can also justify the current research.

First, the research helps clarifying the terminology being used. Sometimes e-learning is used interchangeably with online learning, when in fact they mean different things; as demonstrated in Section 2, online learning is a type of network-based learning (see Table 2). Second, the 2010 Manila amendments to the STCW-95 Code strongly recommend the adoption of contemporary training methodologies, namely distance learning/e-learning, to improve seafarers' competencies. Third, the International Maritime Organisation Model Course 6.09 '*Training Course for Instructors*' includes new learning approaches (computer-based training, distance learning/e-learning, blended teaching, and massive open online courses) even though Pipchenko and Kovtunenکو (2020)³⁰⁶ claim that neither the STCW nor any other IMO Model Courses specify on where these new learning approaches apply. Fourth, 96% of International Association of Maritime University member maritime universities have incorporated e-learning to keep their education and training activities during the COVID-19 pandemic (Vuong, 2021)³⁰⁷, and 83% of the universities have transitioned entirely to online or distance education during this period (International Association of Maritime University, 2020)³⁰⁸. These

³⁰³ Coşofreţ, D. and Avram, E. R. (2020). Evaluation of the Maritime Higher Education didactic support during the coronavirus pandemic. Case Study. *The 15th International Conference on Virtual Learning ICVL 2020*, 493-499. Retrieved from: https://www.researchgate.net/publication/346075892_Evaluation_of_the_Maritime_Higher_Education_didactic_support_during_the_coronavirus_pandemic_Case_Study [accessed 10 October 2022].

³⁰⁴ Renganayagalu, S. K., Mallam, S. and Hernes, M. (2022). Maritime Education and Training in the COVID-19 Era and Beyond. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 16(1), pp.59-69. <http://dx.doi.org/10.12716/1001.16.01.06> [accessed 27 September 2022].

³⁰⁵ Coşofreţ, D. and Avram, E. R. (2020). Evaluation of the Maritime Higher Education didactic support during the coronavirus pandemic. Case Study. *The 15th International Conference on Virtual Learning ICVL 2020*, 493-499. Retrieved from: https://www.researchgate.net/publication/346075892_Evaluation_of_the_Maritime_Higher_Education_didactic_support_during_the_coronavirus_pandemic_Case_Study [accessed 10 October 2022].

³⁰⁶ Pipchenko, O. D. and Kovtunenکو, D. (2020). A Suggestion of an Application of Blended Learning in MET Through a Harmonized STCW Model. *TransNav, the International Journal on Marine Navigation and Safety of Sea Transportation*, 14(3), pp.545-548. <https://doi.org/10.12716/1001.14.03.04> [accessed 30 July 2022].

³⁰⁷ Vuong, N. H. (2021). *Improving e-learning in maritime education and training: action research in the Vietnam maritime context*. World Maritime University. Retrieved from: https://commons.wmu.se/all_dissertations/1760/ [accessed 25 July 2022].

³⁰⁸ International Association of Maritime University (2020). *Survey on the impact of and response to COVID-19 by IAMU member universities*. Retrieved from: <https://iamu-edu.org/survey-on-the-impact-of-and-response-to-covid-19/> [accessed 30 July 2022].

figures are outstanding if the findings of the 2020 Maritime Training Insight Database survey are considered. In 2019, 98% of maritime education and training institutions were still using the classroom approach to a medium or high degree, even though more than 40% of maritime education and training institutions reported that they had used e-learning, especially internet-based ones, to a medium or high extent (Maritime Training Insight Database, 2020)³⁰⁹.

Finally, the paper views maritime education and training from a broader perspective embracing seafarers and shore personnel courses, overcoming the limitation given by the International Maritime Organisation under the 1995 STCW Code. It refers to maritime training as the supply of skilled personnel to sea and shore functions of the maritime industry, enlarging the scope of the Safety of Life at Sea Convention. In this way, it considers training within the port sector and considers training within the scope of digitalization not foreseen in the Safety of Life at Sea Convention. A wide approach to maritime training is not new. It was also considered in the literature by Gold (1990)³¹⁰ when analysing Canadian marine training. Gold, rather than focusing on maritime training, adopted the marine training approach to include the Canadian merchant and fishing industries, and the Canadian and international offshore oil industry, among other marine activities.

In this regard, it is noteworthy to highlight the difference between the terms ‘*maritime*’ and ‘*marine*’, which are often used interchangeably when they mean different things (Paixão Casaca, 2013)³¹¹. The term ‘*maritime*’ relates to ships, ship design, naval architecture, shipbuilding, ship operations, navigation, port facilities, among many others related to the maritime industry, which fall within the scope of maritime economics. On the other hand, the term ‘*marine*’ relates to the ocean’s natural resources and their exploitation. The activities performed within the ‘*marine*’ term scope are numerous. They include offshore oil and gas exploitation, renewable energies, farm fishing, and ocean mining, among many others. The current paper focuses on the ‘*maritime*’ term. Therefore, maritime knowledge and skills acquisition enhance competence in the maritime context (Cunningham, 2015)³¹². Subject to the maritime industry activities identified above, the different worldwide education and training institutions have developed specific education and training programmes for the industry. These programmes are varied to educate and train the sea and shore professionals that the industry needs to keep it running.

4. METHODOLOGY

Depending on the nature and objective of the study, research can be carried out using quantitative, qualitative, or combined methodological approaches. Qualitative research implies collecting behavioural or observational data that must be analysed to derive results or provide insights into the problem being investigated. On the other hand, quantitative research aims to quantify the problem; it uses computational, statistical, and mathematical tools to derive its results. The current research adopted a quantitative research approach. The main advantage of a quantitative research is its research objectivity. Unlike qualitative research, which depends on very subjective opinions, quantitative research rests on gathering concrete data, thus removing biases to make the findings more accurate. Also, it is easier to send out a survey by email despite all the work behind to elaborate it that engage on an interview process.

Gathering the Background Knowledge. To achieve the proposed objective, the authors started by updating their knowledge on the subject. For many years, Portuguese trainers have been subject to pedagogic training. With this 40-to-60-hour pedagogic training, trainers were given a training competency certificate which had to be revalidated every five years. To revalidate this certificate, all trainers had to demonstrate that they had delivered 300 hours of training during those five-year periods and enrol on a new pedagogic training

³⁰⁹ Maritime Training Insights Database. (2020). *2020 Training Practices Report*. World Maritime University, Marine Learning Systems and New Wave Media MarTID. Retrieved from: <https://www.wmu.se/scholarly-books/martid-2020-report-2> [accessed 30 July 2022].

³¹⁰ Gold, E. (1990). Canadian marine training: time to change course? A comparative comment. *Maritime Policy & Management*, 17(3), pp.177-188 <https://doi.org/10.1080/03088839000000025> [accessed 08 November 2022].

³¹¹ Paixão Casaca, A. C. (2013). Improving the competitiveness of the Portuguese maritime cluster. In: *Proceedings of the 2013 International Association of Maritime Economists Annual Conference*, 3-5 July, Marseille, France.

³¹² Cunningham, S. B. (2015). *The relevance of maritime education and training at the secondary level*. World Maritime University. Unpublished Master of Science Dissertation 499. Retrieved from https://commons.wmu.se/all_dissertations/499/ [accessed 09 September 2021].

programme. Portuguese trainers gained new knowledge and pedagogic competencies through these continuous training programmes to improve their training performance. As information technology/information systems evolved, the authorised entities began offering these courses either in classroom or distance learning formats, including online training, and trainers could choose the option that favoured them most. However, in the latter option, the final assessment was still carried out in a classroom context.

The demand for continuous revalidation ended by Governmental Order No. 994 dated 29 September 2010; no additional training had to be done once a trainer obtained his training competency certificate. Whether the Government decision was a good or a bad one is out of the scope of the current paper. The revalidation ending was a relief for those trainers unable to deliver the requested 300 hours of training. However, from the competencies' perspective, it came as a pitfall. The obligation to get new pedagogic knowledge vanished and trainers only enrolled in those courses if they wanted to gain additional competencies and learn about new training technologies.

To become acquainted with the new aspects of online learning, the authors enrolled on the 5-week course on '*Learning to Teach Online*'³¹³ delivered by the University of New South Wales on the Coursera Platform. By attending this online Course, the Authors discovered a range of tools available for online training that meet the different planning and delivery activities that trainers must use to accomplish their work. Between 2009³¹⁴ and 2020, the tools evolved considerably, and much more information became available. It is relevant to state that in 2009 little information was available on the Internet; at that time, only Australian websites provided information about online training. A decade later, Australia is still a leading country on the subject, although the number of websites containing valuable information about e-learning/online training has grown exponentially.

Gathering Data Approach. To gather the necessary information, a range of methods available, namely surveys, focus groups, and ethnographic research, among others, were considered. However, given the study's exploratory nature, the choice fell on surveys. In this regard, an email survey questionnaire was considered to the detriment of the traditional mail survey. Email survey questionnaires offer several advantages for collecting data. E-mail survey questionnaires are cost-efficient, save time, are convenient, flexible and may create a sense of urgency (Paixão Casaca and Lyridis, 2021)³¹⁵. However, like mail surveys, the research outcome accuracy depends on 1) the reliability of the data gathered and 2) the number of responses received.

Survey Questionnaire Design. Based on the authors' background knowledge, the information gathered during the Coursera Course and from the websites suggested by the Coursera Course, an online survey questionnaire³¹⁶ was developed to study the integration of online education/training during the COVID-19 Pandemic in global maritime education and training context. Its purpose is to provide an overall picture of the experience gained to identify possible strategies that foster more online training into maritime education/training.

The survey questionnaire included 49 questions distributed along five sections. Section A, which incorporated Questions 1 to 6, investigated respondents' profiles. Besides their basic info such as name and email, respondents were enquired about their gender, age, educational qualification, and the university where they obtained their highest educational qualification. Section B, which incorporated Questions 7 to 15, investigated respondents' working situation when the survey was delivered. These questions included aspects such as the name of the institution and country where they were working, the institution's number of employees and students, the roles they played, the number of years involved in lecturing/teaching activities, the teaching sector where they primarily worked, the evaluation of their lecturing/teaching experience, the disciplines being lectured, and research activities.

Section C, concerning Questions 16 to 22, investigates respondents' experience delivering online training pre-COVID-19 pandemic. At this point, respondents were asked if they had delivered online lecturing/teaching

³¹³ See <https://www.coursera.org/learn/teach-online/home/welcome>

³¹⁴ The year '2009' is referred as a baseline since it is the year in which one of the authors attended her last pedagogic training course.

³¹⁵ Paixão Casaca, A. C. and Lyridis, D. V. (2021). The reasons and the policy instruments behind cabotage policies, *Maritime Policy & Management*, 48(3), pp.391-418. Retrieved from: <https://doi.org/10.1080/03088839.2020.1791992> [accessed 30 July 2022].

³¹⁶ The questionnaire is available online at https://www.worldofshipping.org/WofSP6_Surveys/WofSPSurvey02_EN_Survey.html.

before the COVID -19 Pandemic. In the presence of an affirmative answer, respondents were asked to answer Questions 17 to 21. These questions investigated respondents' lecturing/teaching experience, the type of online lecturing/teaching they have delivered, how respondents perceived the adoption/development of online lecturing/teaching, how respondent's perceived perceive the challenges they faced when adopting or developing online lecturing/teaching practices and finally how confident they felt about their ability in delivering online teaching. In case of a negative answer, respondents were asked to go to Question 22, which aimed to perceive the factors that prevented respondents from adopting or developing online lecturing/teaching.

Section D concerned Questions 23 to 48 and involved several important aspects. From a generic perspective, Part D assessed how difficult it was for respondents to adapt their lives and deliver their online lecturing/teaching, the type of instructional strategies they used for their online lecturing/teaching, the type of online lecturing/teaching they delivered during this period, the instructional methods and means they used for delivering synchronous and asynchronous online learning. Concerning the planning of online lecturing/teaching, respondents were asked 1) how they perceived a range of factors influencing the planning of their online lecturing/teaching and 2) how many hours per week they spent planning their online lecturing/teaching activities. Finally, regarding the development of resources, respondents were asked i) whether they took the time to prepare their own or used online resources created by others, ii) their concerns when using online resources prepared by others in their online teaching, and iii) the aspects to be considered when evaluating online resources prepared by others.

In what concerns the use of technology, respondents were asked about the types of technology used, the reasons behind the adoption of open technologies, their familiarity with the tools/products commonly used in online learning and teaching practice, the video conferencing tools used and their skills and effectiveness in using these tools, their ability in adapting and integrating digital technologies effectively to deliver their lecturing/teaching, the level of their digital literacy and the most appropriate strategies to develop digital literacy. Regarding the delivery of online lecturing/teaching, respondents were enquired about the strategies used for delivering online lecturing/teaching. As to assessment issues, respondents were asked about the issues arising when implementing an online assessment, the methods used when conducting online assessments, the assessment tools used and heard of, and the benefits and pitfalls of the online assessment. Regarding respondents' confidence, they were asked to assess their overall confidence in lecturing/teaching online and corresponding confidence factors and their willingness to continue lecturing/teaching online.

Section E investigated whether respondents were willing to receive a summary of the results.

Finally, when designing this survey, the terms 'lecturing/teaching' were used. The authors chose these words as broad terms to cover all educational methods as defined in Section 1 of this research.

Likert Scales. By bringing together the questions mentioned above, the survey questionnaire aimed to cover the broadest aspects to be considered in online education and training respondents would have to consider. The survey questionnaire incorporates closed-ended questions supported by a blend of nominal, ordinal, and numerical data. For questions incorporated in Sections B, C and D of the survey questionnaire, 7-point Likert scales representing different assessments were used (see Table 7); a 7-point Likert scale is a reliable way to measure opinions, perceptions, and behaviours. Moreover, a Likert scale allows respondents to state how much they agree or disagree with the identified statements (Paixão Casaca and Lyridis)³¹⁷. Like Paixão Casaca and Lyridis (2021)³¹⁸, a questionnaire content validity test was conducted through a theoretical review. Finally, the survey questionnaire was designed in English, given the international nature of the research.

Once the overall survey questionnaire structure was defined and the questions elaborated and validated, it was incorporated into one of the authors' website³¹⁹. This further reduced the costs of delivering the survey, despite the time taken to programme it on a dedicated webpage and test the proper functioning of the form behind the questionnaire. Overall, this work took around two days to be accomplished.

³¹⁷ Paixão Casaca, A. C. and Lyridis, D. V. (2021). The reasons and the policy instruments behind cabotage policies, *Maritime Policy & Management*, 48(3), pp.391-418. Retrieved from: <https://doi.org/10.1080/03088839.2020.1791992> [accessed 30 July 2022].

³¹⁸ Paixão Casaca, A. C. and Lyridis, D. V. (2021). The reasons and the policy instruments behind cabotage policies, *Maritime Policy & Management*, 48(3), pp.391-418. Retrieved from: <https://doi.org/10.1080/03088839.2020.1791992> [accessed 30 July 2022].

³¹⁹ World of Shipping Portugal: https://www.worldofshipping.org/WofSP2_ACSurveys/ACSurvey02_EN_Survey.html

Table 7: The 7-Point Likert Scale Meanings

Scale Meaning							Question Number
Very Poor	Poor	Fair	Good	Very Good	Excellent	Exceptional	13
Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree	19, 20, 22, 28, 31, 32, 34, 40, 41, 42, 43, 45, 47
Not confident	Slightly Confident	Somewhat Confident	Confident	Pretty Confident	Very Confident	Extremely Confident	21, 37, 38, 46
Not Difficult	Slightly Difficult	Somewhat Difficult	Difficult	Quite Difficult	Very Difficult	Extremely Difficult	23
Not Familiar	Slightly Familiar	Somewhat Familiar	Familiar	Quite Familiar	Very Familiar	Extremely Familiar	35
Not Able	Slightly Able	Somewhat Able	Able	Pretty Able	Very Able	Extremely Able	39
Very Unlikely	Unlikely	Somewhat Unlikely	Undecided	Somewhat Likely	Likely	Very Likely	48

Source: Authors

Sampling and Data Gathering. The e-mail survey questionnaire was administered between 29 September 2020 and 09 December 2020 to the worldwide community involved in lecturing/teaching activities, and to obtain the maximum number of answers possible, a tight schedule was applied. Therefore, to achieve this research objective, convenience sampling was chosen; convenience sampling is a specific type of non-probability sampling method; it relies on data collected from the research community members who were potentially available to participate in the study (Paixão Casaca and Lyridis, 2021)³²⁰. Moreover, this sampling approach was aligned with the researchers’ database of worldwide educators. This database facilitated this procedure and saved considerable time in the quest for potential respondents and their emails. Despite this, and given respondents’ mobility, the authors were fully aware that the number of undeliverable emails could be high due. Overall, the circulation list contained 5419 email addresses.

Table 8: Response Rate Analysis

1	Total Emails Sent	5419
2	Undeliverable Emails	412
3	Total Usable emails	5007
4	Deleted Without Reading	29
5	Available Emails / Valid List of Emails	4878
6	Answers Received	95
7	Answers Received but Unable to Use	17
8	Valid Answers Received	78
	Valid Answers Received in %	1.6%

Source: Authors

³²⁰ Paixão Casaca, A. C. and Lyridis, D. V. (2021). The reasons and the policy instruments behind cabotage policies, *Maritime Policy & Management*, 48(3), pp.391-418. Retrieved from: <https://doi.org/10.1080/03088839.2020.1791992> [accessed 30 July 2022].

Given the need to comply with the European Union General Data Protection Regulation, which became effective on 25 May 2018, changing the law relating to Personal Data, the targeted sample population was asked to indicate whether they wanted or not to be removed from the circulation list, which could narrow the sample size. The survey was sent in four rounds to increase the response rate during the period mentioned above, and a time span of about a month was given between them. Considering the undeliverable and deleted emails, a valid email list of 4878 email addresses was obtained (see Table 8).

Data Validity. First, all survey responses were registered in a Microsoft Excel workbook; this targeted two objectives, namely data validation and data codification. All survey responses were validated to ensure the accuracy and quality of data so that the outcome became consistent despite the limited number of answers. Out of the 95 responses received, the authors were unable to use 17 because respondents did not complete the response to the survey questionnaire. The length of the survey questionnaire can be the reason for this since the initial pilot tests indicated that respondents needed at least 30 minutes to answer it if they were familiarised with the terms. This left authors with a valid response rate of 1.6%, equivalent to 78 valid responses, well above the required 30 for concluding (see Table 8). The survey outcome would have benefitted if more responses had been received. Data codification was necessary so that the authors could use the data gathered in the responses in the SPSS statistical package.

Ethical Considerations. Respondents were guaranteed their anonymity. When delivering the survey by email, and even on the survey questionnaire webpage, respondents were assured that all individual responses would be held in the strictest confidence, and no specific details about them and/or their institutions would be reported. Only the authors of this research would have access to the information/data gathered; therefore, risks to respondents were minimal. Moreover, authors' ethical consideration was also extended to sourcing and referencing to guarantee that the current research work is free of plagiarism or research misconduct.

5. ANALYSIS OF THE OUTCOME

In order to analyse the data gathered, this research starts by investigating respondents' profile (Part A of the survey questionnaire - Section 5.1.), next respondent's current working situation (Part B of the survey questionnaire - Section 5.2.), followed by respondents online training pre-COVID-19 (Part C of the survey questionnaire - Section 5.3.) and finally respondents online training during COVID-19 pandemic (Part D of the survey questionnaire - Section 5.4.). To analyse the data gathered, this study used univariate statistics. The analysis was carried out using SPSS 20.0 and Microsoft Excel 365. The subsections that follow present the analysis outcome sent to the sample population according to the survey's structure.

5.1. Respondents' Profile

The analysis started by investigating respondents' gender. For many years, the shipping industry has been male-dominated and still is, as shown in this analysis; 75.64% of respondents are male, while 24.36% are female (see Figure 3). The industry is far from being balanced from a gender perspective, suggesting that a change of attitude and further inclusion of women in maritime activities is necessary. Rayos and Borbon (2022)³²¹ claim that general weather and sea conditions, hard work and limited opportunities for women seafarers to develop a career in the industry deter women from coming into the shipping industry. This requires the development of a gender inclusion policy where men and women are given the same opportunities, considering women's motherhood role in society. A broader policy is also necessary to promote the career path among the young so that boys and girls at an early stage of their life create awareness about the industry and see it as one that offers equal opportunities to both genders. Data indicates that 7.5% of seafarers are

³²¹ Rayos, J. L. T. and Borbon, N. M. D. (2022). Seafarers' attitude and cultural adaptation influencing the work motivation during the time of pandemic. *International Journal of Research Studies in Management*, 10(1), pp.107-124. <https://doi.org/10.5861/ijrsm.2022.17> [accessed 08 November 2022].

female, and 30% of companies employ women on their board (International Chamber of Shipping, 2022)³²². In this sense, the International Chamber of Shipping launched a global diversity tracker for the shipping industry.

Furthermore, the gender issue must be associated with diversity. As the industry goes into the future diversity, which is now coming to the forefront of many economic sectors, including shipping, will become critical due to the variety of generations and individuals. Statistics highlight that maritime employers and employees would benefit from a more inclusive and diverse working environment since a correlation exists between diversity and performance. However, some advocates suggest that diversity is not enough; they suggest adding inclusion to diversity. Against this suggestion, not many organisations in the maritime industry have demonstrated the implementation of diversity policies as part of their corporate strategy. Despite this background, some companies are emerging in this direction; a good example is the Danish shipping company Maersk in which some of their board of directors has participated in the Copenhagen Pride (LinkedIn, 2022)³²³.

Figure 3: Gender Distribution Among Respondents

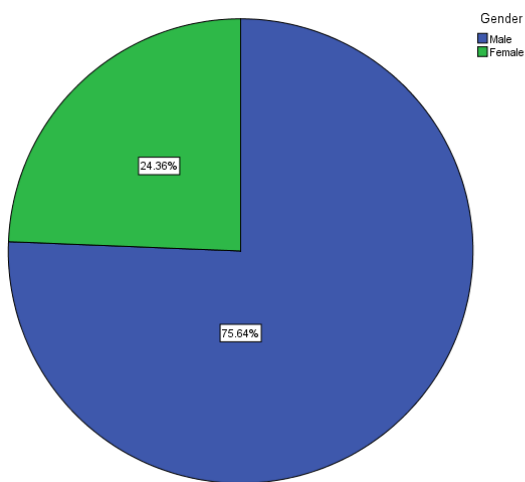
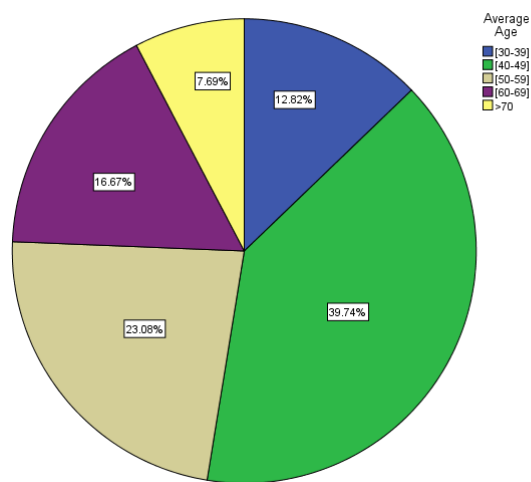


Figure 4: Respondents' Age Distribution



Source: Authors

Respondents' average age is 50.8 years, where the minimum age is 30, and the maximum age is 73. About 39.74% of respondents fall within the [40–49 years] modal class. However, this figure is overcome when the [50–59 years], [60–69 years] and greater than 70 modal classes are added, totalling about 47.44% of the respondents (see Figure 4). This meets the findings of Rayos and Borbon (2022)³²⁴, who concluded that most seafarers “belong within the late early adulthood or young adults and middle adulthood in human life development”. Such age indicators suggest the lack of new blood in the shipping industry and maritime lecturing/teaching activities. For many years, maritime lecturing/teaching activities have benefitted from nautical, i.e., deck and engine, officers coming ashore after several years at sea engaging in maritime lecturing/teaching activities, which is no longer the case in business-oriented education and training; the exception applies to nautical oriented courses. Such a situation is a pitfall for maritime education and training institutions since they miss the vast knowledge of professionals and prevent them from building bridges between academia and industry as they talk in different languages.

