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# The importance of entrepreneurship for the maritime sector and the tendency of maritime students to be "maripreneurs"

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ABSTRACT

The possibility that technological advances may replace human power and lead to unemployment is one of the most debated issues in all sectors, including maritime. While some studies argue that this will not lead to unemployment but to a shift in the skills expected of workers, others insist that the probability of unemployment is high. Assuming that the second option is realized, it will be necessary to take some measures to create new jobs for laid-off workers. One of these measures could be to train people to have an entrepreneurial mindset, as entrepreneurship plays a key role in creating new jobs and thus increasing employment. In this study, the entrepreneurial tendencies of maritime students were investigated to see their potential to become entrepreneurs. For this purpose, the entrepreneurial orientation scale developed by Bolton and Lane was applied to 268 students at a maritime university. The data evaluated with the R program shows that the students have above-average risk-taking, proactiveness, and innovativeness skills which are important for entrepreneurship, thus they have the potential to become entrepreneurs or intrapreneurs if appropriate entrepreneurship education is provided.

## 1 Introduction

Technology has profoundly changed people's lives in numerous ways, revolutionizing how they communicate, work, learn, entertain themselves, and even how they perceive the world. While it brings multiple benefits and opportunities, it also poses challenges and risks that require careful consideration and management. As technology develops, machines and software become increasingly capable of performing tasks previously done by humans causing the risk of unemployment in several forms.

First, it can lead to job displacement, particularly in industries where tasks are mostly routine or repetitive [1]. Workers and communities reliant on declining industries may face challenges in the transition to new forms of employment, leading to periods of economic disruption and unemployment [2].

Second, there may be structural unemployment because of the changing skills required in the workforce. As industries adopt new technologies, workers may find themselves lacking the necessary skills to remain employable. This can lead to a disconnection between available jobs and the skills of the workforce, resulting in unemployment [3].

Next, there may be job polarization, that is technological advancements disproportionately affect middle-skilled jobs, leading to a hollowing out of the job market. High-skilled jobs requiring creativity and problem-solving, as well as low-skilled jobs involving manual labor, may continue to exist, while middle-skilled jobs are replaced by automation [4].

The threats posed by advancing technology affect all sectors, including the maritime sector, to varying degrees, depending on their characteristics. Studies on the

possible effects of automation and digitalization on employment in the maritime sector reveal that the role of the human element will be reduced leading to a decrease in traditional maritime positions and an increase in newly created ones. [5, 6, 7]. The Seafarers and Automation Report [8] prepared by the International Chamber of Shipping approaches the issue from another perspective. It predicts that there will be a decrease in the jobs onboard while new ones in ashore units will increase. New jobs will require new skills especially those related to digitalization and remote operations. Technical competence and digital literacy will be the most sought-after skills [9]. It was also found that seafarers' jobs should be redefined [10] and strategic workforce planning should be made [7]. On the other hand, the skills that future employees in the maritime sector are supposed to have are not confined to technical ones. They are also expected to have business skills, logistics skills, and managerial skills [11,12] in addition to methodological and personal skills [13]. Developing these skills is important to realize the goals of "Blue Growth", which means sustainable and stable growth without harming the seas and the resources derived from them [14, 15].

The change in the skills that future seafarers will need has raised the question of how the new skills, called blue skills in the maritime sector [16], can be acquired best and how an innovative mindset, which is among the blue skills, can be created. Maritime schools have started to thoroughly update their education and training programs to teach STCW (Standards of Training, Certification, and Watchkeeping) courses with the help of the innovations brought by the developing technology [17] and to provide 21st-century blue skills to their students [18, 19]. They try different methods to find the best one to provide the students with skills in demand such as critical thinking, collaboration, innovativeness, and problem-solving [20, 21].