³²² International Chamber of Shipping (2020). ICS launches global diversity tracker for shipping industry. *International Chamber of Shipping*. Retrieved from: <https://www.ics-shipping.org/press-release/ics-launches-global-diversity-tracker-for-shipping-industry/> [accessed 14 May 2022].

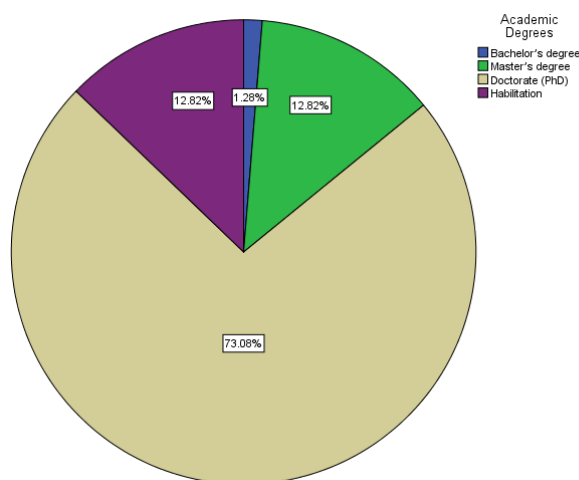
³²³ Skou, S. (2022). Celebrating diversity at the Copenhagen Pride today, with a great atmosphere and joined by fantastic colleagues of our Maersk team - including Vincent Clerc and Henriette Hallberg Thygesen, *LinkedIn*, August 2022. Retrieved from: https://www.linkedin.com/posts/s%C3%B8renskou_copenhagenpride-activity-6966836375769731073-NKYy/ [accessed 16 November 2022].

³²⁴ Rayos, J. L. T. and Borbon, N. M. D. (2022). Seafarers' attitude and cultural adaptation influencing the work motivation during the time of pandemic. *International Journal of Research Studies in Management*, 10(1), pp.107-124. <https://doi.org/10.5861/ijrsm.2022.17> [accessed 08 November 2022].

Seafaring, while offering a unique and rich life experience, is not for everyone due to the inherent working conditions and the difficulty of getting a good work-life balance. Unlike shore workers who benefit from family and social life, seafarers are stranded 24 hours on ships, quite often within the space limits of their cabins, at the service of shipping companies, despite the resting periods to which they are entitled. More often than not, seafarers still have to work during their resting periods if requested, mainly during manoeuvring times when ships call ports for loading and discharging operations. This results in long working hours to keep operations running and avoid port delays. In addition, ships only earn when at sea carrying goods throughout the most diverse trade lanes of the world. Given the lack of seafarers to operate the existing fleet, it is very likely that maritime lecturing/teaching activities will also be affected.

This lack of seafarers was only to be expected. According to a study performed by Hill in 1972 on ‘The Seafaring Career’ cited in Rosenstein et al. (1978)³²⁵, the wastage (or drop-out) of seafarers was an unavoidable phenomenon that was only to be expected and for which the industry should have planned while the number of students entering nautical schools decreased. Some years later, this outcome would be confirmed by several reports addressing seafarers’ demand and supply released by the Baltic and International Maritime Council, Drewry and International Chamber of Shipping. Unfortunately, seafarers’ wastage (or drop-out) is only expected to increase due to the very stressful conditions during the COVID-19 pandemic that sometimes led to suicide (Tang et al., 2022)³²⁶. For instance, in a post-pandemic period, the cruise industry lacks not only seafarers from the traditional perspective but also personnel working on the most diverse services provided on board. If nothing is done to reverse this situation, there may be a loss of knowledge that is not transferred from the older to the younger generations. Some policy measures should be in place to disrupt this trend and guarantee the continuous education of the coming generations.

Figure 5: Respondents’ Academic Degrees



Source: Authors

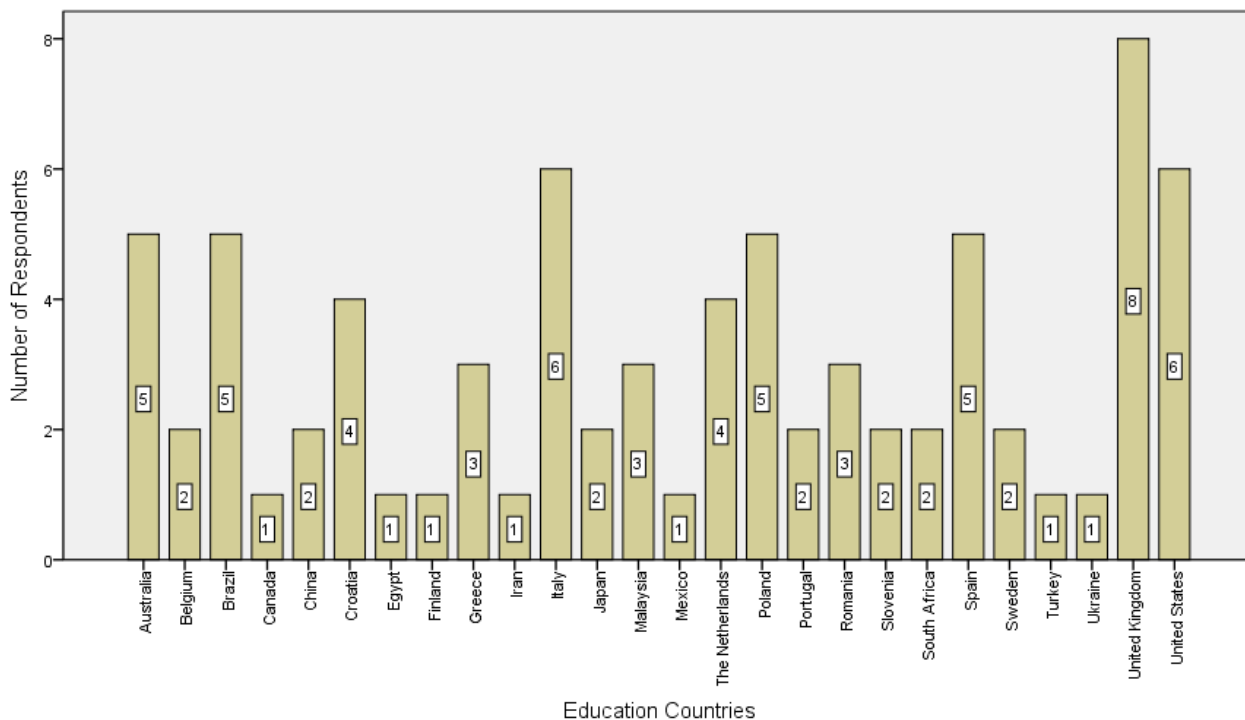
From an educational qualification perspective, 73.08% of respondents hold a Doctorate Degree. They are followed by respondents who hold, in equal terms (12.82%), Master and Habilitation Degrees. Only 1.28% of respondents have a Bachelor’s Degree (see Figure 5). These results suggest that the current respondents master specific areas of study or fields of profession, which may contribute to transferring the right information that will sustain the development of future professionals. Data gathered also indicates the countries in which respondents obtained their highest qualifications. From a continental perspective, about 60.26% of respondents took their academic qualifications in Europe. The remaining 39.74% of respondents are distributed along North and South America, Asia, Former Soviet Union countries and the Middle East (including Turkey), Asia

³²⁵ Rosenstein, E., Manneheim, B. and Nutes-Kinberg, S. (1978). Nautical training systems and the occupational behaviour of seamen: the Israeli experience. *Maritime Policy & Management*, 58(1), pp. 5-18. <https://doi.org/10.1080/03088837800000002> [accessed 05 November 2022].

³²⁶ Tang, L., Abila, S., Kitada, M., Malecosio Jr., S. and Montes, K. K. (2022). Seafarers’ mental health during the COVID-19 pandemic: An examination of current supportive measures and their perceived effectiveness. *Marine Policy*, 145, Article ID: 105276. <https://doi.org/10.1016/j.marpol.2022.105276> [accessed 08 November 2022].

(Including China) and Oceania. From a country perspective, the United Kingdom ranks as the preferred destination for education (10.3% of respondents), followed by Italy and the United States, each with 7.7% of the response rate (see Figure 6).

Figure 6: Respondents' Education Countries



Source: Authors

5.2. Respondents' Working Situation at the Time of the Survey

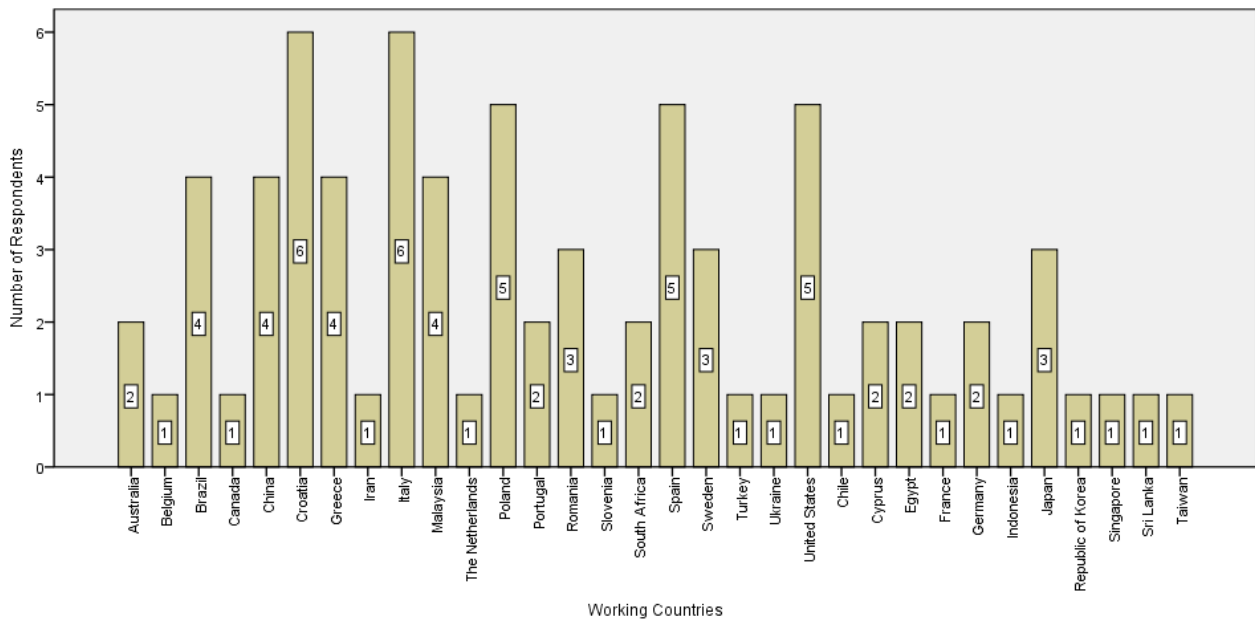
Respondents' working situation at the time of the survey presents some interesting results. The results highlight a difference between respondents' working countries at the time of the survey relative to their countries of education. First, while the number of education countries identified in the survey totalled 26, the number of working countries amounted to 32. This suggests that education-country options are more concentrated while work-country options are dispersed, indicating the presence of learning mobility. Learning mobility is an opportunity for students to gain new experiences and develop valuable skills; these two aspects combined allow students to widen their horizons and become more prone to learn continuously from new experiences. In addition, mobility allows students to create a vast network of contacts that will accompany them throughout their lives, opening the scope for future collaborations and exchange programmes at an institutional level.

The outcome also shows that some respondents target certain countries (for instance, the United Kingdom) for their education to return to their homes. The outcome does not show if, after achieving their degree, the respondents spent some of their working life in an intermediary country other than the one they were working in at the time of the survey (see Figure 7). Furthermore, by carrying out a cross-tabulation analysis between education and working countries, it could be found that the eight respondents that took their degree in the United Kingdom were working in China, Croatia, Greece, Malaysia, Sweden, France, Korea, and Taiwan. In other cases, such as the one of Croatia, indicate that respondents are not so prone to the mobility mentioned above and tend to work and study in their country. Possible reasons contributing to this situation are family matters, the difficulty of speaking a foreign language or lacking funding opportunities, which deters knowledge transfer between the different academic circles, regional or global.

The dimension of the institutions considered in the survey can be seen from employee and student perspectives. From an employee perspective, about 71.79% of respondents work for institutions whose number of employees is greater than or equal to 301 (see Figure 8). From a student perspective, 74.36% of respondents work for institutions with more than 3001 students (see Figure 9). The outcome also suggests that in most cases, there is a proportional relationship between the number of employees and students. For instance, for

85.90% of respondents, the ratio of students-employees equals 1, suggesting that the number of employees employed by maritime education and training institutions in the management of their activities is adequate for the number of students. However, there are cases where this ratio is greater than 1, meaning that the number of students per employee is higher. For instance, 10.26% of respondents in countries such as Malaysia, Romania or Germany acknowledged the situation. While this situation may lead to greater economic efficiency, it puts additional pressure on employees, particularly teaching staff with more work to do during assessment times. The opposite also occurs in countries such as Poland, the United States and Japan; here, the number of employees per student is higher. While geographical location could justify such practices, there is no such relationship.

Figure 7: Respondents' Working Countries



Source: Authors

Figure 8: Institutions – Number of Employees

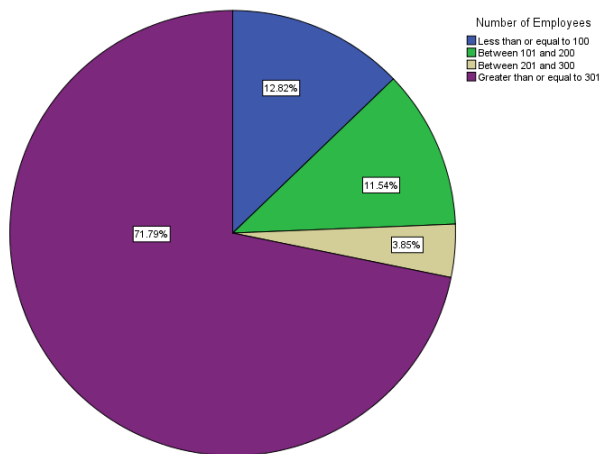
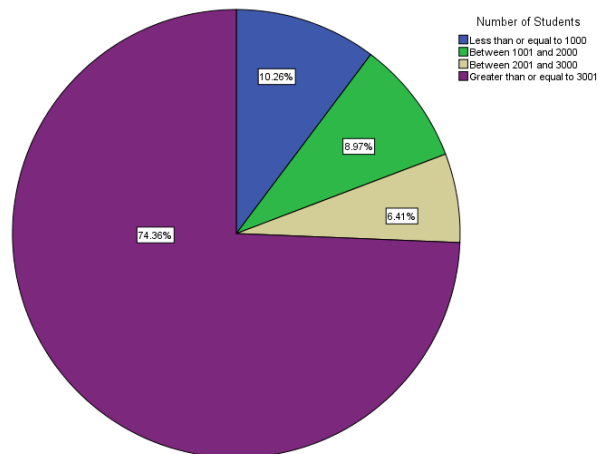


Figure 9: Institutions – Number of Students



Source: Authors

At their institutions' respondents carry out several roles. For the analysis, this survey considered that respondents carried out five roles, namely 'Managerial', 'Administrative', 'Lecturing/Teaching', 'Research', and 'Consultancy'. According to the outcome, at least 41.03% of respondents perform five roles, even though the average per respondent is 2.5. The analysis also indicates that the predominant roles are

‘Lecturing/Teaching’ (38.7%) and ‘Research’ activities (33.5%). The remaining roles account for 27.8% of the work performed by respondents (see Figure 10).

In average terms, respondents have been involved in ‘Lecturing/Teaching’ activities for 19.39 years. However, the outcome indicates that respondents falling within the [10–19] years (34.62%) and [20–29] years (30.77%) modal classes dominate and contribute to the average identified. The remaining modal classes account for 32.61% of the respondents. Only a small percentage of respondents with more than or equal to 40 years are involved in lecturing/teaching activities (see Figure 11).

Figure 10: Roles Played by Respondents

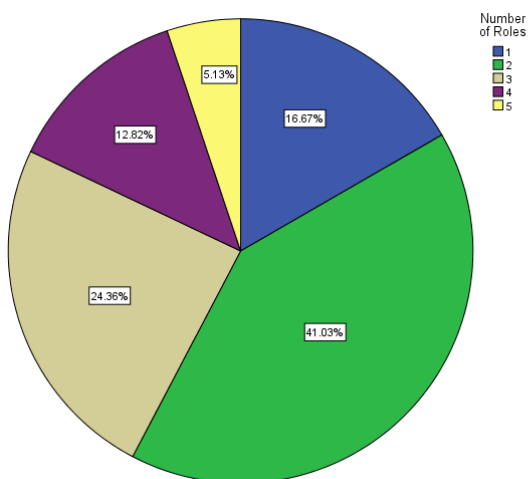
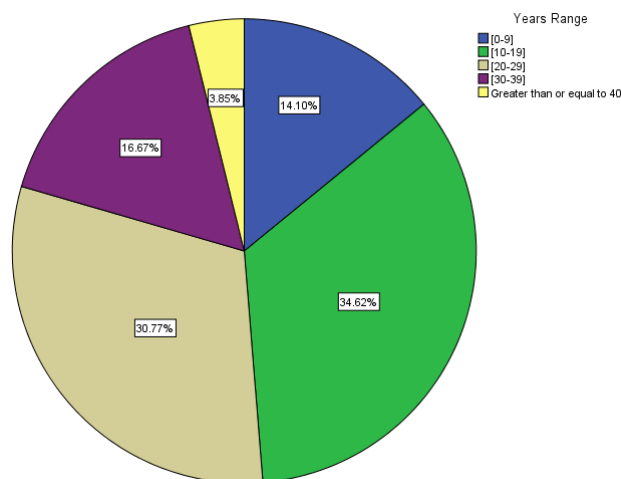
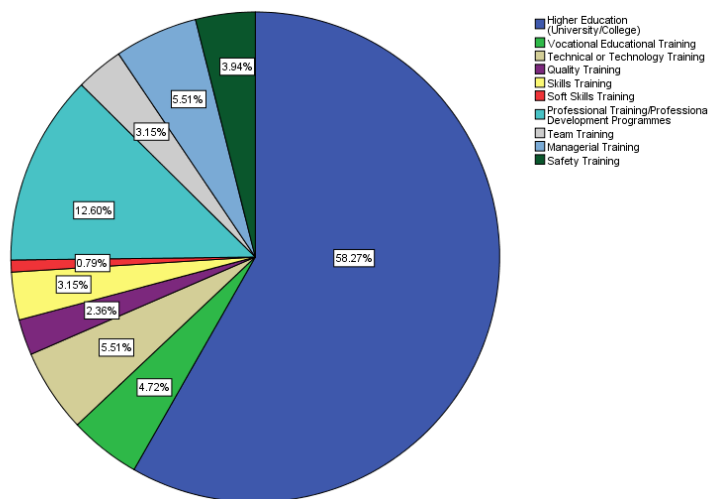


Figure 11: Respondents’ Time Involved in Lecturing/Teaching Activities



Source: Authors

Figure 12: Respondents’ Teaching Sectors



Source: Authors

Concerning teaching sectors, the current study identified ten sectors; these include ‘Higher Education (University/College)’, ‘Vocational Educational Training’, ‘Technical or Technology Training’, ‘Quality Training’, ‘Skills Training’, ‘Soft Skills Training’, ‘Professional Training/Professional Development Programmes’, ‘Team Training’, ‘Managerial Training’, ‘Safety Training’. The outcome shows that most respondents only teach in one teaching sector; the survey indicates that 69.23% of respondents are concentrated on one sector; their preferred teaching sector is ‘Higher Education (University/College)’. This high percentage explains why the teaching sector average is 1.6. Next follows 16.67% of respondents working in two teaching sectors; in most cases, the predominant combination is ‘Higher Education (University/College)’ and

'*Professional Training/Professional Development Programmes*'. As the number of teaching sectors increases, the number of respondents decreases. For instance, 1.28% of respondents work in 7 teaching sectors; the same percentage applies to respondents working in 8 teaching sectors. The same data also indicates that the predominating teaching sector is '*Higher Education (University/College)*' with 58.27% of the total. '*Professional Training/Professional Development Programmes*' follow with 12.60%. '*Soft Skills Training*' as a teaching sector represents less than 1% (see Figure 12). In addition, respondents classify their average lecturing/teaching experience as very good.

The number of subjects being taught by respondents varies. It depends on institutions' policies or respondents' knowledge and experience. In general terms, 14.10% of respondents lecture/taught 5 different subjects, while 11.54% deliver 2 subjects. Respondents delivering either 4 or 6 subjects account for the same percentage (8.97%). Also, the greater the number of subjects delivered, the lesser the number of respondents. As a result, 10.24% of respondents deliver between 18 and 31 subjects. The most lectured/taught subjects are '*Logistics and Supply Chain Management*', '*Transport Management and Operations*', '*International Logistics*', '*Economics of Sea Transport*' and '*Introduction to Shipping*'. The remaining subjects follow. What the outcome suggests is that little attention is being given to subjects such as '*Maritime Logistics*' or '*Maritime Arbitration and Mediation*' despite their importance. While it is understood that '*Maritime Logistics*' as a subject is relatively new even though much has been written about '*International Logistics*', the same does not happen with '*Maritime Arbitration and Mediation*', which has always been there. This outcome can only suggest that they may end up being delivered within the scope of other subjects, such as '*International Logistics*' or '*Maritime Law*'. To assess the veracity of this assumption would require the authors to investigate the contents delivered within the scope of the other subjects by the different institutions, which is out of the scope of this work.

The outcome also suggests that by focusing on '*International Logistics*', '*Logistics and Supply Chain Management*' and associated topics, educational institutions are shifting education from a narrow to a broader perspective. Only time will tell whether this is the right or the wrong direction; for sure, the lecturing/teaching of shipping-related subjects must be kept. Learning about an industry that Stopford (2009)³²⁷ claims to have more than 5000 years is fundamental to being acquainted with its terminology, market fundamentals, operations, and contractual arrangements. However, maritime education and training must become more adaptable. The speed at which maritime technology is changing, driven by the technological changes emerging from the industry decarbonisation, digitalisation, and digital transformation, implies that maritime education and training institutions must be prepared to revise course contents more frequently than in the past leading to the incorporation of subjects supporting the change of competencies that future maritime professionals ashore and on board. For instance, digitalisation and decarbonisation will force the introduction of new clauses in contractual arrangements such as new building contracts, charter parties and sale and purchase (Baltic and International Maritime Council, 2021b)³²⁸. If this is not achieved, maritime education and training will be outdated, and the educational gaps shown by Schinas and Thalassinou (2003)³²⁹ will enlarge.

When investigating respondents' research activities, eight types of research work were identified. These include '*Own Research*', '*Bachelor Projects Supervision*', '*Master Thesis Supervision*', '*PhD Thesis Supervision*', '*Research Proposals*', '*Research Projects*', '*Peer Review/Proposals Evaluation*' and '*No Research Activities*'. The inclusion of '*No Research Activities*' aimed to target respondents who only focus their work on 'Lecturing/Teaching'. Out of the activities identified, '*Own Research*' accounts for 20.48% of the activities performed. '*Research Projects*' and '*Master Thesis Supervision*' follow next with 16.27% and 14.76%, respectively (see Figure 13).

When investigating only those respondents that carried out research activities, the outcome shows that 24.68% of respondents are engaged in 6 types of the research activities identified; in generic terms, these activities are '*Own Research*', '*Master Thesis Supervision*', '*PhD Thesis Supervision*', '*Research Proposals*', '*Research Projects*', '*Peer Review/Proposals Evaluation*' even though there are variations among respondents. Next, 16.88% of respondents are involved in 4 activities; here no pattern is identified, even though '*Research*

³²⁷ Stopford, M. (2009). *Maritime Economics*. Routledge: United Kingdom.

³²⁸ Baltic and International Maritime Council (2021b). BIMCO tackles challenging carbon rules with new charter party clauses. *Baltic and International Maritime Council*. Retrieved from: <https://www.bimco.org/news/priority-news/20210528-bimco-tackles-challenging-carbon-rules-with-new-charter-party-clauses> [accessed 31 July 2022].

³²⁹ Schinas, O. and Thalassinou, E. (2003). Adjusting Basic Maritime Training in an E-Learning Environment. *European Research Studies*, 6(3-4), pp.237-256. Retrieved from: <https://www.ersj.eu/journal/112> [accessed 25 July 2022].

Proposals’ is common to all of them. Finally, respondents involved in 2 and 3 research activities have the same in percentage (12.99%); here, *Own Research*’ is common to most of them, and then different combinations apply (see Figure 14).

Figure 13: Type of Research Activities Carried Out by Respondents (N=78)

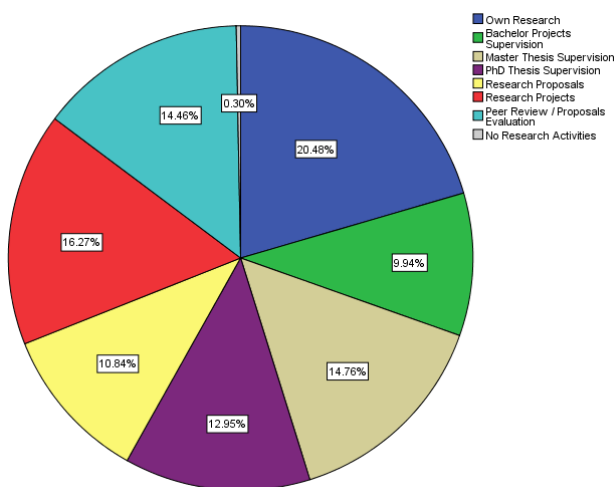
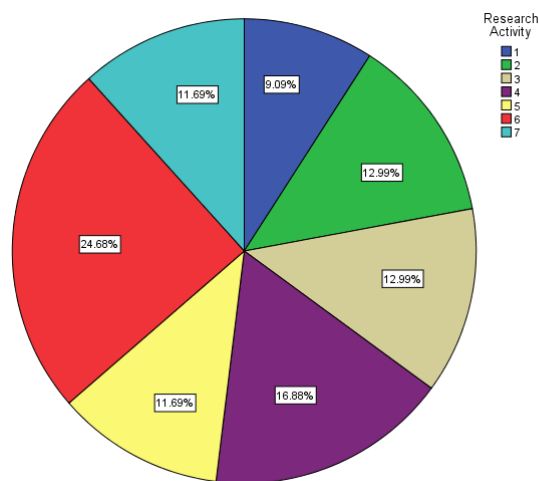


Figure 14: Research Activities in Number Carried Out by Respondents (N=77)

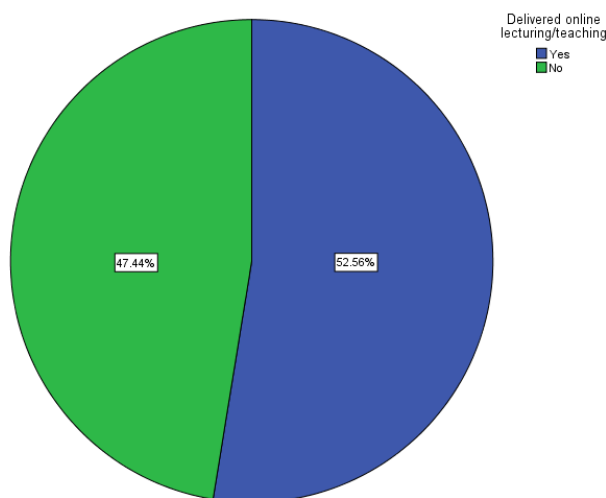


Source: Authors

5.3. Respondents’ Online Training Pre-COVID-19

To understand how respondents were prepared to deal with the challenges derived from the COVID-19 Pandemic, they were asked whether they had delivered online lecturing/teaching before the COVID-19 Pandemic. The survey’s outcome indicated that 52.3% had already delivered online training while the remaining 47.44% had not (see Figure 15). Eventually, the outcome suggests that all respondents were delivering face-to-face learning, however a percentage of them were delivering a mix of face-to-face and online lectures simultaneously depending on the educational programmes.

Figure 15: Respondents’ Having Delivered Online Lecturing/Teaching Before the COVID-19 Pandemic, in % (N=78)

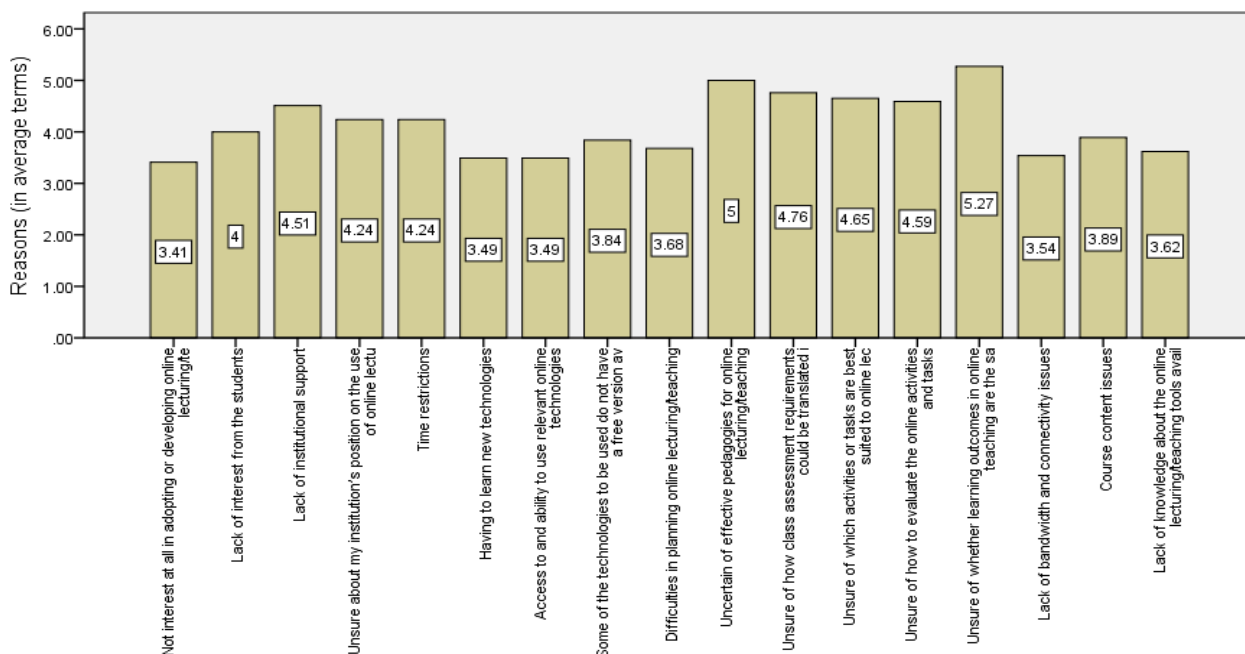


Source: Authors

When enquired about the reasons that prevented them from adopting or developing online lecturing/teaching, respondents (N=37) identified nine main reasons, with an average greater than or equal to

4, out of a list of seventeen possible ones (see Figure 16). These are, by descending order of importance, 1) ‘Unsure of whether learning outcomes in online teaching are the same as those in face-to-face lecturing/teaching’, 2) ‘Uncertain of effective pedagogies for online lecturing/teaching’, 3) ‘Unsure of how class assessment requirements could be translated into an online context’, 4) ‘Unsure of which activities or tasks are best suited to online lecturing/teaching’, 5) ‘Unsure of how to evaluate the online activities and tasks’, 6) ‘Lack of institutional support’, 7) ‘Unsure about my institution’s position on the use of online lecturing/teaching’, 8) ‘Time restrictions’, and 9) ‘Lack of interest from the students’.

Figure 16: Reasons Preventing Respondents from Adopting or Developing Online Lecturing/Teaching (N=37)



Source: Authors

An insight into this outcome suggests that the inexistence of guidelines due to a possible lack of institutional support derived from inexistent policy towards e-learning may be the actual reason for this outcome. Moreover, the burden of work that educators face daily is such that they do not have the time to explore alternative methods and modes for delivering their lecturing/teaching activities.

5.3.1. The Online Training Pre-COVID-19 Experience

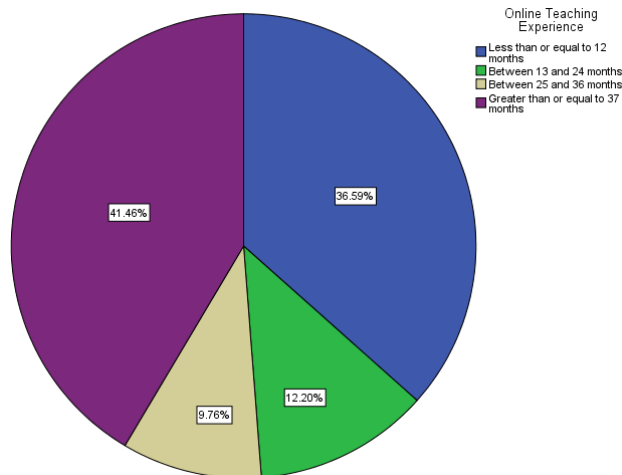
The following paragraphs present the findings of the 41 respondents who delivered online lecturing/teaching before the COVID-19 pandemic. They profile their experience of online lecturing/teaching activities, which were already part of their daily routine.

Respondents’ experiences of online lecturing/teaching before the COVID-19 Pandemic vary (see Figure 17). About 41.46% of respondents have an experience greater than or equal to 37 months; on the other hand, about 36.59% have an experience less than or equal to 12 months. This highlights an unbalanced distribution of experience among respondents. The findings also indicate that respondents having an experience within [13–24 months] and [25–36 months] modal classes account for 21.96% altogether. These results claim that further incentive must be given to educators that are not experienced, which according to the survey outcome, may represent about 58.55% of the surveyed population.

In this survey, nine online lecturing/teaching types have been identified. They are ‘Blended learning (incl. flipped classroom)’, ‘Fixed e-learning’, ‘Interactive online learning’, ‘Synchronous online learning’, ‘Adaptive e-learning’, ‘Individual online learning’, ‘Asynchronous online learning’, ‘Linear e-learning’ and ‘Collaborative online learning’. Out of the nine types of online lecturing/teaching that have been identified, four types predominate. ‘Synchronous online learning’, ranks first place with 20.83%. Next, ‘Blended learning (incl. flipped classroom)’ accounts for 18.33%. ‘Asynchronous online learning’ follows with 17.50%, and ‘Interactive online learning’ totals 15.83%. Altogether these four types represent 72.49% of the available types

(see Figure 18). When questioned about the number of online lecturing/teaching types delivered, the outcome identifies that 21.95% of respondents deal with only one type, while the same percentage deals with two types. On the opposite side of the scale, 2.44% of respondents deal with seven types of online lecturing/teaching (See Figure 19).

Figure 17: Experience of Respondents Who Have Delivered Online Lecturing/Teaching Before COVID-19 Pandemic (N=41)



Source: Authors

Figure 18: Types of Online Lecturing/Teaching in Number and Percentage Delivered by Respondents (N=41)

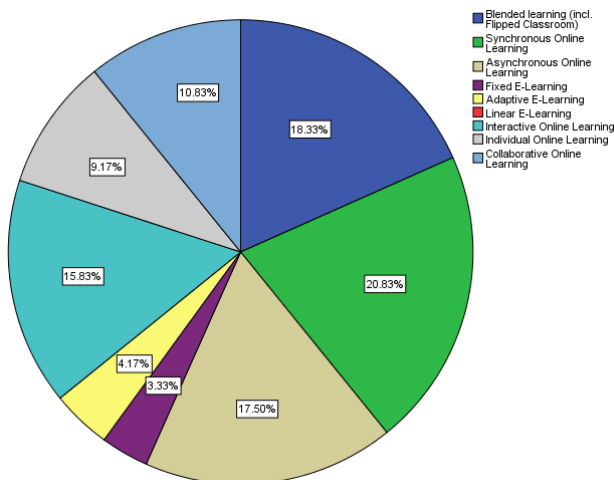
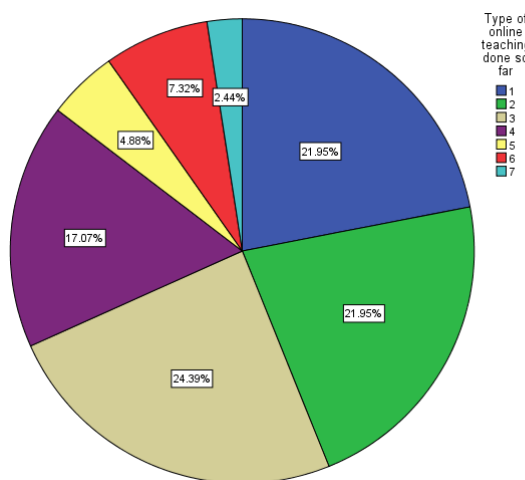


Figure 19: Types of Online Lecturing/Teaching in Number and Percentage Delivered by Respondents (N=41)

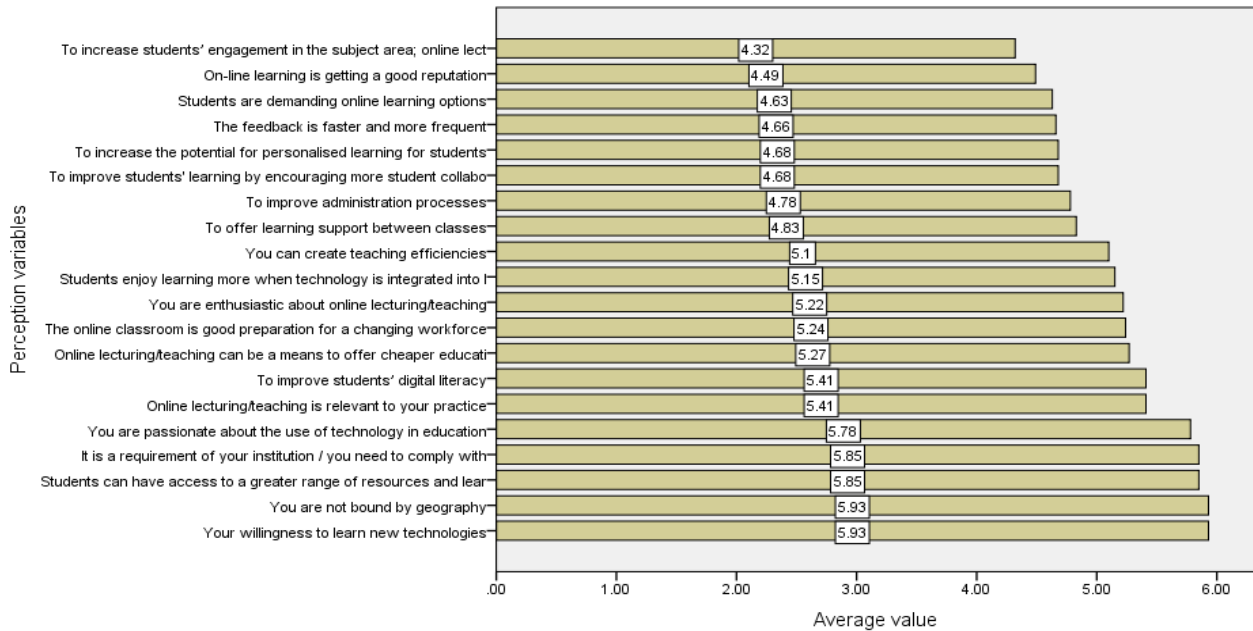


Source: Authors

In employing the types of online lecturing/teaching identified, respondents were asked how they perceive the adoption/development of online lecturing/teaching. For this analysis, the survey questionnaire identified twenty perception variables. The outcome indicates that all the perception variables identified are relevant, as each presents an average above 4.0 (see Figure 20). However, out of the twenty, the most relevant ones by descending order of importance are ‘Your willingness to learn new technologies’, ‘You are not bound by geography’, ‘Students can have access to a greater range of resources and learning materials 24 hours a day, 7 days a week’, ‘It is a requirement of your institution / you need to comply with an institutional policy’, ‘You are passionate about the use of technology in education’, ‘Online lecturing/teaching is relevant to your practice’, ‘To improve students’ digital literacy’, ‘Online lecturing/teaching can be a means to offer cheaper education’, ‘The online classroom is good preparation for a changing workforce’, ‘You are enthusiastic about online lecturing/teaching’, ‘Students enjoy learning more when technology is integrated into

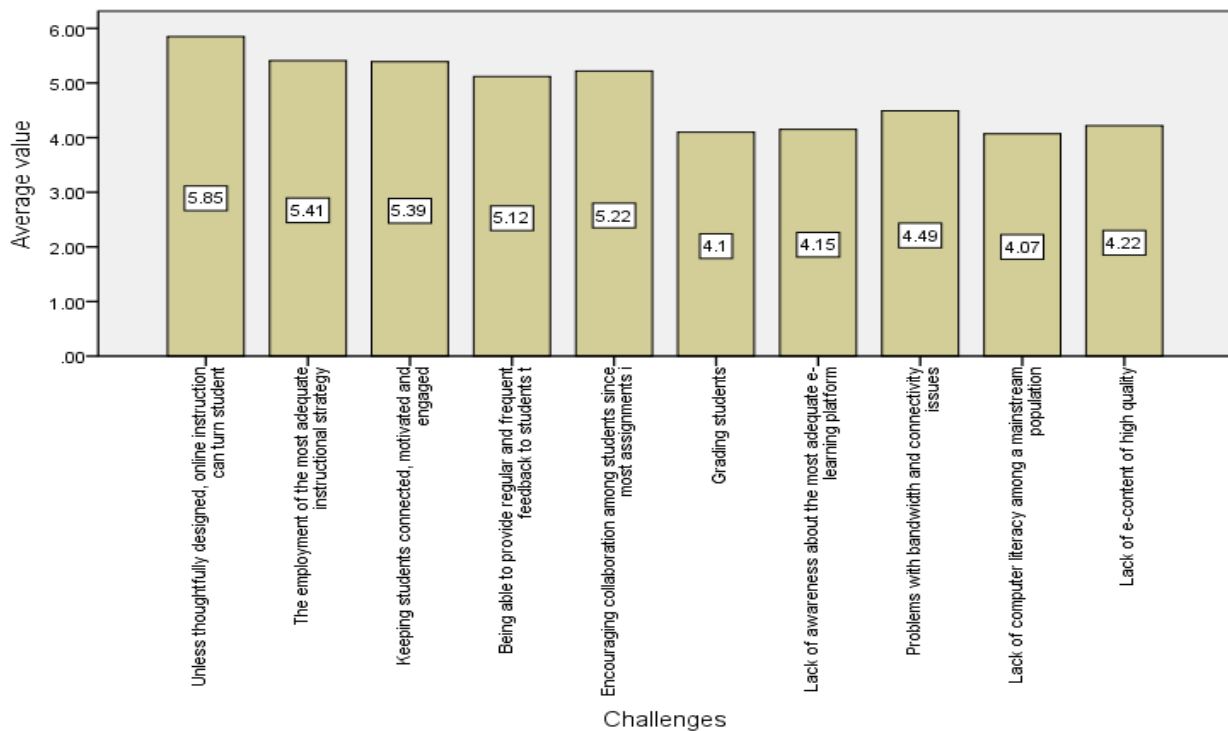
lecturing/teaching activities’, ‘You can create teaching efficiencies’. All of them present an average above 5.0 out of 7.0. The perception variables identified here are aligned with the advantages offered by distance learning in general and by e-learning in particular, which are present in the body of the literature (see § 2.1. Distance Learning).