In addition, several projects aim to equip students with proper skills to prepare them for the ever-demanding future requirements. Of these, "Must-Have Career Skill for Navigating Technological Change and an Uncertain Future" by CERIC (Canadian Education and Research Institute for Counselling), points out the significant role entrepreneurial mindset and work ethic play in keeping up with the changes in soft skills, among which are capturing opportunities, pioneering innovation, establishing successful startups and leading industry [22, 23, 24]. These are what successful entrepreneurs are expected to do. MINE-EMI (Maritime Innovative Network of Education for Emerging Maritime Issues) [25], ISOL-MET (Innovative Soft Skills to Maritime Education and Training) [26], and Blue Skills [27] are also among the projects aiming at developing soft skills as well as entrepreneurial and innovative mindsets in maritime higher education institutions (HEIs) by creating curricula and case studies to practice theoretical information to meet the expectations of future seafarers. Skills acquisition, especially soft skills like critical thinking, problem-solving, decision-making, communication, creativity, and innovation are among the priorities of maritime education and training institutions [28, 29]. These are also skills that entrepreneurs are expected to have [30] and can be acquired through entrepreneurship education [31, 32] since entrepreneurship education not only trains students to be entrepreneurs but also provides them with the soft skills required by the 21st century.

Several factors contribute to the success of entrepreneurship education. One of them is the entrepreneurial orientation level of the people who take it. The objective of this research is to see if the entrepreneurial orientation of maritime university students is high enough to ensure the success of entrepreneurial education that plays a significant role in training entrepreneurial-minded and skilled people to initiate innovation, create new job opportunities, and meet the need for personnel with 21st-century skills required by emerging fields.

## 2 Literature Review

Some studies about the future of the workforce in the maritime emphasize that technological innovations and automation will reduce the need for labor and negatively affect employment [33, 34]. Some others say that the need for physical labor will decrease with automation. Still, the need for labor with technological infrastructure knowledge to construct autonomous ships and other technological devices will increase. For example, the introduction of the Yara Birkeland, an autonomous electric cargo ship, shows a shift from the demand for traditional physical labor to specialized technological expertise [35]. She eliminates the need for a full crew to manage navigation, engine operation, and safety aboard. Tasks traditionally done manually, such as steering and engine maintenance, are now automated. On the other hand, software engineers to design the AI (Artificial Intelligence) systems that enable the ship to navigate autonomously, marine robotics specialists to build and maintain the sensors, cameras, and radar systems used for navigation, electric and battery technicians to develop, monitor, and maintain the battery systems and cybersecurity analysts to protect them from digital threats are needed for the safe operation of the Yara Birkeland. This example shows that automation reduces manual tasks while increasing the demand for highly specialized knowledge in areas like robotics, AI, and systems engineering. The introduction of similar vessels signals that, in the maritime sector, the rate of employment will not decline, but the skills that employees are required to have will change [36, 37, 38].

A study conducted at the World Maritime University stated that the people who are affected most by automa-

tion are those working at low and medium-skill jobs. Those working in high-skill jobs will not be affected much by automation [10]. Another study conducted by the OECD (The Organization for Economic Cooperation and Development) in 2016 found that by 2040, up to 70% of the work of dockers and bag handlers will be automated, putting them at risk of losing up to 50% of their jobs [39]. Ship officers and aircraft pilots are among those with the least threat of losing jobs since they have jobs in the high-skilled group [39]. Likewise, the study conducted by Frey and Osborne [40] found that officers in charge of ships are among those who have the least possibility of losing their jobs because of technological developments. On the other hand, the number of personnel working on board is expected to decrease, while the number of personnel working on land to ensure the ship's safe navigation is expected to increase [41, 42].

Another study pointed out that there will be job losses in the maritime sector due to technological developments, but these losses will not be immediate [43]. It was also discussed that these losses cannot be described as job losses but as job transformations, since it would be possible for companies to find different jobs for the employees instead of making them redundant. On the other hand, the Seafarers and Digital Disruption Report [44] prepared by the Hamburg Business School for the International Chamber of Shipping, noted that while many seafarers were concerned about job losses due to automation, this is groundless. It argues that the rate of decline in the need for seafarers on board will be slower than the rate of increase in the need for support staff with the skills needed to keep autonomous ships operational.