Figure 20: Perception variables acknowledged by respondents regarding the adoption/development of online lecturing/teaching (N=41)



Source: Authors

Figure 21: Challenges faced by respondents when adopting or developing online lecturing/teaching practices (N=41)



Source: Authors

Nevertheless, respondents face challenges when adopting or developing online lecturing/teaching practices. In this research, ten challenges were identified. The outcome suggests that respondents consider all of them important, given that their average is above 4.0. However, 5 of them appear to stand out. These are by

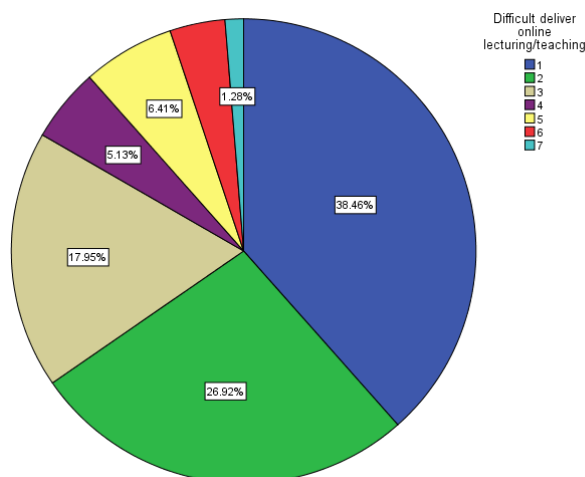
decreasing order of importance 1) ‘Unless thoughtfully designed, online instruction can turn students into passive observers rather than active participants’, 2) ‘The employment of the most adequate instructional strategy’, 3) ‘Keeping students connected, motivated and engaged’, 4) ‘Encouraging collaboration among students since most assignments involve asynchronous communications’, and 5) ‘Being able to provide regular and frequent feedback to students to keep them engaged and committed’ (see Figure 21). Faced with this situation, respondents indicated that based on their experience, they felt ‘Pretty confident’ in delivering their online learning/teaching.

5.4. Respondents’ Online Training During COVID-19 Pandemic

As the COVID-19 Pandemic evolved, educators were forced to shift their lectures/training activities from a physical to a virtual (online) environment. The paragraphs that follow describe how respondents dealt with this situation.

In order to understand the overall situation respondents went through during the confinement days of the COVID-19 pandemic, the survey asked how difficult it was for them to adapt their lives and deliver their online lecturing/teaching, not from a physical environment but a remote one. As most lecturing/teaching was being delivered in-class until at least December 2019, given the different speeds at which the virus spread throughout the world, it is understood that the possibility of respondents having an office at home properly equipped is low. In this regard, 38.46% of respondents claim that such a shift was not difficult; only 5.13% of respondents claim that it was difficult, and 1.28% stated that it was extremely difficult (see Figure 22).

Figure 22: How difficult it was for you to adapt your life and deliver your online lecturing/teaching (N=78)



Source: Authors

In having to adapt to a remote environment, the survey inquired respondents about the type of instructional strategies that they used for their online lecturing/teaching. Instructional strategies refer to each educator’s strategies to achieve the learning objectives of each subject or module. The study considered the five instructional strategies identified by Saskatchewan Education (1991)³³⁰: ‘Direct Instruction’, ‘Interactive Instruction’, ‘Independent Study’, ‘Indirect Instruction’, ‘Experiential Learning’. Out of these, ‘Interactive Instruction’ (30.00%), ‘Direct Instruction’ (28.89%) and ‘Independent Study’ were the instructional strategies most used by respondents (Figure 23). However, the information gathered also suggests that some respondents used more than one type of instructional strategy. For instance, 27 respondents only used one instructional strategy, while 6 used the five types of instructional strategies identified in this survey questionnaire (see Figure

³³⁰ Saskatchewan Education (1991). *Instructional Approaches: A Framework for Professional Practice*. Retrieved from: <https://pubsaskdev.blob.core.windows.net/pubsask-prod/15320/15320-instructional-approaches.pdf> [accessed 31 July 2022].

24). Data also highlights combinations of ‘Interactive Instruction’ with ‘Independent Study’ and ‘Direct Instruction’ with ‘Independent Study’.

Figure 23: Types of instructional strategies used by respondents in their online lecturing/teaching (N=78)

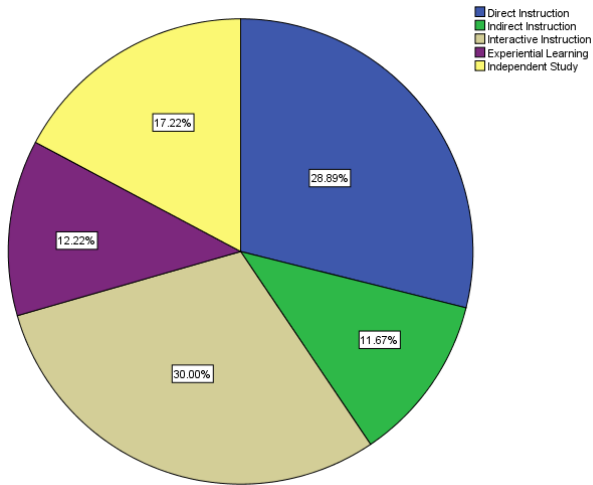
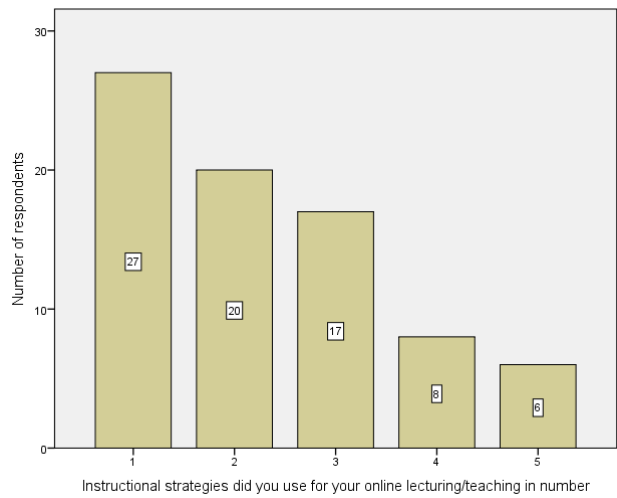


Figure 24: Number of instructional strategies used by respondents (N=78)



Source: Authors

In addressing their online learning, respondents were asked about the type of online lecturing/teaching they delivered during this period. The study identified eight types of online learning, namely ‘Synchronous Online Learning’, ‘Asynchronous Online Learning’, ‘Fixed E-Learning’, ‘Adaptive e-Learning’, ‘Linear E-Learning’, ‘Interactive Online Learning’, ‘Individual Online Learning’ and ‘Collaborative Online Learning’. Out of these, respondents have identified ‘Synchronous Online Learning’ (31.60%), ‘Asynchronous Online Learning’ (23.58%), ‘Interactive Online Learning’ (16.51%) and ‘Fixed e-Learning’ (12.26%) to be the main types of online learning. Altogether, they represent 83.95% of the available possibilities (see Figure 25).

Figure 25: Types of Online Learning adopted by respondents (N=78)

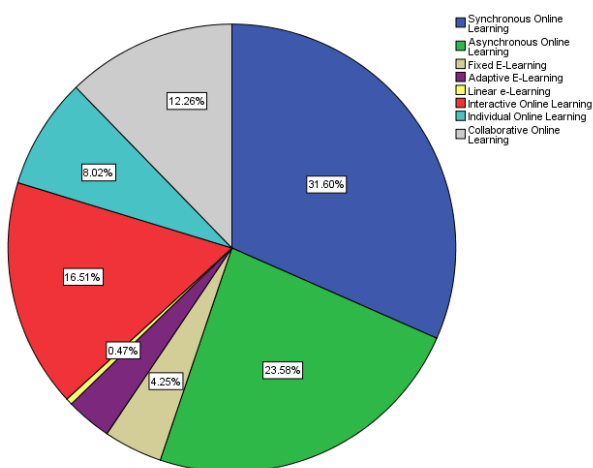
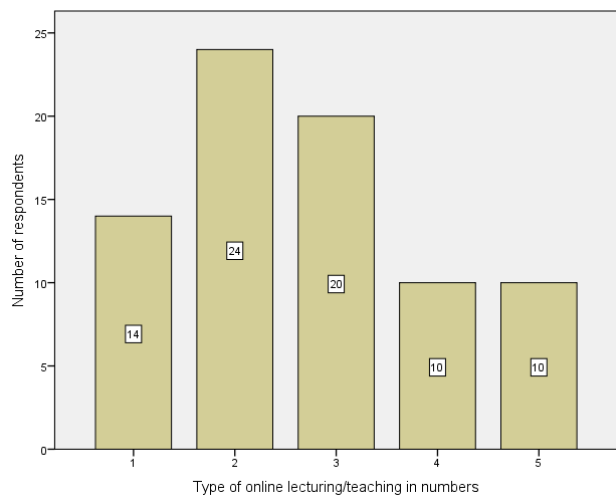


Figure 26: Types of online learning used by respondents in number (N=78)



Source: Authors

The information gathered also indicates that 14 respondents favoured only one type of online learning, while 4 and 5 different types of online learning were used by 10 respondents each, even though data indicate that respondents tend to use mainly two types of online learning (see Figure 26). Based on the data gathered, the survey also indicates that whenever more than one type of online learning is involved, respondents tend to combine ‘Synchronous Online Learning’ with ‘Asynchronous Online Learning’. As the number of types of online learning increases, then combinations vary with no standard pattern.

When assessing the delivery of synchronous online learning, this survey identified 14 types of instructional methods available to respondents (see Figure 27). Out of these, the three most used instructional methods are ‘Synchronous Lectures’, ‘PowerPoints’ and ‘Discussion’. These are followed by ‘Use of video clips’ and ‘Projects’ (see Figure 26). In all this process, there is no consensus regarding the number of instructional methods to be used (see Figure 28). For instance, 15 respondents claim to be using five instructional methods while 11 use seven and only 1 uses thirteen methods. However, data also indicates that the number of respondents using an increased number of instructional methods is very limited. While it is acknowledged that an increased number of instructional methods helps students to learn and apply concepts better, it may also complicate the planning of lecturing/teaching activities, mainly when subjects are delivered for the first time.

Figure 27: Instructional methods adopted for delivering synchronous online learning (N=78)

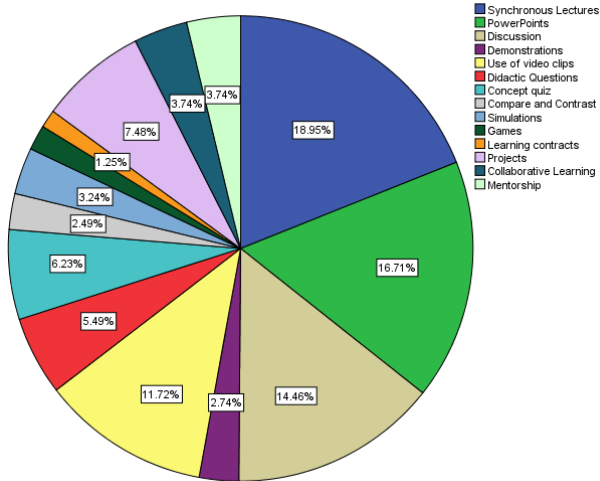
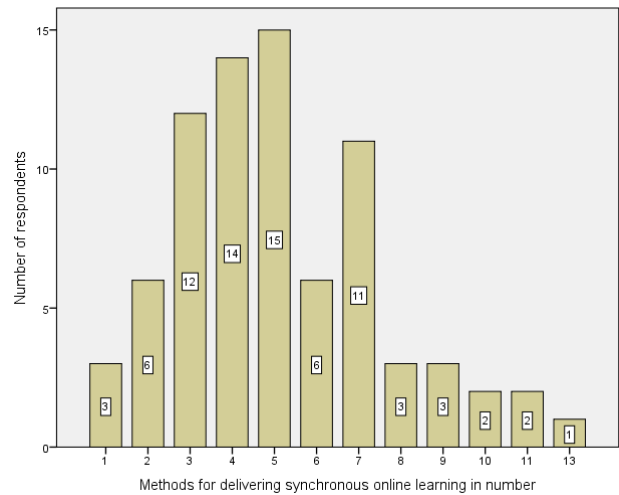


Figure 28: Instructional methods used for delivering synchronous online learning in number (N=78)



Source: Authors

Figure 29: Means adopted for delivering synchronous online learning (N=78)

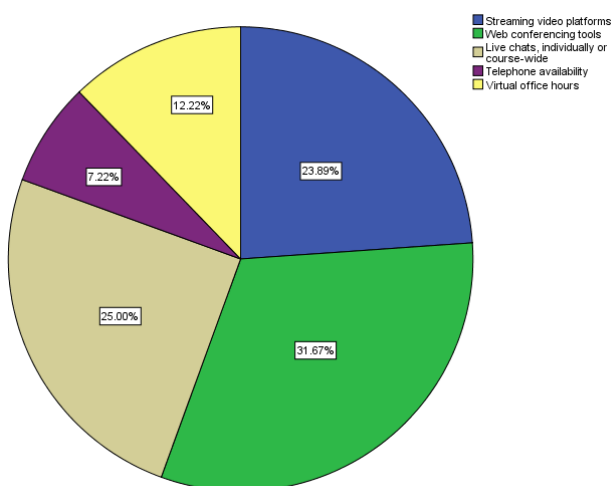
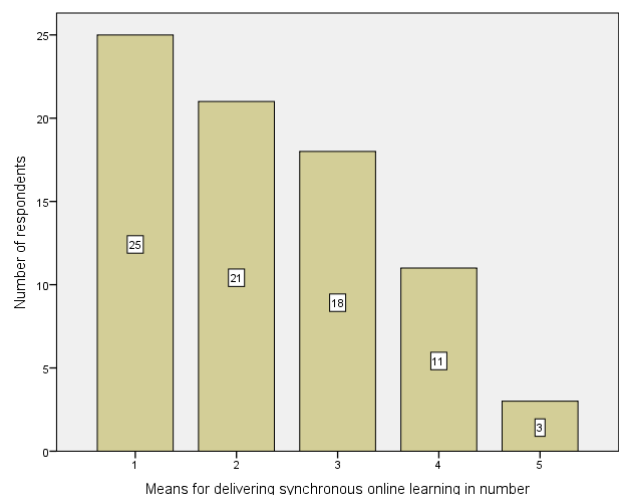


Figure 30: Means used for delivering synchronous online learning in number (N=78)



Source: Authors

For delivering synchronous online learning, this survey identified five types of instructional means available to respondents (see Figure 29). The outcome shows that for delivering synchronous online learning, respondents mainly used ‘Web conferencing tools’ (31.67%) followed by ‘Live chats, individually or course-wide’ (25.00%) and ‘Streaming video platforms’ (23.89%). The data also indicates that most respondents used more than one means; for instance, 21 respondents used two means and 18 used three means. Conversely, only 25 respondents use one means for delivering synchronous online learning. However, data also indicates that

the number of respondents using an increased number of instructional means is low (see Figure 30). This may be justified from a digital literacy perspective, in which the increasing number of means forces respondents to spend more time learning them despite their similarities; therefore, the issue of time is also a constraint. Finally, the lack of technology; COVID-19 pandemic has shown the need to have updated computer equipment with hard disk space to install the software needed and high random-access memory allowing the running of different software at the same time to avoid computer crashing, not to mention the need of high-speed internet routers to connect respondents' computers to institutions servers.

Figure 31: Instructional methods used for delivering asynchronous online learning (N=78)

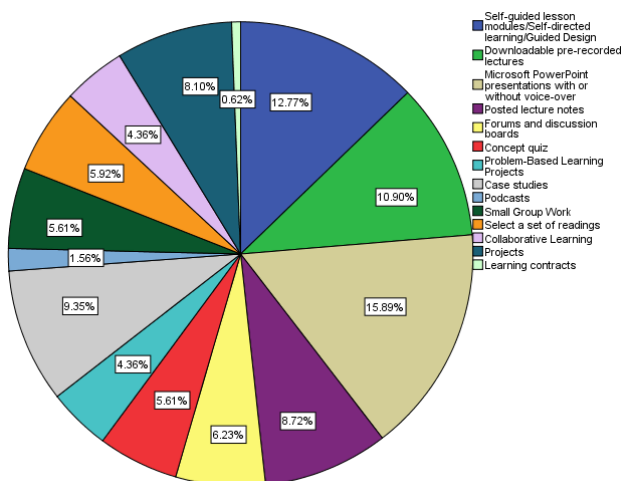
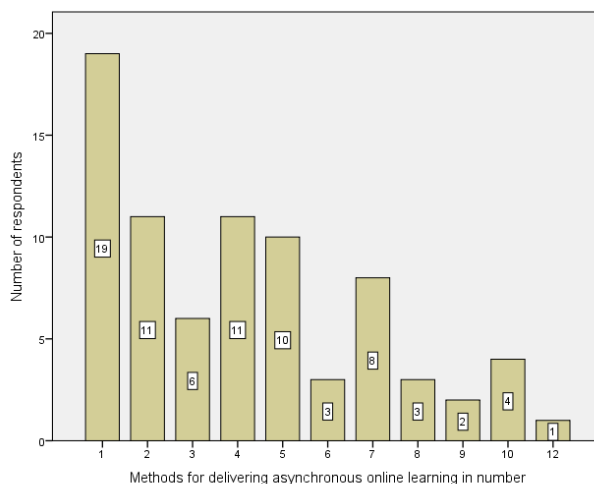


Figure 32: Instructional methods used for delivering asynchronous online learning in number (N=78)



Source: Authors

Figure 33: Means used for delivering asynchronous online learning

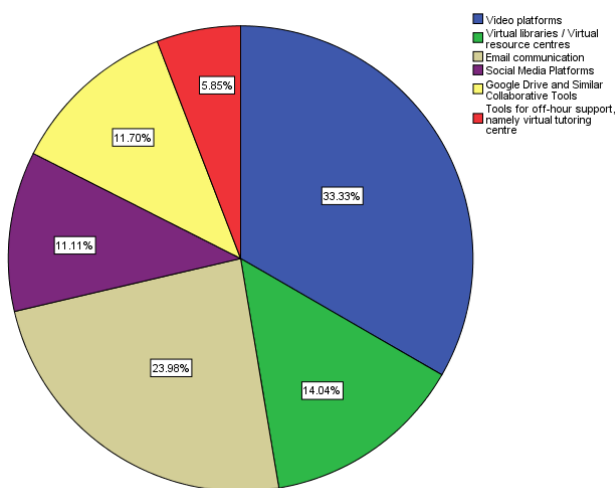
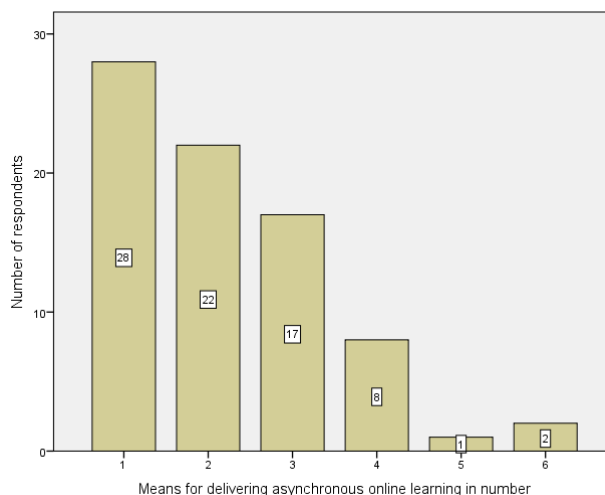


Figure 34: Means used for delivering asynchronous online learning in number (N=78)



Source: Authors

For this survey, this research identified fourteen types of instructional methods which respondents can use for delivering asynchronous online learning (see Figure 31). Out of these, the most used ones are 'Microsoft PowerPoint presentations with or without voice-over' (15.89%), 'Self-guided lesson modules/Self-directed learning/Guided Design' (12.77%), 'Downloadable pre-recorded lectures' (10.90%), 'Case studies' (9.35%) and 'Posted lecture notes' (8.72%). Supporting this outcome, Figure 32 identifies the number of instructional methods used by each respondent. Accordingly, 19 respondents tend to use only one instructional method, while on the extreme opposite position, 1 respondent uses 12 instructional methods, adding complexity to lecture planning.

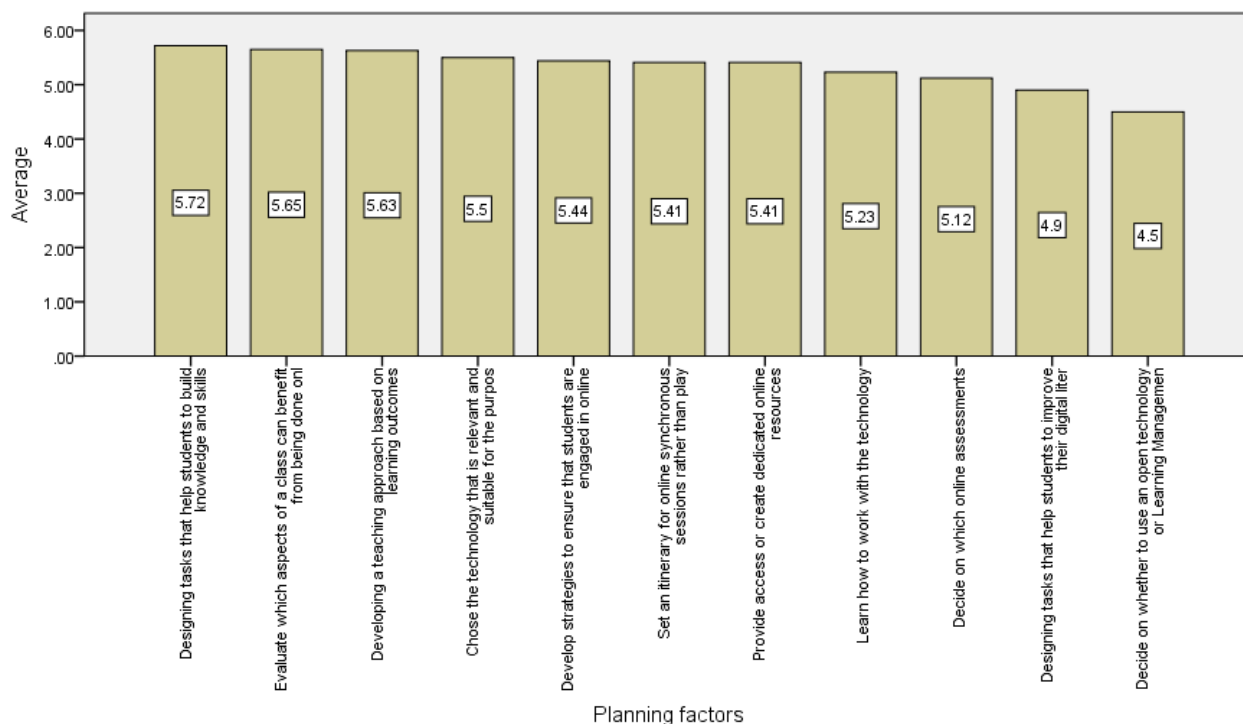
For delivering asynchronous online learning, this survey identified six types of instructional means available to respondents (see Figure 33). The survey outcome indicates that respondents mainly used ‘*Video platforms*’ (33.33%), followed by ‘*Email communication*’ (23.98%) and ‘*Virtual libraries/Virtual resource centres*’ (14.04%). Likewise, the outcome indicates that most respondents used more than one means; for instance, 22 respondents used two means, and 17 respondents used three means. Conversely, only 28 respondents use one instructional means for delivering asynchronous online learning. However, data also indicates that the number of respondents using an increased number of instructional means is limited (see Figure 34). Therefore, the reasons identified for synchronous online learning also apply here.