Despite studies that discuss that technological developments will not affect the demand for maritime labor, but will change its direction, many seafarers, especially low-skilled ones, are concerned that this will lead to unemployment. People argue that autonomous ships will be the biggest factor responsible for potential unemployment. They will reduce the need for crews to be physically present on board, potentially leading to a reduction in crew numbers and employment opportunities [45, 46]; however, this is not the only development that poses a threat of unemployment for maritime workers. Technological developments have also become a threat to employment in many areas for those working in the onshore units such as shipyards or ports. These areas can be summarized under the following headings:

1. Port Automation: Ports increasingly adopt automation technologies for container handling, cargo storage, and terminal operations. Automated container terminals, for example, require fewer manual laborers for tasks such as loading and unloading containers, leading to potential job displacement for port workers [47, 48, 49, 50].
2. Digitalization and Data Analytics: Digitalization and data analytics transform maritime operations, enabling more efficient route planning, fuel optimization, and predictive maintenance. While these technologies can improve operational efficiency, they may also lead to job losses for roles involved in traditional planning and analysis tasks [51, 52].
3. Use of Drones and Robotics: Drones and robotics can be employed for various maritime tasks, including surveying, inspection, and maintenance of vessels and offshore installations. These technologies can perform tasks more efficiently and safely than human workers, potentially reducing the demand for human labor in areas such as diving [53].
4. Shifting Skill Requirements: As technology becomes increasingly integrated into maritime operations, there is a growing demand for workers with technical skills in areas such as data analysis, cybersecurity, and robotics maintenance. Workers without these skills may face challenges in adapting to the changing job market, leading to potential unemployment [34, 54].

As the studies emphasize, it is important to upskill or reskill the employees who face the risk of losing their jobs in the maritime sector. This imposes a new task on educational institutions, which are obliged to equip the students with the requirements of the new era [55, 56, 57, 58]. They can use several methods to achieve this. One of these methods is to provide entrepreneurship training. Through entrepreneurship education, students not only acquire the skills required for the 21st century but also the skills that will make them job creators rather than job seekers. The role of entrepreneurship education in creating an entrepreneurial mindset is increasingly recognized. For this reason, many schools have started to offer entrepreneurship education [59, 60].

A literature review on entrepreneurship education in maritime tertiary education reveals that there are few studies related to entrepreneurship in the maritime sector.

One of them is a study that investigated entrepreneurship education in a maritime university in Indonesia. The research found that entrepreneurship education increased the cadets' cognitive, affective, and psychomotor learning outcomes, improved students' entrepreneurial skills, and encouraged them to become entrepreneurs [61].

Another study related to entrepreneurship in maritime schools was conducted in Romania. This study investigated the courses offered by maritime universities in Constanta, Romania, and found that more entrepreneurship and business administration courses should be given in these universities to offer innovative solutions to the problems, especially in the cruise sector [62].

Ozdemir [63] conducted a study that covered the top 20 maritime universities in terms of entrepreneurial courses. This research concluded that there should be more courses and activities related to entrepreneurship in maritime universities to provide the students with an entrepreneurial mindset and skills.

Oluwagbenga, Bello, and A.E [64] approached the issue of entrepreneurship from a gender perspective and drew attention to the low number of women entrepreneurs and talked about the benefits of women becoming entrepreneurs in the maritime sector, not only for themselves but also for the maritime sector and society. They found that the biggest obstacle to this was the lack of funding.

A study in Norway concluded that shipping has an important place in the future of the economy, but that the connection between venture capitalists and external knowledge institutions in the maritime sector is underdeveloped and unsatisfactory for entrepreneurs. However, educational institutions should be aware of the expectations in the maritime sector and organize their education to meet these expectations. This also applies to entrepreneurship education [65].

Wang et. al. [66] emphasized the importance and necessity of the concept of skills training for maritime innovation and entrepreneurship education. However, this study focused only on maritime safety engineering and did not consider other fields [66].

In the literature review, it was seen that some word combinations were used to refer to entrepreneurship in the maritime sector. One of them is 'seapreneur', which is used to refer to two social entrepreneurship-based activities in the maritime sector with a focus on sustainability [67]. The other is 'oceanpreneur', the name of a site that has focused on encouraging, inspiring, and informing people about ocean adventures and contributing to a healthier ocean [68]. A university-level program offering entrepreneurship courses is called the 'marine entrepreneurship' program [69]. Another term, blue entrepreneurship, is used to emphasize sustainability in the sea [70]. However, no term covers not only the field of social entrepreneurship but also all entrepreneurship-related activities, that is providing entrepreneurship-related education and training, disseminating research and promotional activities to create an ecosystem to have more start-ups, and contributing to the economy by establishing new companies in the maritime sector. For this reason, the term 'maripreneurship', which is a combination of the words maritime and entrepreneurship, has been used in this study, following the examples of 'womenpreneurs', which is a combination of the words 'women' and 'entrepreneurship' for women entrepreneurs, and 'technopreneurs', which is a combination of the words 'technology' and 'entrepreneurship' for people engaged in entrepreneurial activities in the field of technology. In this study, the term maripreneurship will be used to refer to all entrepreneurial activities in the maritime field and maripreneur will be used to refer to entrepreneurs in the maritime sector.

## 3 Materials and Methods

### 3.1 Data Collection

The data was collected by convenience sampling method using the Entrepreneurship Orientation Scale developed by Bolton and Lane [71]. The reason for using this scale is that it has become the most dominant method for assessing individual entrepreneurial propensity since its introduction [72], and it was originally generated, validated, and then tested on university students [71].

The survey was electronically distributed to 325 second-year students in the second semester of the 2023-2024 academic year and was completed by 268 of them. There were five demographic questions at the beginning of the survey. Besides, it had 10 statements with a 5-point Likert scale to assess entrepreneurship orientation in three dimensions: innovativeness, willingness to take risks, and proactiveness. The options used in the scale were "1- Strongly disagree, 2- Disagree, 3- Neither Agree nor disagree, 4- Disagree, 5- Strongly disagree." The R program was used to evaluate the survey.

Before data collection, ethical approval was obtained from the relevant institutional review board that no personal information of the participants would be revealed, and participants would be informed about the purpose of the study.

### 3.2 Study Population

The survey was responded to by 268 second-year students studying at a maritime university. They were either from Maritime Higher Vocational School with ten different programs or the Maritime Business Management Department of the Faculty of Economics and Administrative Sciences (FEAS). The reason for administering the survey to students from multiple programs was to reach the perspectives of students from as many departments as possible. Another reason was to include as equal a number of male and female students as possible. Female students usually constitute a small percentage of the whole group when a survey is applied in maritime faculties or higher vocational schools since these schools are male-dominated. The percentage of both genders is close in this research because the students attending the Maritime Business Management Department, which is not male-dominated, are also included in the survey. Table 1 shows the demographic characteristics of the participants, 61% of whom were from the Maritime Business Management Department and 39% were from the Maritime Higher Vocational School.

**Table 1** Demographic Characteristics of the Participants

| **Gender** | **f** | **%** |
|---|---|---|
| Male | 154 | 57.5 |
| Female | 114 | 42.5 |
| **TOTAL** | **268** | **100** |
| **Major** | **f** | **%** |
| Maritime Business Administration Department (FEAS) | 155 | 58 |
| Maritime Higher Vocational School | 113 | 42 |

The limitation of the study is that it reflects the views of students attending only one maritime university in a specific location. It is considered that similar results can be reached in different schools in the same location, but the results may differ in other regions.

### 3.3 Reliability and validity analysis of the research scales

To determine the reliability and validity of the survey, Cronbach's Alpha, Kaiser -Meyer-Olkin (KMO) test, and Bartlett's test of sphericity were found.

Reliability is about how consistently or reliably a scale measures what it is supposed to measure and requires that measurements taken at different times give the same results [73]. The most frequently used method to measure the level of reliability is to analyze the value of Cronbach's Alpha coefficient. The confidence levels of Cronbach's Alpha coefficient ranges of this study are as follows:

If ≤ α < 0.40, the scale is not reliable. 0.40 ≤ α < 0.60, the reliability of the scale is low. 0.60 ≤ α < 0.80, the scale is highly reliable. 0.80 ≤ α < 1.00, the scale is highly reliable. As Table 2 shows, Cronbach's Alpha coefficient ranges of the scale and subdimensions in this study are highly reliable.