The paragraphs that follow provide a deeper insight into how they have dealt with the planning of online lecturing/teaching, resources development, use of technology, delivery of online lecturing/teaching, assessment, and overall confidence.

5.4.1. Planning Online Lecturing/teaching and Resources Development

The planning of lectures/teaching activities is always time consuming. It involves picking up information and cross-checking it to ensure data validity. The situation is burdensome if educators are preparing subjects for the first time and have no guidance from where they can get some inspiration in how to approach the subject. Distributing contents along a timeframe is like making a puzzle where educators try to accommodate the all the items to be taught to meet the learning objectives. When shifting lectures/teaching online the planning of lectures/teaching activities becomes somehow more complicated since the virtual environment appears to create an icy barrier preventing a normal two-way communication. The issue of planning was already acknowledged by Coşofreţ and Avram (2020)³³¹.

Figure 35: Factors to be considered when planning online lecturing/teaching



Source: Authors

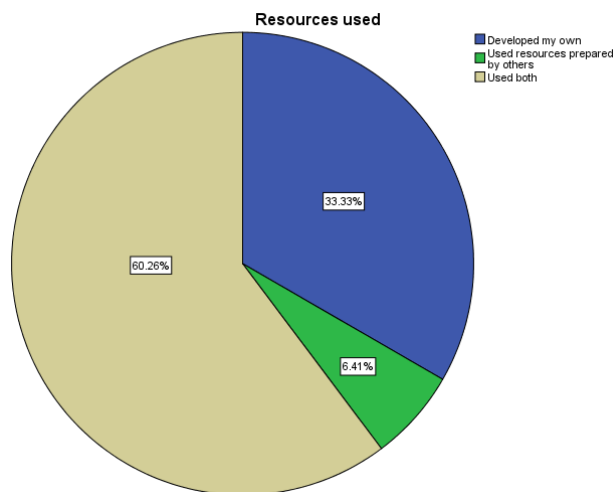
This survey identified 11 factors to be considered when planning online lecturing/teaching. Generically, respondents considered them all to be relevant since their average is above 4.0. However, out of these, the

³³¹ Coşofreţ, D. and Avram, E. R. (2020). Evaluation of the Maritime Higher Education didactic support during the coronavirus pandemic. Case Study. *The 15th International Conference on Virtual Learning ICVL 2020*, pp.493-499. Retrieved from: https://www.researchgate.net/publication/346075892_Evaluation_of_the_Maritime_Higher_Education_didactic_support_during_the_coronavirus_pandemic_Case_Study [accessed 10 October 2022].

three most important planning factors are ‘*Designing tasks that help students to build knowledge and skills*’, ‘*Evaluate which aspects of a class can benefit from being done online*’ and ‘*Developing a teaching approach based on learning outcomes*’ (see Figure 35).

In this process, respondents claimed to spend an average time of 10 hours planning activities. Nevertheless, the survey identified that some respondents take considerably more time (20 hours), while others take none. Furthermore, the time allocated may depend on a range of factors, such as respondents’ experience in delivering those lectures, lectures not needing to be constantly updated, or the number of subjects being delivered.

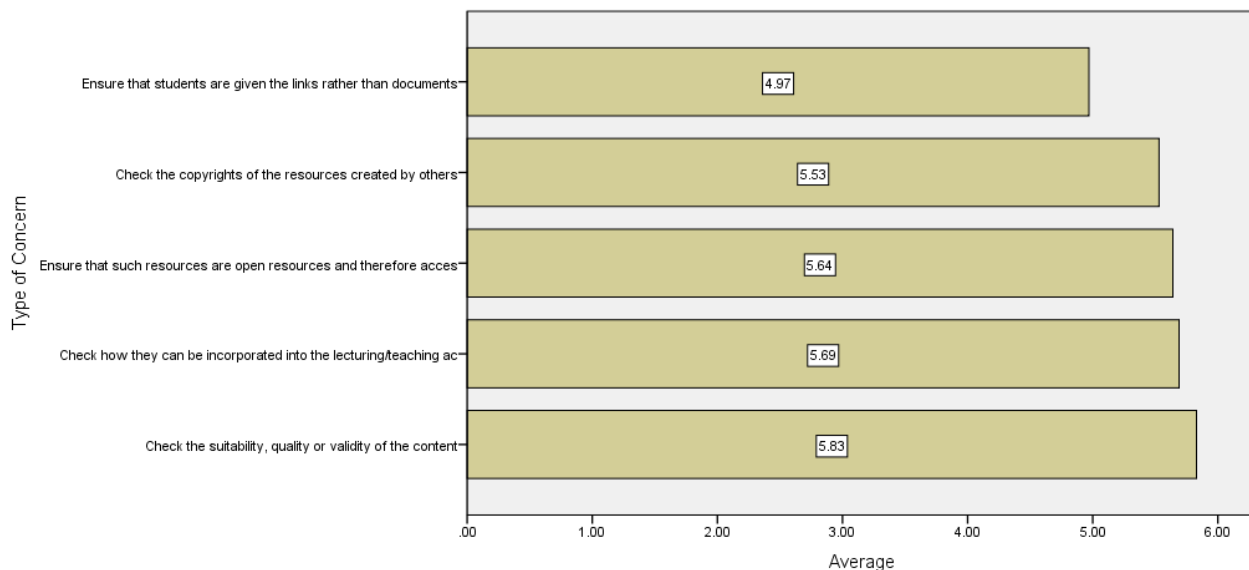
Figure 36: Type of online resources used by respondents (N=78)



Source: Authors

Within the scope of planning, the survey asked respondents how they dealt with the issue of resources. The outcome shows that about 33.33% of respondents claimed to develop their resources while 6.41% used resources prepared by others. Nevertheless, most respondents (60.26%) tend to use a mix of both in their lecturing/teaching activities (see Figure 36).

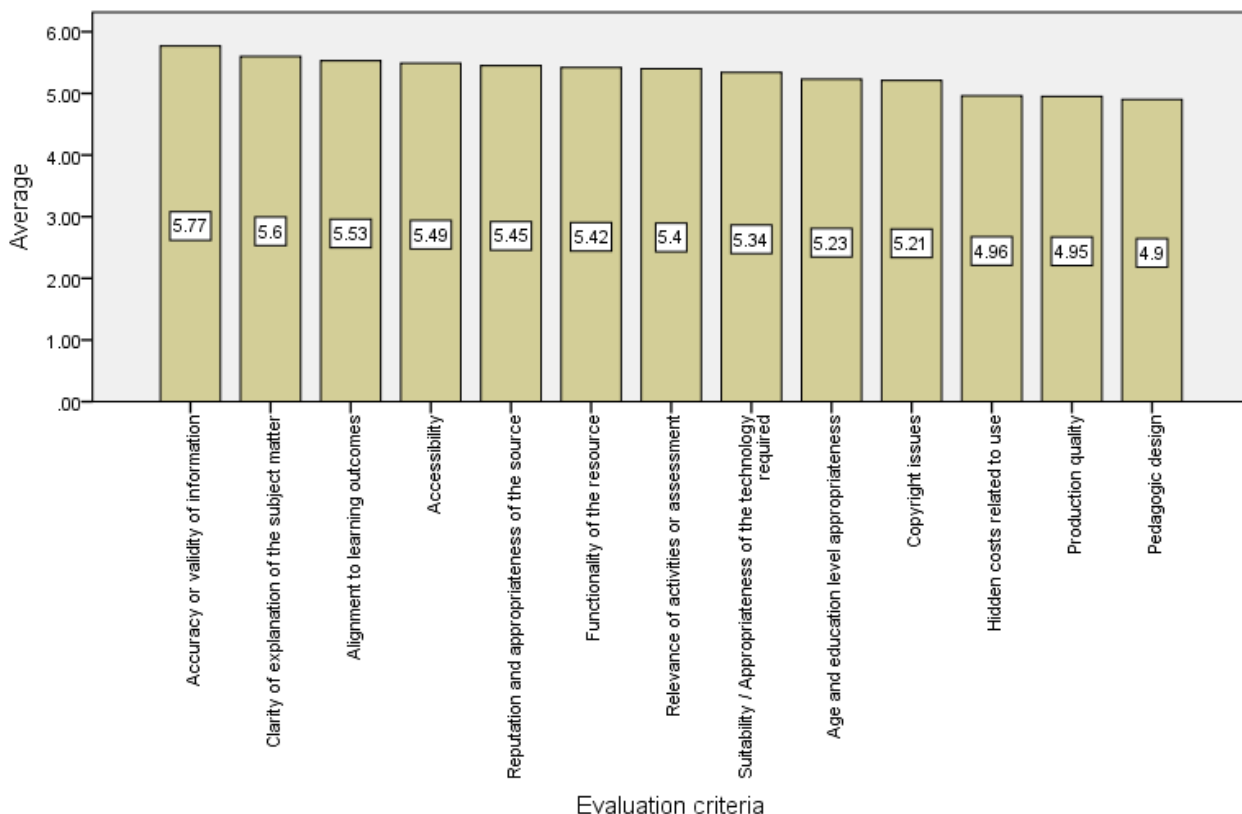
Figure 37: Concerns when using online resources



Source: Authors

Considering the use of online resources provided by others, the survey asked about respondents’ main concerns when using them. The study considered five concerns, namely ‘*Check the suitability, quality or validity of the content*’, ‘*Check how they can be incorporated into the lecturing/teaching activities*’, ‘*Ensure that such resources are open resources and therefore accessible by the students*’, ‘*Check the copyrights of the resources created by others*’ ‘*Ensure that students are given the links rather than documents*’. The outcome indicates that all the above concerns are considered important since their corresponding average is above 4.0. However, the most important aspects are the necessity to ‘*Check the suitability, quality or validity of the content*’ and ‘*Check how they can be incorporated into the lecturing/teaching activities*’ (see Figure 37). However, whether resources are developed from scratch or prepared by others, they must draw the attention and the interest of students particularly that the information available is so vast that students may run the risk of divert their attention.

Figure 38: Criteria considered when evaluating online resources



Source: Authors

In order to evaluate the suitability, quality or validity of the content of online resources, this study identified thirteen criteria (see Figure 38). Respondents considered all the criteria relevant since the average for each criterion is above 4.0. However, five criteria stand out, out of the thirteen listed criteria. These include ‘*Accuracy or validity of information*’, ‘*Clarity of explanation of the subject matter*’, ‘*Alignment to learning outcomes*’, ‘*Accessibility*’, and ‘*Reputation and appropriateness of the source*’, even though the difference in average is not significant. The least important ones are ‘*Production quality*’ and ‘*Pedagogic design*’ (see Figure 38). The issue of suitability, quality, or validity of the content of online resources is becoming more important than ever due to the increasing number of information sources, in which some are more reliable than others. This is particularly critical when dealing with statistical data, forcing educators sometimes to spend a considerable length of time checking the sources to guarantee the soundness of their work.

5.4.2. Use of Technologies

The survey asked about the type of technologies being used to deliver online lecturing/teaching; for that, it considered three possibilities; using ‘*Open (Free) Technologies*’, ‘*Closed (Paid) Technologies*’ or ‘*Both Technologies*’. Regarding their use, 52.56% of respondents tend to use open and closed technologies. Against

this percentage, 33.33% of respondents used open technologies and 14.10% closed technologies (see Figure 39). The reasons for using open technologies are identified in Figure 40. The outcome indicates that the six are relevant because their average is above 4.0; however, ‘*Reduced costs and Simplified Operations*’ is the main reason for using them. ‘*Improved interoperability*’ and ‘*Enhanced pedagogy*’ are the reasons that follow next (see Figure 40).

Figure 39: Type of technologies used by respondents (N=78)

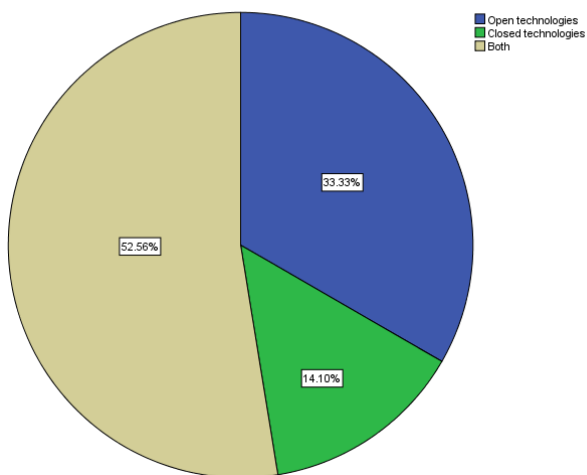
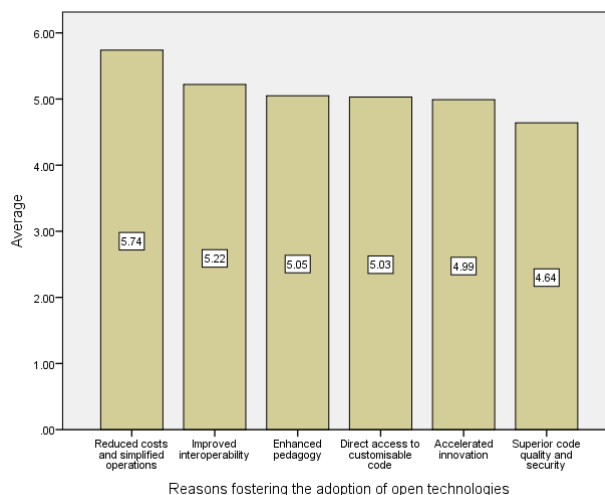
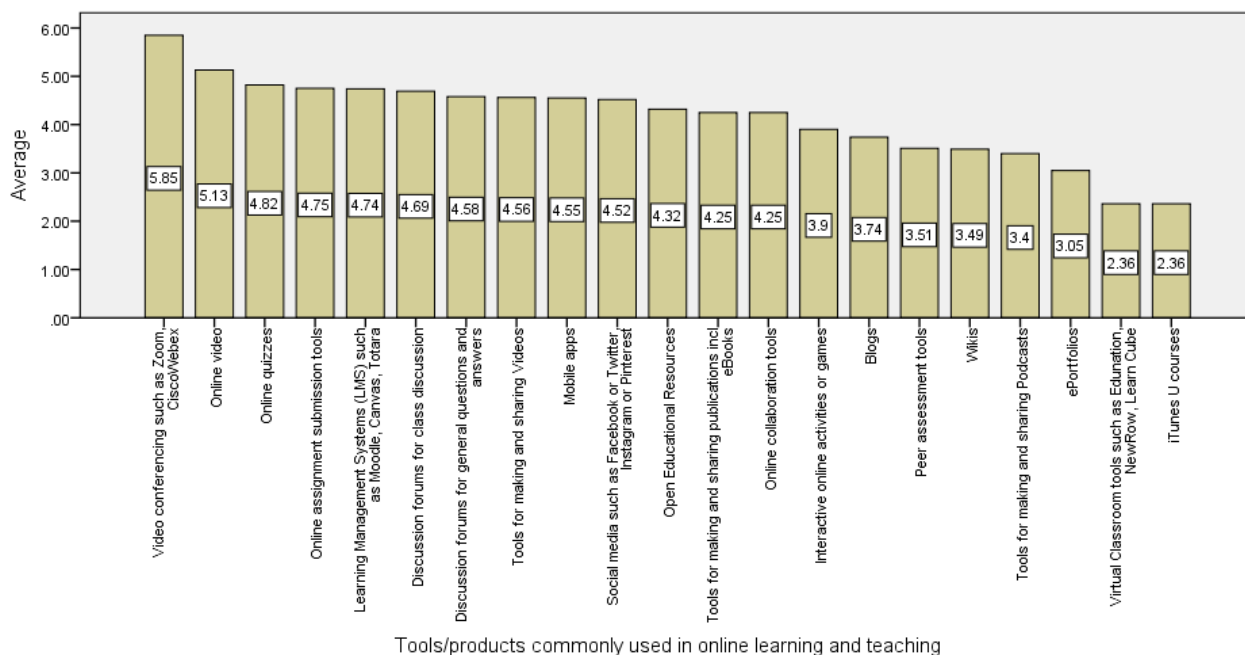


Figure 40: Reasons for fostering the adoption of Open Technologies



Source: Authors

Figure 41: Tools/Products used in online learning/teaching



Source: Authors

For delivering online lecturing/teaching, the survey identified a range of tools, 21 in total. These included ‘*Video conferencing platforms such as Zoom and Cisco Webex*’, ‘*Learning Management Systems (LMS) such as Moodle, Canvas, Totara*’, ‘*Open Educational Resources*’, ‘*Tools for making Podcasts*’, ‘*Wikis*’, ‘*Blogs*’ among many others (see Figure 41). When enquired how familiar respondents were with the tools/products available that can be incorporated into their online learning/teaching practice, respondents claimed that out of the 21 identified tools, 13 are considered relevant as their average is above 4.0. They claimed that they are most familiar with ‘*Video conferencing platforms such as Zoom and Cisco Webex*’; the two following tools

are ‘Online video’ and ‘Online quizzes’. A range of tools considered unimportant was also identified. These include ‘Interactive online activities or games’, ‘Blogs’, ‘Peer assessment tools’, ‘Wikis’, ‘Tools for making and sharing Podcasts’, ‘ePortfolios’, ‘Virtual Classroom tools such as Edunation, NewRow, Learn Cube’ and ‘iTunes U courses’ (see Figure 41).

This outcome eventually represents the lack of interest that some institutions have had towards online lecturing, since there is still the idea that online learning is always of poor quality and does not bring institutional credibility. This lack of institutional focus prevented educators from drawing their attention towards learning how to use different tools. Quite interesting to see that respondents considered ‘Interactive online activities or games’ unimportant which goes against the recent research claiming the use of serious gaming to improve students learning experience. Their use can be seen as the driver to attract Generation Z students to more conservative industries like the maritime industry, meaning that the future online programmes must be designed to address their way of learning. In the end, educators will have to learn how to use them to introduce them in their teaching activities.

Regarding video conference tools, based on the information available, the study considered eight video conferencing tools; these included ‘Zoom’, ‘Skype’, ‘Cisco Webex Meetings’, ‘Google Hangouts’, ‘Google Meet’, ‘GoToMeeting’, ‘Bluejeans’, and ‘Microsoft Teams’ even though many more exist in the market. Out of these, ‘Zoom’ is the most used video conferencing tool (24.64%), followed by Microsoft Teams (22.46%) and Skype (18.84%). The least used is Bluejeans (see Figure 42). Respondents’ feedback also indicates that most use more than one video conferencing tool; in fact, only 12.84% of respondents use only one video conferencing tool. For instance, the survey identified that ten respondents used only 1 video conferencing tool, 15 used 3, and six used 6. The number of video conferencing tools used by respondents may be directly related to the lecturing/teaching activities and the attendance of webinars that have proliferated during the high days of the COVID-19 pandemic, where webinars’ organisers prefer one video conferencing tool over another. Concerning this last issue, the choice of a video conferencing tool is much related to the streaming stability of the platform. The number of video conferencing tools used by respondents is presented in Figure 43.

Figure 42: Video Conferencing tools used by respondents (N=78)

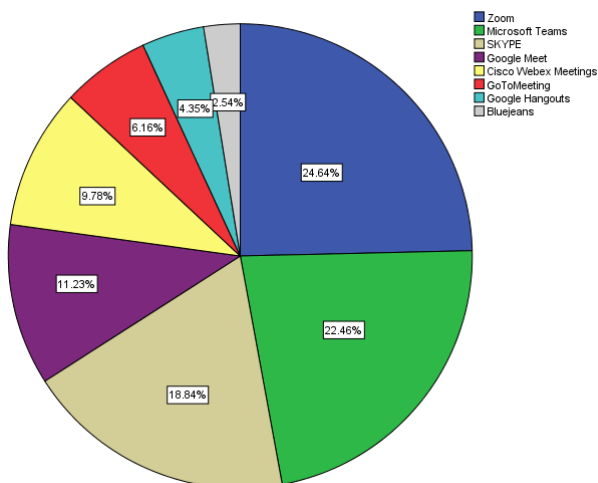
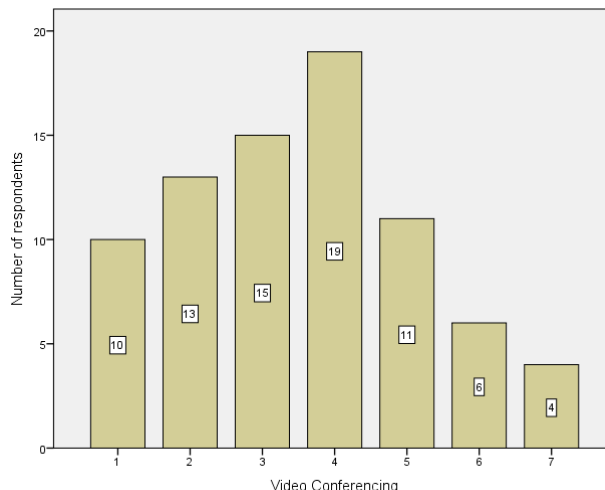


Figure 43: Number of video conferencing tools used by respondents (N=78)



Source: Authors

Within the technology scope, respondents were asked about their skills and effectiveness in using video conferencing tools. About 29.49% of respondents are ‘Pretty Confident’ with their use; 24.36% are ‘Very Confident’, and 20.51% are only ‘Confident’. The remaining percentage (25.63%) is distributed among those respondents that are ‘Extremely Confident’, ‘Slightly Confident’ and ‘Somewhat Confident’. Furthermore, as a sudden shift from in-class lecturing/teaching to a remote one occurred, the survey investigated educators’ confidence in their ability to effectively adapt and integrate digital technologies in their lecturing/teaching activities. Concerning this issue, about 26.92% of respondents are ‘Pretty Confident’ with their use; 24.36% are ‘Very Confident’, 20.51% are only ‘Confident’, and 12.82% are ‘Extremely Confident’. The remaining percentage (15.38%) is distributed among those respondents that are ‘Slightly Confident’, ‘Somewhat Confident’ and ‘Not Confident’.

Figure 44: Assessing respondents’ ability to find, evaluate, and compose clear information through writing and other media on various digital platform (N=78)

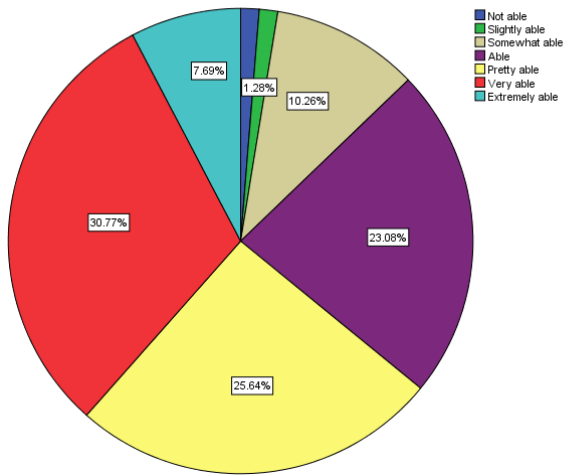
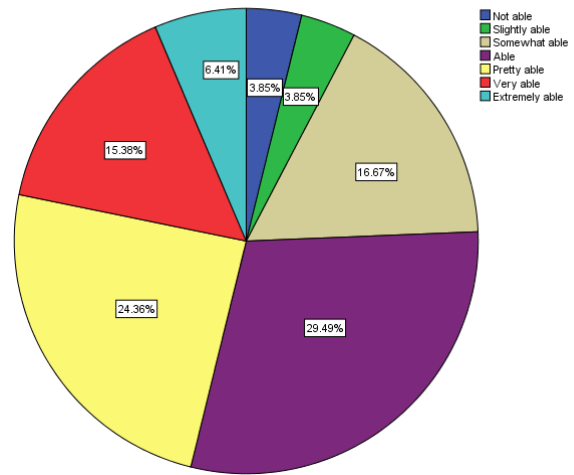
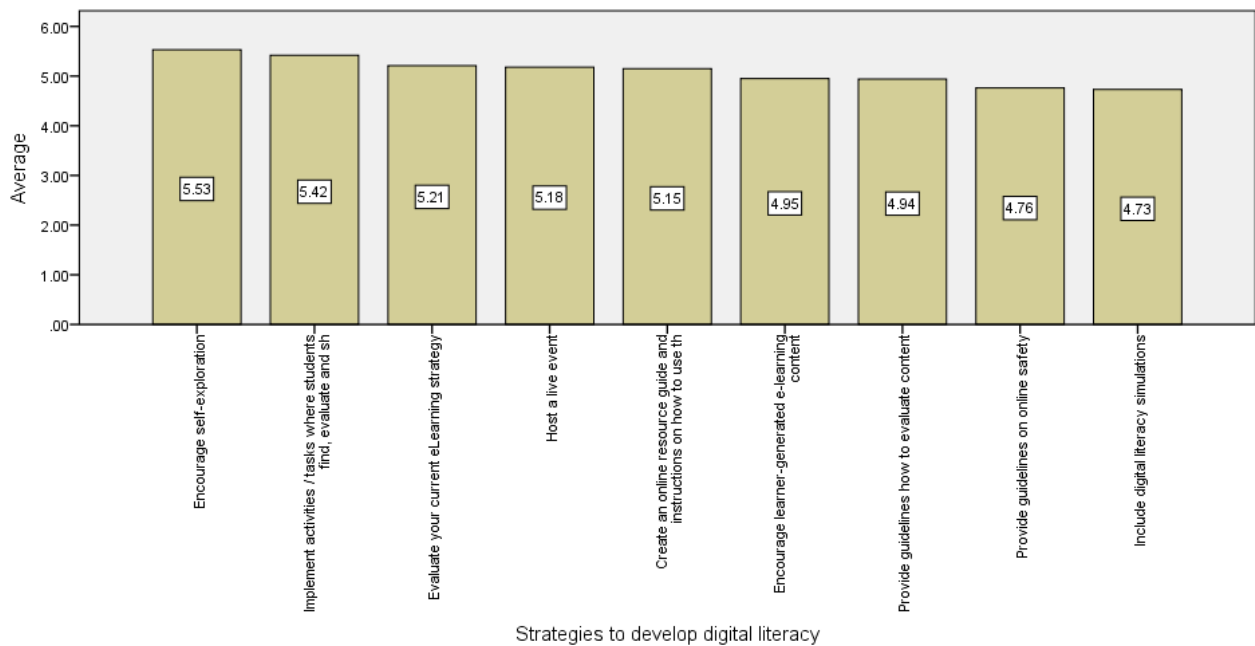


Figure 45: Assessing students’ ability to find, evaluate, and compose clear information through writing and other media on various digital platforms (N=78)



Source: Authors

Figure 46: Strategies to enhance digital literacy



Source: Authors

Moreover, as the successful implementation depends on the overall level of digital literacy that educators and students might have, this study investigated this relevant aspect. For this purpose, it adopted the digital literacy definition provided by the National Library of New Zealand. Accordingly, digital literacy relates to “*finding, evaluating, using and creating digital content in meaningful and responsible ways*” (National Library of New Zealand, 2022)³³², which meets the focus of this research because it requires all participants, i.e., educators and students, to think about their technical knowledge, skills, and abilities. According to Galic et

³³² National Library of New Zealand (2022). Digital content — finding, evaluating, using and creating it. *National Library of New Zealand*. Retrieved from: <https://natlib.govt.nz/schools/digital-literacy/strategies-for-developing-digital-literacy/digital-content-finding-evaluating-using-and-creating-it> [accessed 01 August 2022].

al. (2020)³³³ the lack of digital literacy makes the content integrated in the e-learning system useless. Based on the definition provided by the National Library of New Zealand, respondents were asked about their ability to find, evaluate, and compose clear information through writing on various digital platforms. The outcome indicates that 30.77% are 'Very Able', 25.64% are 'Pretty Able', and 23.08% are 'Able' (see Figure 43). However, the situation differs when respondents are asked to assess their students' ability concerning this matter. According to them, 29.49% of students are 'Able', 24.36% are 'Pretty Able', and 16.67% are 'Somewhat Able'. Only 15.38% of the students are 'Very Able' to deal with these aspects (see Figure 45).

The outcome presented in Figures 44 and 45 concerning respondents' and students' ability to find, evaluate, and compose clear information through writing and other media on various digital platforms suggests the need to implement digital literacy strategies. Concerning this aspect, this research identified nine strategies (see Figure 46). According to the outcome, respondents considered all the identified strategies relevant because their average is above 4.0. Out of the identified list, the most important ones are 'Encourage self-exploration', 'The implementation activities/tasks where students find, evaluate and share information using a range of online technologies and tools', 'Evaluate current eLearning strategy', 'Host a live event', and 'Create an online resource guide and instructions on how to use the chosen online technologies'.

5.4.3. Online Lecturing/teaching Delivery and Assessment

Given that the successful implementation of online lecturing/teaching depends on the implementation of the right mix of strategies, this survey identified 23 strategies available to educators of content and instructional design, technological, and pedagogical nature. The distribution of these strategies according to their nature is presented in Table 9.

Table 9: Distribution of strategies according to their nature

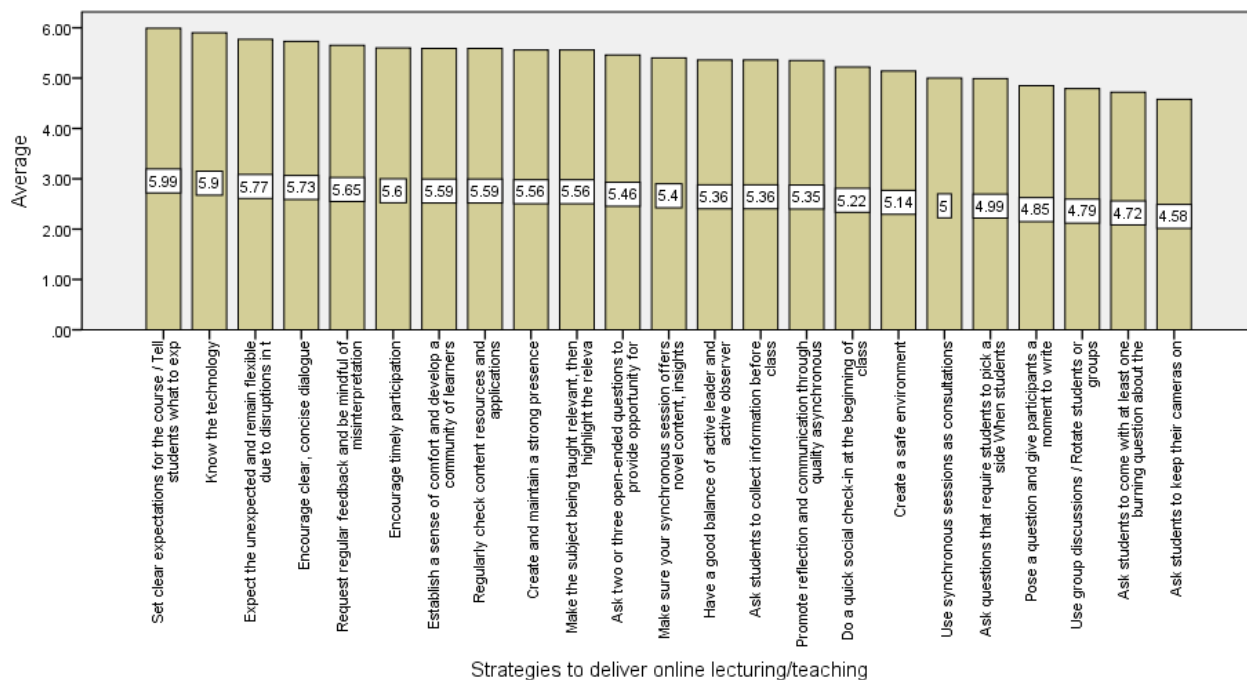
Nature	Strategy
Content and Instructional Design	Set clear expectations for the course / Tell students what to expect
	Regularly check content resources and applications
	Make the subject being Regularly check content resources and applications taught relevant, then highlight the relevance
	Make sure your synchronous session offers novel content, insights, or activities thus avoid duplicating what is covered elsewhere in the course
Pedagogical	Encourage clear, concise dialogue
	Request regular feedback and be mindful of misinterpretation
	Encourage timely participation
	Establish a sense of comfort and develop a community of learners
	Create and maintain a strong presence
	Ask two or three open-ended questions to provide opportunity for ongoing dialogue
	Have a good balance of active leader and active observer
	Ask students to collect information before class
	Promote reflection and communication through quality asynchronous discussion
	Do a quick social check-in at the beginning of class
	Create a safe environment
	Use synchronous sessions as consultations
	Ask questions that require students to pick a side. When students are asked to state an opinion, they become more invested in discussing it.
	Pose a question and give participants a moment to write
	Use group discussions / Rotate students or groups
Ask students to come up with at least one burning question about the topic at hand	
Ask students to keep their cameras on	
Technological	Know the technology
	Expect the unexpected and remain flexible due to disruptions in technology

Source: Authors

³³³ Galić, S., Lušić, Z. and Stanivuk, T. (2020). E-learning in maritime affairs. *Journal of Naval Architecture and Marine Engineering*, 17(1), pp.39–50. <https://doi.org/10.3329/jname.v17i1.42203> [accessed 25 July 2022].

The study outcome suggests that all strategies identified are important, given their average score above 4.0 (see Figure 47). Moreover, the outcome indicates that the four main strategies are a mix of Content and Instructional Design (*‘Set clear expectations for the course / Tell students what to expect’*), Technological (*‘Know the technology’* and *‘Expect the unexpected and remain flexible due to disruptions in technology’*) and Pedagogical (*‘Encourage clear, concise dialogue’*) nature. Furthermore, the importance of technological strategies is well documented. For example, one strategy that was expected to achieve a higher score was *‘Ask students to keep their cameras on’*; however, this turnout to be the strategy that scored less, meaning that such strategy is not critical to determining the success or unsuccess of online learning.

Figure 47: Strategies to deliver online lecturing/teaching



Source: Authors

Many educators see online assessment as a critical issue. For this reason, some institutions require that exams are still carried out in an in-class environment to guarantee their credibility. Considering this aspect, this study identified 12 issues arising when implementing an online assessment (see Figure 48). The outcome indicates their relevance, and out of the 12 possible issues, respondents have identified four that may raise more concerns than the others. These are *‘Ensure that the questions asked are appropriate to the technology being used’*, *‘Level of Internet connectivity to avoid any sort of disruptions’*, *‘The choice of a reliable tool to guarantee a good performance during the online exam’*, and *‘The possibility that students taking online exams remotely can cheat’*. While the first three are technical, the fourth is related to social behaviour (Diego, 2017)³³⁴ and academic dishonesty (Colnerud and Rosander, 2009)³³⁵.

The issue of academic dishonesty, such as cheating, unauthorised collaboration, plagiarism, and fabrication, is not new (Colnerud and Rosander, 2009)³³⁶. Colnerud and Rosander claim that the number of reported cases of academic dishonesty increase due to plagiarism and fabrication; according to the authors, and in the case of Sweden, this has resulted in a higher number of disciplinary cases in Sweden. The reasons for academic dishonesty differ from its type; however, the most common ones are time pressure, laziness, and grades improvement, peer pressure, home environment, learning styles and school environment (Kwong et al.,

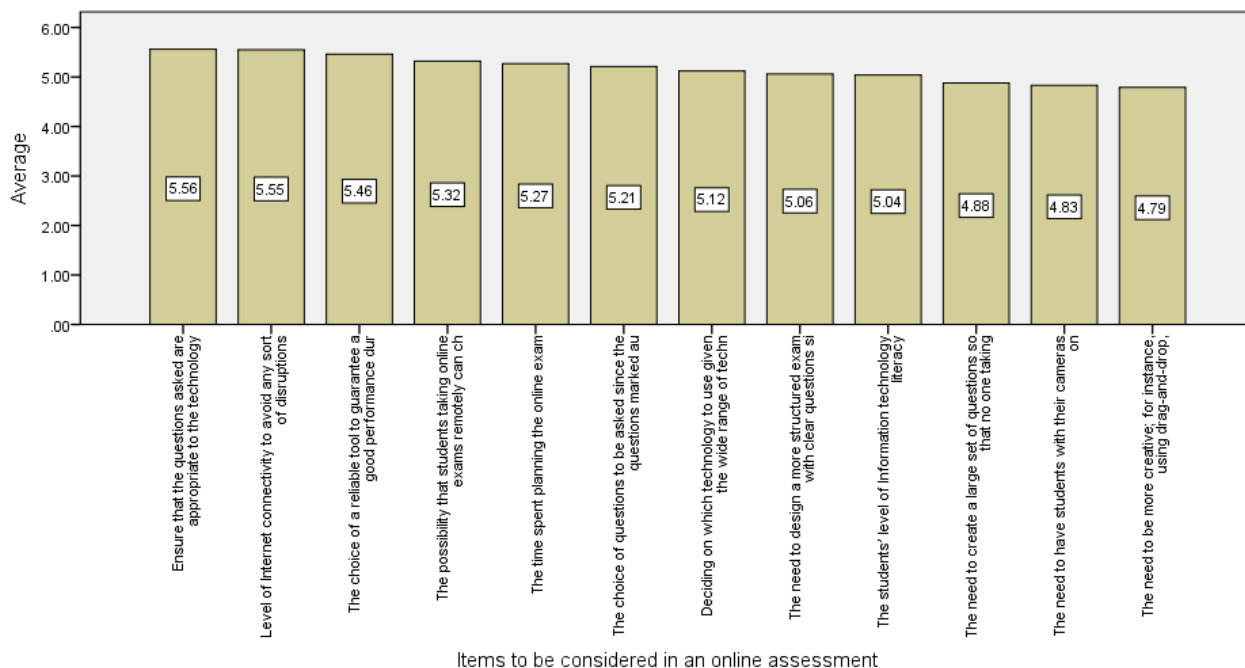
³³⁴ Diego, L. A. B. (2017). Friends with benefits: Causes and effects of learners’ cheating practices during examination. *IAFOR Journal of Education*, 5(2), Article ID: 6, pp.121–138. <https://doi.org/10.22492/ije.5.2.06> [accessed 01 August 2022].

³³⁵ Colnerud, G. and Rosander, M. (2009). Academic dishonesty, ethical norms and learning. *Assessment & Evaluation in Higher Education*, 34(5), pp.505–517. <https://doi.org/10.1080/02602930802155263> [accessed 02 August 2022].

³³⁶ Colnerud, G. and Rosander, M. (2009). Academic dishonesty, ethical norms and learning. *Assessment & Evaluation in Higher Education*, 34(5), pp.505–517. <https://doi.org/10.1080/02602930802155263> [accessed 02 August 2022].

2010³³⁷; Diego, 2017³³⁸) Therefore, depending on students’ actual intentions, academic dishonesty may result from conscious deception, self-deception and ignorance deception which leads Colnerud and Rosander to say that academic dishonesty is a moral phenomenon. Certainly, that if students involved academic dishonesty activities are not caught, such unfair behavioural practices will impact their future professional performance even if in the short term they have been granted higher marks.

Figure 48: Respondents’ concerns when dealing with online assessment



Source: Authors

Within the scope of the online assessment, respondents were also asked about their approaches concerning some aspects when conducting their online assessment. The study identified seven possible alternative assessment methods available to educators, in which technology plays a fundamental role. Still, the outcome indicates that respondents’ favour ‘*Traditional assessment submitted online: Essays; Case studies; Article reviews; Proposal writing; Report writing*’. Next, ‘*Automated online assessment: Online Quizzes (MCQs, MRQs, FIBs, T/F, matching, ordering); In-video quizzes; Assessment of prior knowledge*’ and ‘*Group assessments online: Online presentations; Group online projects; Role play; Online debates*’ follow (see Figure 49).

The technological evolution over the last years has allowed the development of various assessment tools available online. For this study, 17 assessment tools available to educators were identified. Given that over the years, educators, in line with educational institutions’ policies, have favoured a traditional assessment approach, the sudden shift towards an online environment meant that educators had to consider an alternative assessment approach and so use one of the available technologies. Therefore, respondents were asked to indicate which assessment tools they have heard of (see Figure 50) and which they have used (see Figure 51).

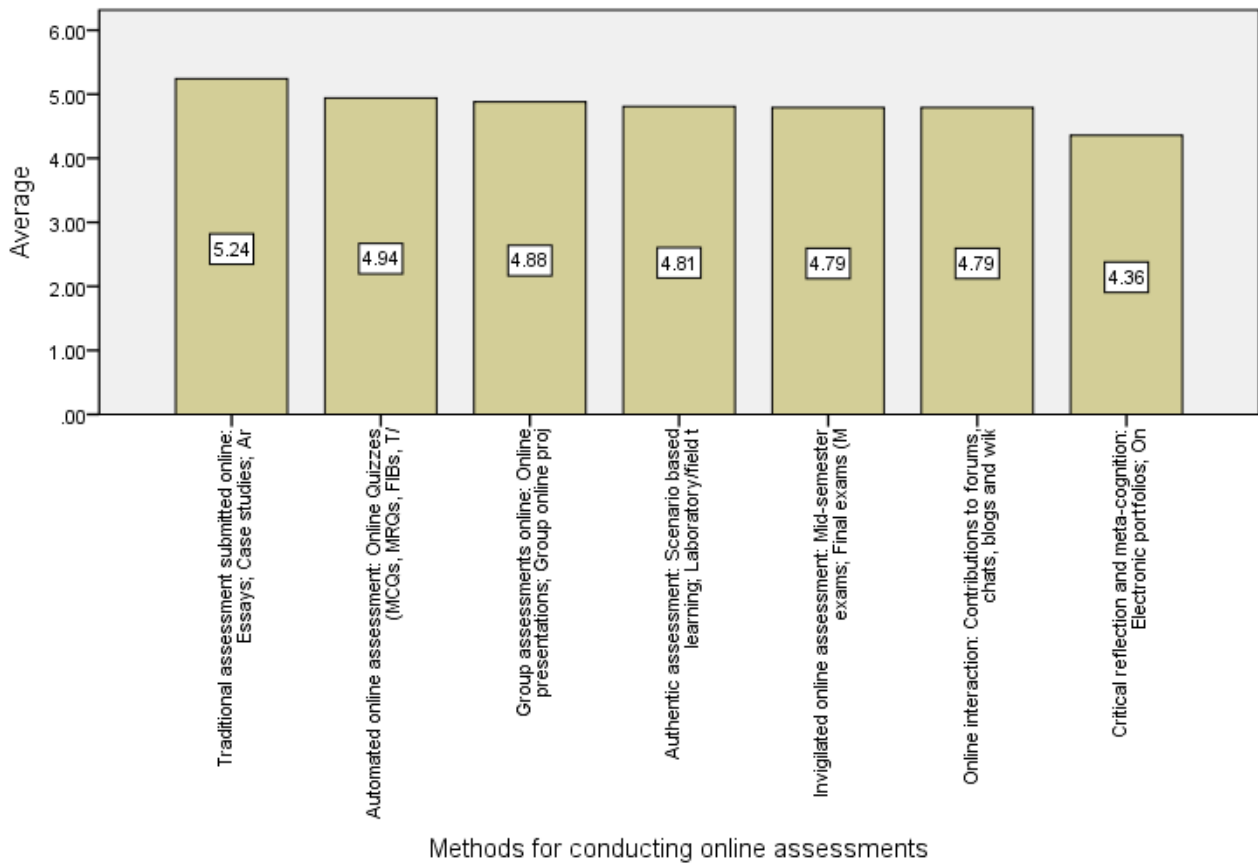
Regarding the assessment tools, the outcome shows that respondents have good knowledge of them. Data gathered shows that 93.59% of respondents have heard of assessment tools and 10.26% of respondents heard of all the assessment tools listed in the survey (see Figure 50). On the opposite side, 6.41% of respondents have not heard of them. In between, respondents have heard of at least 1 and 16 assessment tools. However, the use of assessment tools is not established in lecturing/teaching activities (see Figure 51); the difference between awareness and applicability of the existing tools is still there. For instance, 15.38% of respondents indicate not having used them when data show that at least 58.33% of these respondents have heard of these

³³⁷ Kwong, T, Hing-Man, N. and Wong, E. (2010). Students’ and faculty’s perception of academic integrity in Hong Kong, *Campus-Wide Information Systems*, 27(5), pp.341–355. <https://doi.org/10.1108/10650741011087766> [accessed 09 November 2022].

³³⁸ Diego, L. A. B. (2017). Friends with Benefits: Causes and Effects of Learners’ Cheating Practices During Examination. *IAFOR Journal of Education*, 5(2), Article ID: 6, pp.121–138. <https://doi.org/10.22492/ije.5.2.06> [accessed 09 November 2022].

tools. On the opposite of the scale, one respondent indicates that it uses 11 different assessment tools. However, despite this difference of opinion, 52.56% of respondents use between 2 and 4 assessment tools.