To determine if the data is suitable for factor analysis, the Kaiser -Meyer-Olkin test [74] and Bartlett's test of sphericity are used [75]. Usually, the KMO measure should be between 0.8-0.9 and Bartlett's sphericity test should be relevant at 0.05 level [73]. By testing the Individual Entrepreneurship Orientation Scale measures, it was found that the KMO test is 0.8 and Bartlett sphericity is $\chi^2$ =630.748, p-value <0.01, df 45. Therefore the data is suitable for factor analysis.

For factor analysis, as Figure 1 shows, 3 factors with Eigenvalues above 1 were found, which is compatible with the 3 subcategories of the questionnaire.

The results of the factor analysis are given in Table 3. It is generally accepted that values between 50 to 75 percent indicate sufficient validity.

**Table 2** Cronbach's Alpha co-efficient ranges of the scale and its sub-dimensions

| **Scale/Subdimension Number of Variables** | **Number of Variables** | **Cronbach's Alpha** |
|---|---|---|
| Individual Entrepreneurial Orientation Scale | 10 | 0.78 |
| Risk-taking (1. Sub-Dimension) | 3 | 0.64 |
| Innovativeness (2. Sub-Dimension) | 4 | 0.74 |
| Proactivity (3. Sub-Dimension) | 3 | 0.63 |

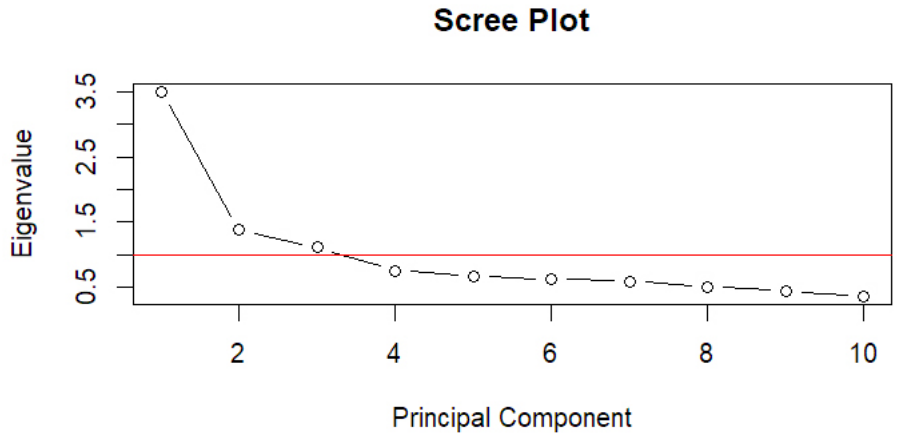


**Figure 1** Scree Plot: Number of Factors vs Eigenvalue

**Table 3** Factor analysis for three subdimensions of question items

| Subcategories | Component 1 | Component 2 | Component 3 |
|---|---|---|---|
| 1 (Risk taking) | | | |
| q1 | 0.592 | | -0.112 |
| q2 | 0.669 | -0.110 | |
| q3 | 0.844 | -0.103 | |
| 2 (Innovativeness) | | | |
| q4 | 0.585 | 0.120 | |
| q5 | 0.162 | 0.407 | 0.129 |
| q6 | -0.143 | 1.018 | |
| q7 | 0.149 | 0.550 | |
| 3 (Proactiveness) | | | |
| q8 | 0.121 | | 0.458 |
| q9 | -0.190 | | 0.831 |
| q10 | 0.124 | -0.129 | 0.608 |

Confirmatory Factor Analysis (CFA), where *goodness of fit* indices were *used* to evaluate the model, was also conducted for the data. Based on the literature, the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) cut-off scores should be above 0.9. We obtained a CFI value of 0.903, and a TLI value of 0.864, which we take as acceptable fit indices for the internal validity. The Root Mean Square Error of Approximation (RMSEA) value is 0.083, and the Standardized Root Mean Square Residual (*SRMR)* is 0.062, both are above the accepted cut-off level of 0.05. All of the estimated coefficient loadings are significant. Figure 2 shows the Confirmatory Factor Analysis Model.