Figure 49: Respondents' approaches for conducting their online assessments



Source: Authors

Figure 50: Number of assessment tools that respondents heard of (N=78)

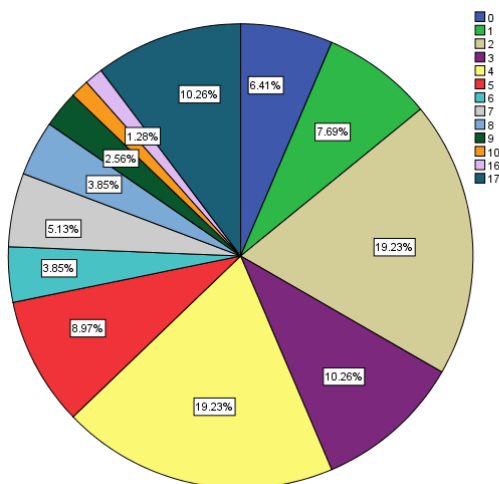
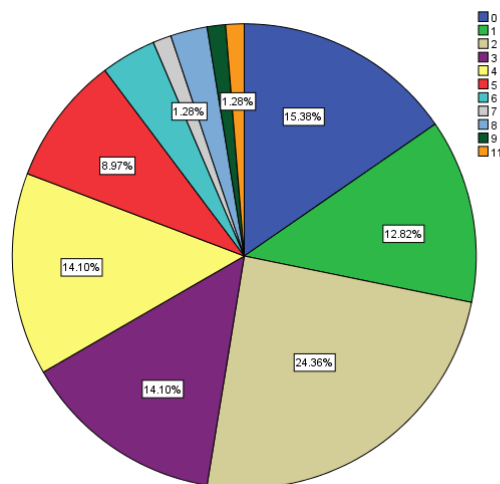


Figure 51: Number of assessment tools that respondents used (N=78)



Source: Authors

Table 10 highlights assessment tools and respondents' awareness and usage in numbers. Awareness levels are high even though this awareness is not distributed uniformly among assessment tools. Also, in some cases, the percentage usage is low compared to awareness levels. For instance, in the case of Gradescope, usage/awareness ratio accounts for 10%, while in the case of 'Moodle', this ratio amounts to 89.6%, indicating

a high usage. Such an outcome only confirms Bauk and Radlinger (2013)³³⁹ expectations when stating that Moodle was probably the most popular e-learning system globally used. Table 10 also allows identifying the most used assessment tools; the ones with a high rate are, by decreasing order of importance, ‘Moodle’ (89.6%), ‘Turnitin Grade Anything’ (83.3%), ‘Google Forms’ (71.4%), and ‘Review’ (70.5%). Finally, data also highlights that there is no uniform choice pattern regarding assessment tools even when respondents are using more than two assessment tools, even though there is a trend to use ‘Google Forms’ with ‘Moodle’. It what concerns Kahoot, its outcome is below the expectations since it offers a high student engagement in learning, promotes gamification of learning, and fosters academic success since it helps students to communicate, discuss and share ideas (Correia and Santos, 2017³⁴⁰; Limbong, et al., 2020)³⁴¹.

Table 10: Distribution of Assessment Tools Heard of and Used by Respondents, in number (N=78)

	Poll Everywhere.	Moodle.	Socrative Response system	Quiz Revolution.	Google Forms.	Mentimeter.	Kahoot	Quizizz.	Easy Test Maker.	Quizlet.	Respondus.	Desire2Learn.	Gradescope.	Questionmark.	Blackboard Gradebook.	Review.	Turnitin Grade Anything.
Respondents’ Awareness in numbers	23	56	18	21	63	19	28	20	17	17	16	12	10	15	17	17	36
Respondents’ Usage in numbers	13	39	4	8	45	9	17	10	4	7	4	3	1	8	7	12	30
Usage/Awareness Ratio in %	56.5	89.6	22.2	38.0	71.4	47.3	60.7	50.0	23.5	41.1	25.0	25.0	10.0	53.3	41.1	70.5	83.3
Difference in number	10	17	14	13	18	10	11	10	13	10	12	9	9	7	10	5	6

Source: Authors

The benefits and the pitfalls of online assessment can be seen in Figures 52 and 53, respectively. For the current research, 16 benefits were identified. The outcome shows that respondents considered them all relevant given that their average score is above 4.0. However, out of the list identified, the three main benefits are ‘The possibility of offering exams to candidates located over greater geographical areas’ the fact that they are ‘More environmentally friendly because it results in the usage of less paper, printing and transport used overall’ and ‘They do not need to be collected or transferred from office to home and then from home to office’.

For the current research, eight pitfalls of online assessment have been identified (Figure 53). Out of these, one pitfall appears not to be so relevant, given its average score. This pitfall relates to the fact that ‘Answers of online assessments can only be right or wrong. There is no room for explaining your answer or getting partial credit. Online assessments do not give teachers the option to see your line of thinking to get to your answer’. Out of the seven remaining pitfalls, the three most important ones are ‘The implementation of an online assessment necessitates a period of familiarisation with the technology being used’, ‘Software runtime

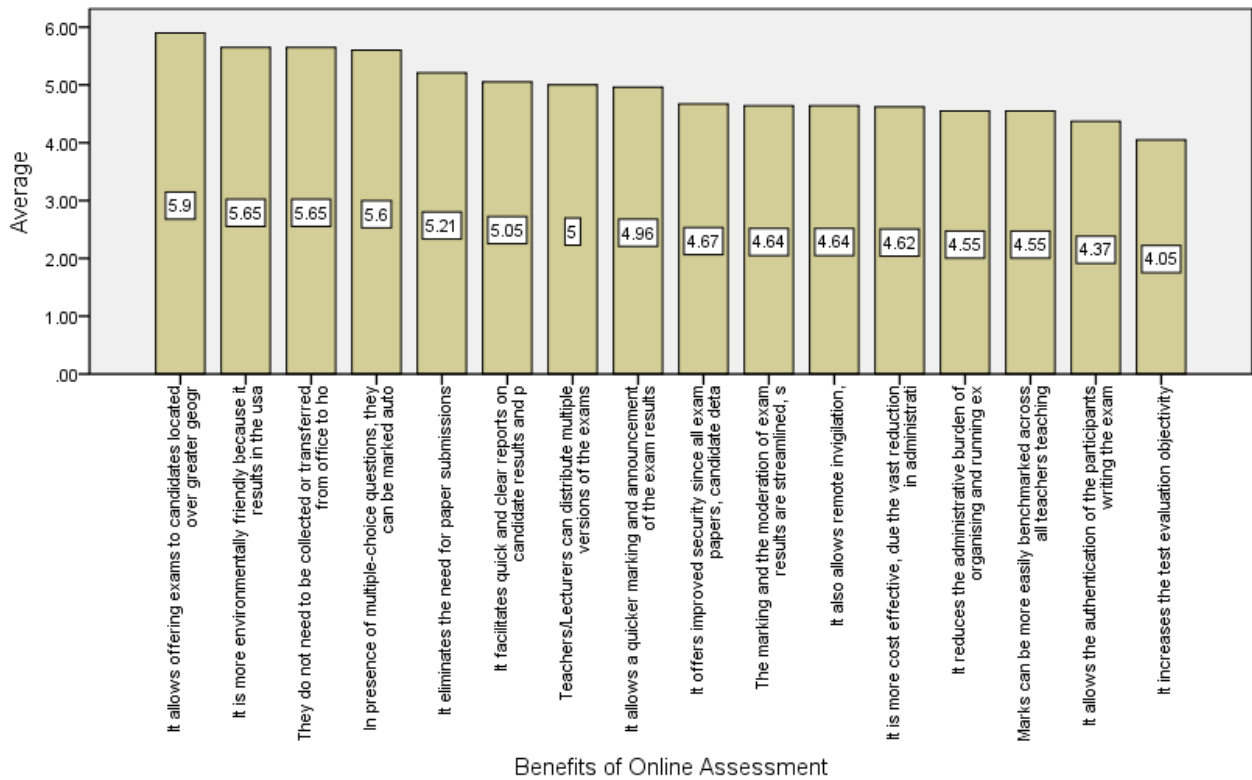
³³⁹ Bauk, S. and Radlinger, R. (2013). Concerning Web-based e-learning at a Maritime Higher Education Institution: Case Study. *Transactions on Maritime Science*, 2(2), pp.115-122. <https://doi.org/10.7225/toms.v02.n02.004> [accessed 22 September 2022].

³⁴⁰ Correia, M. and Santos, R. (2017). A aprendizagem baseada em jogos online: uma experiência de uso do Kahoot na formação de professores. In: *Proceedings of the 2017 International Symposium on Computers in Education (SIIE)*, 09-11 November 2017, Lisbon, Portugal. <http://dx.doi.org/10.1109/SIIE.2017.8259670> [accessed 05 November 2022].

³⁴¹ Limbong, S., Chaniago, M., Tua, H. and Prasiska PT, C. (2020). The Use of Kahoot! in Teaching English Maritime Subject. In: *Proceedings of the 4th International Conference on Maritime Education and Training*, 8 October 2020, Makassar, Indonesia. <https://doi.org/10.48192/prc.v1i4.331> [accessed 05 November 2022].

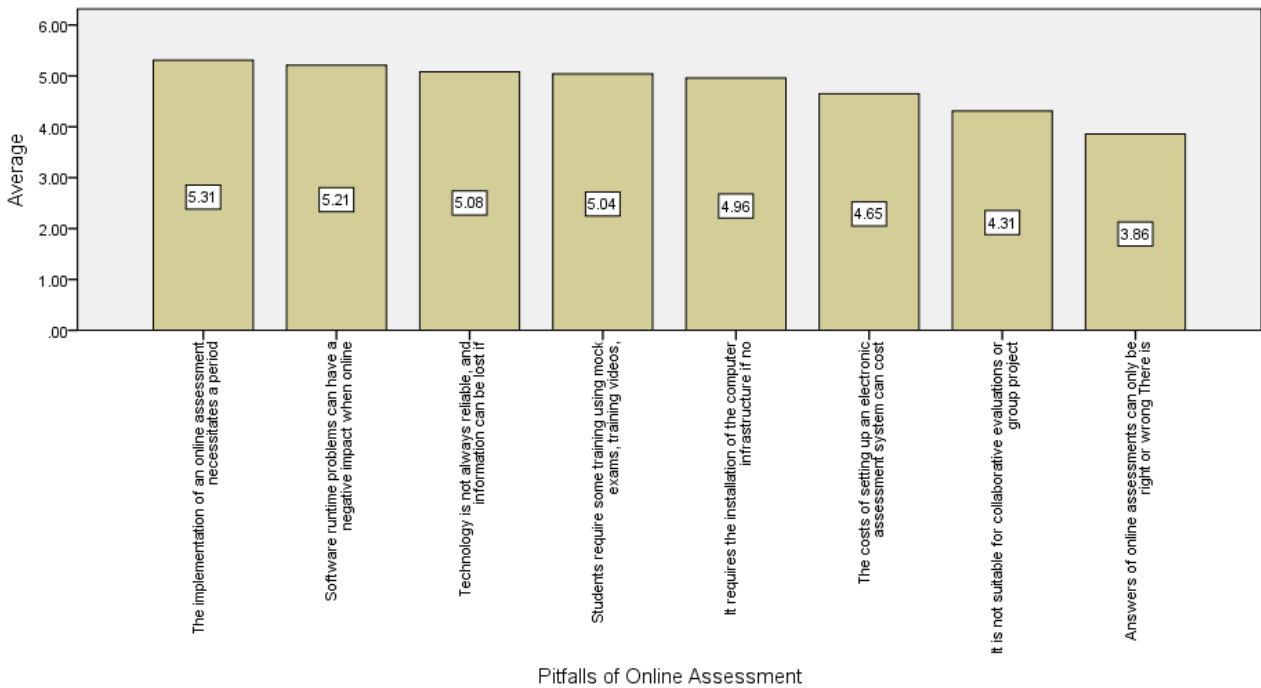
problems can have a negative impact when online assessment is taking place’ and ‘technology is not always reliable, and information can be lost if a system breaks down’.

Figure 52: Benefits of Online Assessment



Source: Authors

Figure 53: Pitfalls of Online Assessment

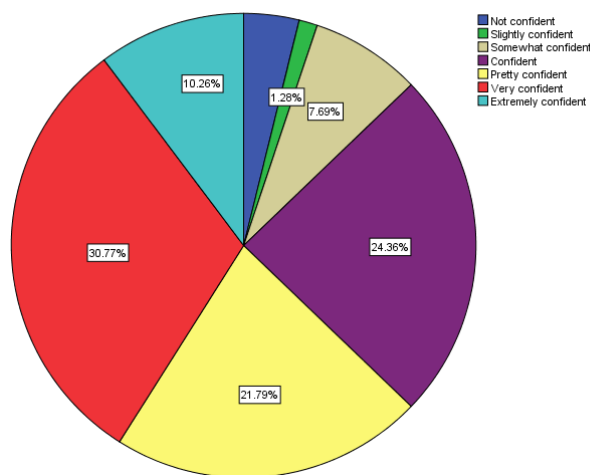


Source: Authors

5.4.4. Confidence in Online Lecturing/teaching

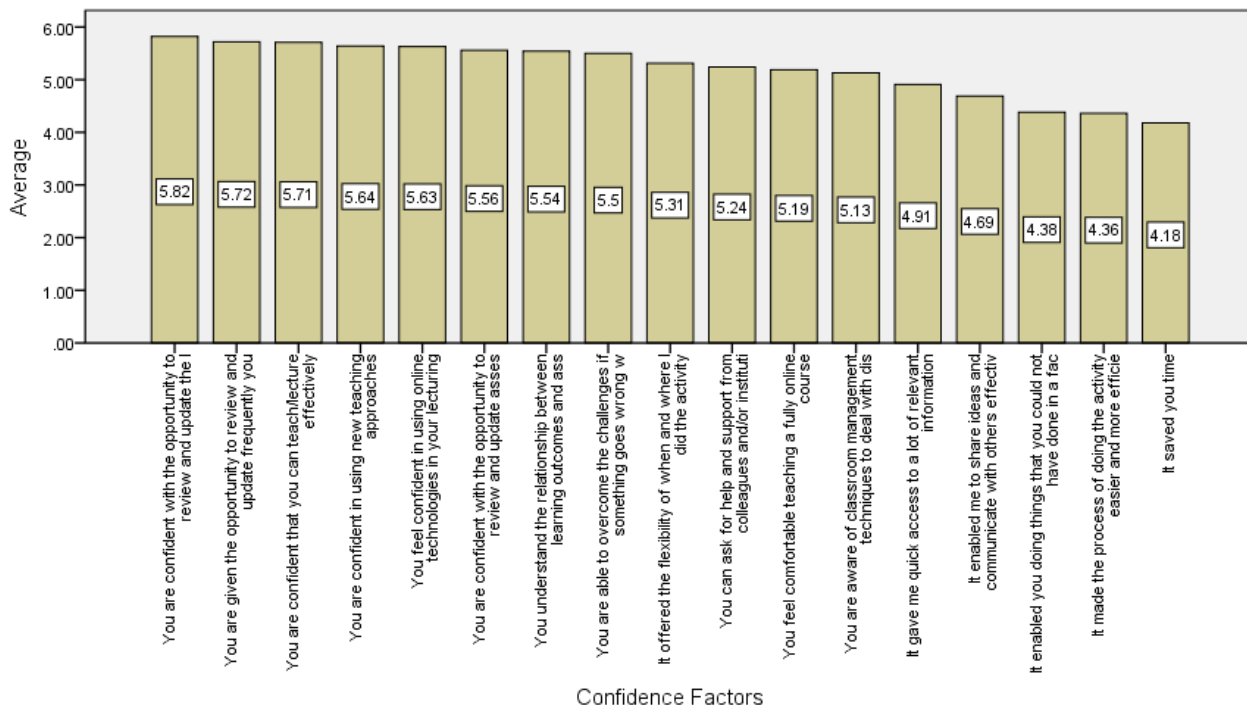
The final findings of the survey relate to the confidence in lecturing/teaching online. Respondents were asked about their overall confidence since 47,4% of respondents are classified as newcomers. The outcome indicates that 30.77% of respondents are ‘*Very Confident*’ while a tiny percentage of respondents (3.85%) are ‘*Not Confident*’ at all. Furthermore, 24.36% of respondents are ‘*Confident*’, and 21.79% are ‘*Pretty Confident*’ (see Figure 54).

Figure 54: How respondents assess their overall confidence in lecturing/teaching online (N=78)



Source: Authors

Figure 55: How respondents assess confidence factors when lecturing/teaching online

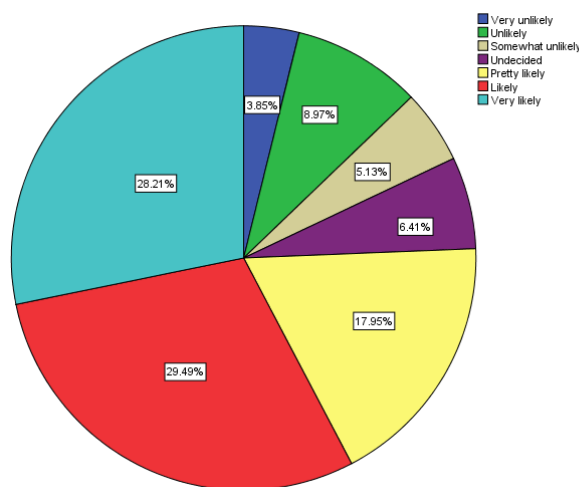


Source: Authors

Next, the survey inquired about the confidence factors influencing educators when lecturing/teaching online. For this assessment, the survey listed 17 confidence factors (see Figure 55). According to the outcome, all factors are deemed relevant given the average score each obtained. However, three leading confidence

factors stand out. The first one is ‘*You are confident with the opportunity to review and update the learning activities of your courses*’; next ‘*You are given the opportunity to review and update frequently your course content*’ and finally ‘*You are confident that you can teach/lecture effectively*’ (see Figure 55).

Figure 56: Likelihood of respondents going on lecturing/teaching online based on their experience (N=78)



Source: Authors

Finally, respondents were enquired about the likelihood of going on lecturing/teaching online based on their experience. The outcome indicates that 17.95% are ‘*Pretty Likely*’ to go on doing it, 29.49% are ‘*Likely*’ to go on doing it, and 28.21% are ‘*Very Likely*’ to go on doing it. Only 3.985% of respondents stated that they are ‘*Very Unlikely*’ to do it (see Figure 56).

5.5. Inferring the Results for the Population

Statistical inference is the process of using a sample to infer the properties/characteristics of the whole population from which the sample was drawn. The decision to focus on a sample rather than on the population rests on the inability to measure fully the whole population. Despite this constraint, the authors tried to use a wider sample in the attempt to obtain a wide response rate. In order to infer the results for the population, the authors followed the approach used by Paixão Casaca (2003)³⁴² and Paixão Casaca and Marlow (2009)³⁴³.

Given that the survey identifies the presence of two different groups of respondents, namely those having delivered online training pre-COVID-19 pandemic and those that did not, the analysis started by verifying if the data complied with the assumptions of the ANOVA so far as the normality of the distribution is concerned. The test variables chosen to assess the normality of the distribution fell on those addressing the confidence factors influencing educators when lecturing/teaching online. To measure the normality of these variables, skewness and kurtosis statistics were used. Skewness is a measure of symmetry, i.e., it is a measure of asymmetry or distortion of symmetric distribution; a distribution that is not symmetrical is said to be skewed. Kurtosis is a measure defining how heavily the tails of a distribution differ from the tails of a normal distribution.

The outcome of the skewness and kurtosis statistics is presented in Table 11. It indicates that the variables did not comply with the assumptions of ANOVA so far as the normality of the distribution is concerned. The skewness statistic value for a normal distribution is zero, meaning that any symmetric data should have a

³⁴² Paixão Casaca, A. C. F. C. (2003). *The Competitiveness of Short Sea Shipping in Multimodal Logistics Supply Chains*. Unpublished PhD Thesis. University of Cardiff, United Kingdom. Retrieved from: https://www.worldofshipping.org/WofSP2_ACRsearch/ACResearch002a_PhDThesis-competitiveness-short-sea-shipping-multimodal-logistics-supply-chains.html [accessed 17 November 2022]

³⁴³ Paixão Casaca, A. C. and Marlow, P. B. (2009). Logistics strategies for SSS operating as part of multimodal transport. *Maritime Policy and Management*, 36(1), pp.1-19. <https://doi.org/10.1080/03088830802652254>.

skewness close to zero, which is not the case. Furthermore, the kurtosis statistic’s outcome is far from three, which is the standard normal distribution value. The kurtosis statistic of the ‘*You feel confident in using online technologies in your lecturing/teaching*’ variable is insufficient to claim the distribution’s normality.

Table 11: ANOVA Normality Tests (N=78) (‘Yes’ = 41 and ‘No’ = 37)

Variables (Confidence Factors)	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
You are confident that you can teach/lecture effectively.	78	-1.835	0.272	5.466	0.538
You are confident in using new teaching approaches.	78	-1.562	0.272	4.306	0.538
You are able to overcome the challenges if something goes wrong with your online lecturing/teaching.	78	-1.254	0.272	2.179	0.538
You can ask for help and support from colleagues and/or institution staff when needed.	78	-1.164	0.272	0.561	0.538
You are given the opportunity to review and update frequently your course content.	78	-1.997	0.272	5.493	0.538
You are confident with the opportunity to review and update the learning activities of your courses.	78	-1.921	0.272	5.716	0.538
You are confident with the opportunity to review and update assessment strategies.	78	-1.325	0.272	2.257	0.538
You understand the relationship between learning outcomes and assessments.	78	-1.528	0.272	2.287	0.538
You are aware of classroom management techniques to deal with disruptive behaviour in a virtual environment.	78	-0.796	0.272	0.417	0.538
You feel confident in using online technologies in your lecturing/teaching.	78	-1.575	0.272	2.961	0.538
You feel comfortable teaching a fully online course.	78	-0.961	0.272	0.188	0.538
It enabled you doing things that you could not have done in a face-to-face environment.	78	-0.298	0.272	-1.146	0.538
It offered the flexibility of when and where I did the activity.	78	-1.053	0.272	0.437	0.538
It saved you time.	78	-0.191	0.272	-1.343	0.538
It enabled me to share ideas and communicate with others effectively.	78	-0.591	0.272	-0.680	0.538
It gave me quick access to a lot of relevant information.	78	-0.571	0.272	-0.498	0.538
It made the process of doing the activity easier and more efficient.	78	-0.253	0.272	-1.004	0.538

Source: Authors

In the presence of non-normal distributions, a non-parametric Mann-Whitney U test statistic, equivalent to the t-test, was applied to see if these two groups were part of the same population. The Mann-Whitney U-test is used for comparing two samples where the assumption of normality is questionable. The null hypothesis, Ho, and the alternative hypothesis, H1 were the following:

Ho = The two groups are part of the same population

H1 = The two groups are not part of the same population

The outcome of this test is presented in Table 12. Table 12 indicates significant differences between the two groups, those having delivered online training pre-COVID-19 pandemic and those that did not. Furthermore, the outcome shows that 7 out of the 17 variables are statistically significant at a probability

sample level of 5%. Therefore, it can be concluded that significant differences can be found between the behaviour of the two groups identified in the sample, so the respondents are said not part of the same population.

Table 12: Mann-Whitney U test statistics (N=78) ('Yes' = 41 and 'No' = 37)

Variables (Confidence Factors)	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
You are confident that you can teach/lecture effectively.	635.000	1338.000	-1.314	0.189
You are confident in using new teaching approaches.	541.000	1244.000	-2.281	0.023
You are able to overcome the challenges if something goes wrong with your online lecturing/teaching.	557.500	1260.500	-2.090	0.037
You can ask for help and support from colleagues and/or institution staff when needed.	631.500	1334.500	-1.310	0.190
You are given the opportunity to review and update frequently your course content.	555.500	1258.500	-2.158	0.031
You are confident with the opportunity to review and update the learning activities of your courses.	650.000	1353.000	-1.150	0.250
You are confident with the opportunity to review and update assessment strategies.	537.500	1240.500	-2.295	0.022
You understand the relationship between learning outcomes and assessments.	473.500	1176.500	-2.976	0.003
You are aware of classroom management techniques to deal with disruptive behaviour in a virtual environment.	510.500	1213.500	-2.557	0.011
You feel confident in using online technologies in your lecturing/teaching.	503.000	1206.000	-2.677	0.007
You feel comfortable teaching a fully online course.	657.500	1360.500	-1.035	0.301
It enabled you doing things that you could not have done in a face-to-face environment.	635.000	1338.000	-1.252	0.211
It offered the flexibility of when and where I did the activity.	635.000	1338.000	-1.271	0.204
It saved you time.	720.500	1423.500	-0.386	0.699
It enabled me to share ideas and communicate with others effectively.	647.500	1350.500	-1.130	0.259
It gave me quick access to a lot of relevant information.	664.000	1367.000	-0.964	0.335
It made the process of doing the activity easier and more efficient.	631.000	1334.000	-1.291	0.197

Grouping Variable – Lecturing Pre-COVID-91 Yes or Not?

Source: Authors

Following this finding, a Kruskal-Wallis H test statistic was used to investigate whether the two different groups of respondents, namely those having delivered online training pre-COVID-19 pandemic and those that did not, indicated unequal population means because the variables did not comply with the assumptions of ANOVA so far as the normality of the distribution is concerned (see Table 11).

The results of the Kruskal-Wallis H test statistic are presented in Table 13; they were based on the following null hypothesis, Ho, and the alternative hypothesis, H1:

Ho = The distributions of the two groups of the sample are equal for the population.

H1 = The distributions of the two groups of the sample are not equal for the population.

Table 13: Kruskal-Wallis H test statistic (N=78) ('Yes' = 41 and 'No' = 37)

Variables (Confidence Factors)	Chi-Square	df	Asymp. Sig.
You are confident that you can teach/lecture effectively.	1.726	1	0.189
You are confident in using new teaching approaches.	5.202	1	0.023
You are able to overcome the challenges if something goes wrong with your online lecturing/teaching.	4.370	1	0.037
You can ask for help and support from colleagues and/or institution staff when needed.	1.716	1	0.190
You are given the opportunity to review and update frequently your course content.	4.655	1	0.031
You are confident with the opportunity to review and update the learning activities of your courses.	1.322	1	0.250
You are confident with the opportunity to review and update assessment strategies.	5.268	1	0.022
You understand the relationship between learning outcomes and assessments.	8.856	1	0.003
You are aware of classroom management techniques to deal with disruptive behaviour in a virtual environment.	6.540	1	0.011
You feel confident in using online technologies in your lecturing/teaching.	7.167	1	0.007
You feel comfortable teaching a fully online course.	1.070	1	0.301
It enabled you doing things that you could not have done in a face-to-face environment.	1.567	1	0.211
It offered the flexibility of when and where I did the activity.	1.615	1	0.204
It saved you time.	0.149	1	0.699
It enabled me to share ideas and communicate with others effectively.	1.277	1	0.259
It gave me quick access to a lot of relevant information.	0.929	1	0.335
It made the process of doing the activity easier and more efficient.	1.667	1	0.197

Grouping Variable: Lecturing Pre-COVID-19 Yes or Not

Source: Authors

The results of the Kruskal-Wallis H test statistic are presented in Table 13, and from it, six variables out of the 17 listed present significant levels at a probability level of 5% or lower. Even though the remaining variables were not statistically significant at a probability level of 5%, the balance between the ‘*Not Statistically Significant*’ and the ‘*Statistically Significant Variables*’ lead us to conclude that significant differences can be found between the two groups of the sample. Therefore, the distributions of the two groups of the sample are not equal for the population. A possible cause influencing this outcome, not covered in the paper but addressed in the body of literature may be the one of educators’ burnout (Sokal, et al., 2020)³⁴⁴ due to increased stress and resilience to keep their commitment towards their learning activities and motivate students, particularly those in less favourable environments

³⁴⁴ Sokal, L., Trudel, L. E. and Babb, J. (2020). Canadian teachers’ attitudes toward change, efficacy, and burnout during the COVID-19 pandemic, *International Journal of Educational Research Open*, 1, Article ID: 100016. <https://doi.org/10.1016/j.ijedro.2020.100016> [accessed 02 September 2022].

6. IMPLICATIONS OF THE ANALYSIS

The outcome of the non-parametric Mann-Whitney U and Kruskal-Wallis H test statistics is a good starting point to assess the implications of the analysis. The tests highlight differences between the groups of respondents who delivered online training pre-COVID-19 pandemic and those who did not. However, more than these differences, the outcome reveals that different maritime and education and training institutions worldwide have different implementation speeds for online maritime education and training.

Underlying these differences are the investment levels these maritime and education and training institutions make. High-quality education infrastructure, i.e., buildings, classrooms, laboratories, and equipment including infostructure, is needed since it facilitates better education and training, motivates educators, and improves student outcomes, thus reducing dropout rates. According to Barret et al. (2017)³⁴⁵, students' academic progress is dependent on the environmental and design elements of school infrastructure since this progress is dependent on three interrelated infrastructure factors, namely *naturalness* (e.g., light, air quality), *stimulation* (e.g., complexity, colour), and *individualization* (e.g., the flexibility of the learning space). However, investments in high-quality education infrastructure per se are insufficient to justify the different implementation speeds of online maritime education and training; other factors must be considered.

The first factor concerns the maritime education and training policies that countries adopt at the national level. Countries that do not have a strong maritime culture very seldom have good maritime education and training policies, thus resulting in a lack of investments in this area. Very frequently, the number of maritime education and training institutions is limited and not much emphasis is put on this education and training sector. Therefore, these countries and other countries with a low gross domestic product and high unemployment rates miss a golden opportunity since the maritime industry's employability rate is still high due to the industry's lack of seafarers. According to the International Chamber of Shipping (2022b)³⁴⁶, the existing seafarers' population is estimated at 1,647,500, of which 774,000 are officers, and 873,500 are ratings. However, with the current demand for seafarers estimated at 1,545,000 globally, of which 790,500 are officers and 754,500 are ratings, data shows a shortage of 16,500 officers and a surplus of 119,000 ratings. Therefore, based on the data provided by the International Chamber of Shipping (2022b)³⁴⁷, the opportunity is there to train qualified and competent officers rather than ratings to meet the future needs of the industry.

This lack of policies results in a loss of knowledge not transferred from the older to the new generations. Furthermore, in the long term, this lack of policies will impact the maritime-related jobs ashore that would benefit from the knowledge seafarers gained during their time at sea. This is critical since the current labour market is made up of different generations (from Baby Boomers to Generation Z), each with their knowledge, skills and abilities that brought together could promote a more effective and efficient sector. Furthermore, when the shipping industry is about to invest heavily in fleet renewal over the next years due to its decarbonisation, it is believed that this mix of workers can bring about extraordinary things.

So, the different industry players, particularly the associations and organisations representing the different maritime industry sectors, have a role to play. They are the ones that can demonstrate to governmental rulers and policymakers the role and importance that the maritime industry has in a global, regional, and national context. The maritime industry is more than shipping; it embraces a wide range of related activities, including shipbuilding, ship repairs, ports, shipmanagement ship agency activities, to name a few. Events like the Ever-Given grounding in the Suez Canal preventing the smooth flow of vessels through that maritime chokepoint and the Russia-Ukraine war, which for some months prevented the shipment of grain while improving the shipping industry's visibility and highlighting how dependent the world economy is on it, are not sufficient to demonstrate the role it plays in the modern economy.

³⁴⁵ Barrett, P., Davies, F., Zhang Y. and Barrett, L. (2016). The Holistic Impact of Classroom Spaces on Learning in Specific Subjects. *Environment and Behavior*, 49(4), pp.425-451. Retrieved from: <https://doi.org/10.1177%2F0013916516648735> [accessed 02 August 2022].

³⁴⁶ International Chamber of Shipping (2022b). Shipping and World Trade: Global Supply and Demand for Seafarers, *International Chamber of Shipping*. Retrieved from: <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-global-supply-and-demand-for-seafarers/> [accessed 02 august 2022].

³⁴⁷ International Chamber of Shipping (2022b). Shipping and World Trade: Global Supply and Demand for Seafarers, *International Chamber of Shipping*. Retrieved from: <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-global-supply-and-demand-for-seafarers/> [accessed 02 august 2022].

Governmental rulers and policymakers must be remembered that maritime transport accounts for around 80% of world trade (Psaraftis, 2021)³⁴⁸ and from an economic perspective changed the structure of global commerce. The increasing vessel size witnessed in the three main shipping sectors (tanker, dry bulk, and container shipping), allowing economies of scale, resulting in lower transport costs along the sea leg, led the different manufacturing companies to redo their overall logistics and supply chains. With time, the distinct markets of raw materials, production, distribution, and consumption emerged as companies relocated their manufacturing premises to countries offering lower production costs and implemented postponement strategies to ensure that a wide variety of products is available to their customers while keeping their costs as low as possible (Harrisson and Skipworth, 2004)³⁴⁹.

Besides, the maritime industry is a source of direct and indirect employment that goes upstream to the most diverse activities that support the industry, for instance, packaging, labelling and many others, depending on how far the industry is integrated into the transport chains that meet the individual needs of its users and end-users. In 2018, at a European Union level, the industry directly employed 685,000 people and supported up to 2 million jobs, including the impact it has on other sectors. The result of all this activity is seen in countries' gross domestic product (Oxford Economics, 20220)³⁵⁰. Furthermore, the involvement of Maersk, CMA-CGM and MSC in the air freight market reveals a great opportunity for shipping companies to invest in modal integration, thus opening scope for employing an even greater number of people. For instance, the industry decarbonisation process, which is already underway albeit not at the desired speed due to the many constraints it must solve, is asking for information technology people capable of creating software that will help the industry to streamline and optimise their operations.

Consequently, industry players must devise long-term strategic plans to improve the industry's visibility at the contribution it brings to national gross domestic product. For example, at a European Union level, in 2018, European shipping direct contribution to the European Union 's gross domestic product was €54 billion; this figure increases to €149 billion if the calculations consider the spillover effects of the industry onto other sectors such as supply chain and worker spending impacts (Oxford Economics, 20220)³⁵¹.

The second factor concerns maritime education and training institutions since they must devise effective strategies to put in place countries' maritime education and training policies, otherwise these policies are worthless. For many years maritime education and training have been confined to a national in-class environment. However, while distance learning slowly became a reality for maritime business-related courses, the same did not happen to seafarers' education and training courses that need hours of simulator and workshop practices to meet at least the minimum standards determined by the STCW Convention and STCW-2010 Code. Many maritime education and training institutions have failed to take advantage of the STCW-2010 Code that foresaw the possibility of using alternative delivery methods in maritime education and training institutions, i.e., distance/e-learning/blended learning. The shift from an in-class environment to a remote one due to the COVID-19 pandemic highlighted the role that e-learning, particularly online learning, can have in the education and training of future maritime professionals. However, e-learning in general and online learning, in particular, requires more than the experience gained during this period.

Implementing online learning for maritime education and training requires that institutions devise strategies for its implementation. It implies that maritime education and training institutions get involved in strategic planning to develop a plan of action to define their online learning strategy. It will require them to assess the maritime education and training market, decide on the strategies to follow, plan their implementation, implement them, and finally assess their outcomes and revise them to achieve their objectives. However, independently of the number of stages that a strategic planning process might have, a SWOT/TOWS analysis

³⁴⁸ Psaraftis, H. N. (2021). The Future of Maritime Transport. In: *International Encyclopaedia of Transportation*. Elsevier: Amsterdam, The Netherlands, pp.535–539.

³⁴⁹ Harrisson, A. and Skipworth, H. (2004). Implications of Form Postponement to Manufacturing: a Case Study. *International Journal of Production*, 42(10), pp.2063-2081. Retrieved from: <https://doi.org/10.1080/00207540410001661373> [accessed 02 August 2022].

³⁵⁰ Oxford Economics (2020). *The Economic Value of the EU Shipping Industry*, 2020. Retrieved from: <https://www.ecsa.eu/sites/default/files/publications/Oxford%20Economics%20-%20The%20Economic%20Value%20of%20EU%20Shipping%20-%20Update%202020%20-%20Report.pdf> [accessed 02 August 2022].

³⁵¹ Oxford Economics (2020). *The Economic Value of the EU Shipping Industry*, 2020. Retrieved from: <https://www.ecsa.eu/sites/default/files/publications/Oxford%20Economics%20-%20The%20Economic%20Value%20of%20EU%20Shipping%20-%20Update%202020%20-%20Report.pdf> [accessed 02 August 2022].

is deemed necessary to accomplish the maritime education and training market assessment; the market has become very competitive with numerous courses available. Therefore, it is necessary to understand the maritime education and training market to integrate the alternative learning method and modes within educational institutions' visions, missions, and values. From a timeline perspective it is known that the development of such courses takes a considerable amount of time depending on the activities involved. Therefore, if maritime education and training institutions want to follow that path, the moment is now to grasp the advantages offered by it.

This is critical for established maritime education and training institutions rather than newcomers. Over the years, maritime education and training institutions have invested in physical infrastructures that cannot be thrown away because of new learning methods and modes. This may explain why several research papers published on seafarers' maritime education and training advocate blended learning as an alternative to traditional learning. From a futuristic perspective, blended learning can be seen as the intermediary stage through which maritime education and training institutions will go before, they are prepared to transfer all maritime education and training online. Implementing blended learning will also give time educational institutions to devise how to integrate and finance cloud-based simulators and serious gaming in their e-learning programmes from which students can learn. An example of an augmented reality cloud-based simulator is the SimFlex Cloud although Wärtsilä also provides similar solutions that contribute to improve the efficiency and safety of the ship and industry. The issue of distance simulation specific to maritime education and training had already been addressed by Stan (2014)³⁵² when addressing online learning in Constanta Maritime University for existing and former students. Therefore, there is an opportunity to rethink maritime training not so much the contents delivered but how they will be delivered to Generation Z, who is technology savvy.

Without this exercise, maritime education and training institutions can not elaborate the guidelines that will help implement new learning methods and modes; considerable investments must also be made in infrastructure to guarantee connectivity during synchronous and asynchronous online learning. These guidelines are important since one of the factors identified in the survey preventing the development of online lecturing/teaching is '*Lack of institutional support*'; therefore, the institutional commitment is fundamental for the successful implementation of online lecturing/teaching.

The third factor concerns human resources. Whether maritime education and training is delivered in-class or online, they will require educators to deliver them. The current survey highlighted that the average age of current educators is high, therefore, maritime education and training institutions must start thinking about how to replace them in the future. A new breed of maritime educators is needed, and the current lack of officers, as acknowledged by the International Chamber of Shipping (2022b)³⁵³, does not help. The alternative could be increasing the number of students per educator. However, while appealing from a cost perspective, it may eventually result in the delivery of poor lecturing and training activities, if such an increase is high, since students are not given the proper attention to their learning progress. Even online learning must be subject to a maximum number of students since these courses cannot be categorised as massive open online courses but as small private online courses as Ferreira (2014)³⁵⁴ classified.

As educators are replaced, the new ones must be given pedagogic training. In the past, it was only necessary to hold technical expertise to deliver a course; those days are gone, and educators must possess additional knowledge other than the one that led to their specialisation. However, this pedagogic training must be tailored to maritime education and e-learning, particularly online learning.

Therefore, besides the basic pedagogic training that gives educators the competencies to develop courses from concept to its evaluation, which applies to both in class and online and education and training (see Figure 1), educators must be taught about the numerous technologies available. For instance, the outcome of the analysis shows that educators still use a limited number of tools/products used in online learning/teaching, in

³⁵² Stan, L. C. (2014). Online Teaching Technique in Maritime Learning Process, *Procedia - Social and Behavioral Sciences*, 116, pp.4517-4520. <https://doi.org/10.1016/j.sbspro.2014.01.977> [accessed 25 July 2022].

³⁵³ International Chamber of Shipping (2022b). Shipping and World Trade: Global Supply and Demand for Seafarers, *International Chamber of Shipping*. Retrieved from: <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-global-supply-and-demand-for-seafarers/> [accessed 02 august 2022].

³⁵⁴ Ferreira, A. (2014). The Maritime English MOOC: using the MOOC technology to flip the classroom. In: *Proceedings of the International Maritime English Conference 26*, 7-10 July 2014, Maritime Institute Willem Barentsz. Terschelling, The Netherlands, pp.85-101. Retrieved from: <https://hal.archives-ouvertes.fr/hal-03187161/document> [accessed 25 July 2022].

the same way, that despite the numerous assessment tools available, respondents' usage tends to be limited. In addition, as the burden of work increases, educators are faced with a list of things to do, including student support, thesis supervision and their research work, providing them with these opportunities will help them streamline their online lecturing /teaching activities.

Providing educators with this background from the moment they start lecturing/teaching contributes to improving their confidence. Factors, such as 'Time restrictions', 'Access to and ability to use relevant online technologies' or 'Uncertain of effective pedagogies for online lecturing/teaching', that in the past prevented them from developing online lecturing/teaching will slowly disappear since the background knowledge has been delivered and they are prone to learn more about new issues. Adopting either a new teaching approach or a new technology in an online lecturing/teaching environment contributes to raising educators' awareness about the importance of online lecturing/teaching and overcoming some of the challenges that some respondents acknowledged in the survey.

Likewise, the same applies to industry knowledge. Educators must be allowed to benefit from interaction with the industry to learn from what the industry is doing to share that knowledge with students. As claimed by Schinas and Thalassinou (2003)³⁵⁵, students need "more practical and real-life issues". Social networks like LinkedIn or Twitter, the latter when used for professional purposes, can be a source of valuable information. However, the speed at which this information flows is such that educators will need at least one hour per day to keep updated on their topics. With a vast list of tasks to perform daily, sometimes this hour or so is not there, and educators may miss important industry events. Moreover, this interaction can help to fill the gap that Schinas and Thalassinou (2003)³⁵⁶ claim to exist between the seafarers produced by the current educational system and the needs of the industry.

The fourth and final one concerns the students' acceptance. While online lecturing/teaching is something appealing from educational institutions' perspective, given the benefits offered (see Section 2.1 on Distance Learning), its implementation is not successful if students' reject it. To this acceptance or rejection much contributes the cultural environment in which they have been educated. Students living in countries that favoured student-centred learning or self-study will be more prone to accept it; the opposite may happen in countries that favour more conventional approaches such as a teacher-centred learning³⁵⁷. In presence of a student mix with these or further cultural backgrounds, and given the geographical reach offered by online lecturing/teaching, educators will need to consider students cultural and educational diversities. In addition, it will be necessary that educators provide students with a range of information at the beginning of the course not only to improve their digital literacy but also to ensure that they stand on a level playing field and capable of engaging in self-study, particularly when educational institutions favour flipped learning.

Now the question that such aspects raise is how to provide future maritime students with all this knowledge when they originate from countries such as China, the Philippines, Indonesia, the Russian Federation, Ukraine, and India, where the share of the population using the Internet is low (International Chamber of Shipping, 2022³⁵⁸; Roser et al., 2015)³⁵⁹. Except for the Russian Federation, where 73% of the population uses the Internet, the remaining countries have lower utilisation rates. For instance, in Indonesia, the share of the population using the Internet is 25%, while in India is 30%; in the remaining maritime nations identified, the share of the population using the internet is 52% for Ukraine, 53% for China and 56% for the Philippines (Roser et al., 2015)³⁶⁰. Online maritime education training will surely be implemented at different speeds, thus creating digital literacy imbalances, and learning opportunities as maritime education and training shifts online.

³⁵⁵ Schinas, O. and Thalassinou, E. (2003). Adjusting Basic Maritime Training in an E-Learning Environment. *European Research Studies*, 6(3–4), pp.237–256. Retrieved from: <https://www.ersj.eu/journal/112> [accessed 25 July 2022].

³⁵⁶ Schinas, O. and Thalassinou, E. (2003). Adjusting Basic Maritime Training in an E-Learning Environment. *European Research Studies*, 6(3–4), pp.237–256. Retrieved from: <https://www.ersj.eu/journal/112> [accessed 25 July 2022].

³⁵⁷ For additional information on teacher-centred and student-centred learning, check the link: Retrieved from: <https://knowledgeworks.org/resources/learner-centered-learning/> [accessed 02 august 2022].

³⁵⁸ International Chamber of Shipping (2022). Shipping and World Trade: Global Supply and Demand for Seafarers, *International Chamber of Shipping*. Retrieved from: <https://www.ics-shipping.org/shipping-fact/shipping-and-world-trade-global-supply-and-demand-for-seafarers/> [accessed 02 august 2022].

³⁵⁹ Roser, M., Ritchie, H. and Ortiz-Ospina, E. (2015). Internet. *OurWorldInData.org*. Retrieved from: <https://ourworldindata.org/internet> [accessed 02 august 2022].

³⁶⁰ Roser, M., Ritchie, H. and Ortiz-Ospina, E. (2015). Internet. *OurWorldInData.org*. Retrieved from: <https://ourworldindata.org/internet> [accessed 02 august 2022].

7. CONCLUSIONS

The transition of maritime education and training from an in-class environment to an online one is already underway albeit at different speeds. The implementation of online classes requires a set of conditions highlighted in this work, one of which is the commitment of the educational institutions towards its implementation since it is by no means the work of an individual.

The COVID-19 pandemic has demonstrated that such transition is possible. Educators and institutions managed to find the solutions to overcome the eventual disruptions that the several confinements could bring to students. However, it has also shown that there are several issues to be dealt with until the system can be fine-tuned to be considered a true alternative to face-to-face education and training.

The experience that educators gained over this period is valuable since it highlighted them about the numerous issues needed to implement an online learning system. All the difficulties found, and all their concerns contribute to find viable solutions that guarantee the credibility of online learning.

For now, given the current constraints, some of a technological nature, it is believed that blended learning will be here to stay. Blended learning can be seen as the intermediary stage through which maritime education and training institutions will go before, they are prepared to transfer all maritime education and training online. Implanting blended learning will also give time educational institutions to devise how to integrate and finance cloud-based simulators and serious gaming in their e-learning programmes from which students can learn.

In all this process attention must be given to educators pedagogic training. And for the interaction between academia and industry. For many years academia and industry have been moving apart. However, this moat needs to be covered so that the educational system delivers the right training contents to meet industry needs. Finally, in designing online learning attention must be given to students cultural and educational diversities.

Finally, this research would have benefitted from a great number of responses. Although this was not possible, the results therein provide considerable food for thought to carry out the necessary changes that maritime education and training needs to make to attract generation Z into the industry.

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