When evaluating the survey results, the grade ranges given in Table 4 were used.

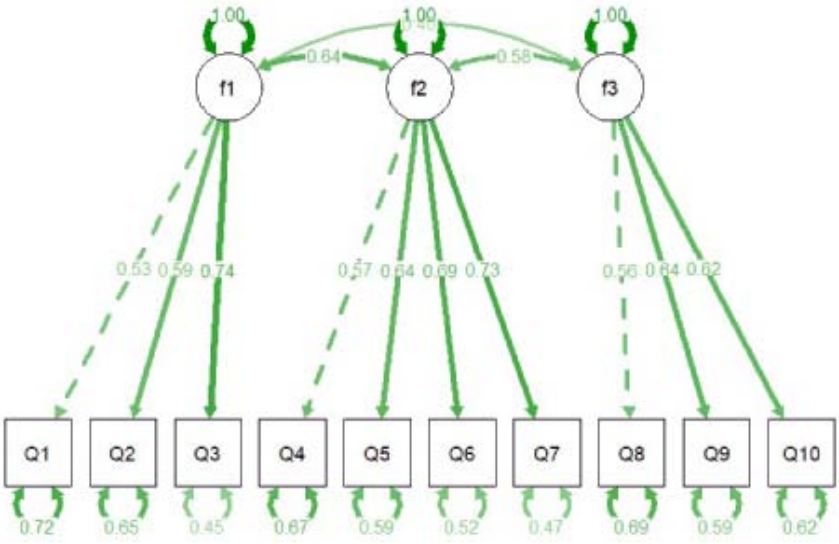


**Figure 2** Confirmatory Factor Analysis Model

**Table 4** Grade ranges

| Descriptive rating | Grade Range (%) | Orientation |
|---|---|---|
| Strongly disagree | 1-20 | Highly negative |
| Disagree | 21-40 | Negative |
| Neither agree nor disagree | 41-60 | Neither positive nor negative |
| Agree | 61-80 | Positive |
| Strongly agree | 81-100 | Highly positive |

### 3.4 Research Questions

This study aims to take into account the entrepreneurial tendencies of maritime students to see their likelihood of becoming entrepreneurs in the maritime sector. To this end, the entrepreneurial tendencies of students at a maritime-oriented university were measured and the potential for entrepreneurship education to be successful was predicted.

The study investigates the following research questions:

1 What is the risk-taking level of the students studying maritime-related subjects at the university?
2 What is the innovativeness level of the students studying maritime-related subjects at the university?
3 What is the proactivity level of the students studying maritime-related subjects at the university?
4 What is the overall entrepreneurial orientation of the students studying at this maritime university?

The fact that the survey was given to the students of only one maritime university may be the drawback of the study; however, it may be administered to students from other universities to test the findings of this study and to generalize them.

## 4 Results

### 4.1 Findings on the demographic characteristics of the participants

As Figure 3 shows, 58% of the students said they didn't have any entrepreneurs in their family while 31% said their mother or father are entrepreneurs and 11% said one of their close family members is dealing with his/her own business. Of the 268 students, 82%, which makes 222 students, said they wanted to start their own business. While 14% said they had not thought about this before. As Figure 4 shows, only 4% of the participants said they did not intend to start their own business or be entrepreneurs. 75% of them do not have any working experience as Figure 5 shows and 56% have not had any entrepreneurship education as seen in Figure 6.

### 4.2 Risk-taking orientation of the participants

The first sub-dimension of the scale consists of three statements and measures the risk-taking orientation of the participants. The average of the "Agree" and "Strongly Agree" responses to the statements in this subdivision is 63. As Figure 7 shows, participants' risk-taking orientation is high for all statements, with the highest value in the second statement in the survey. That is, 75% of the participants are willing to invest a lot of time and/or money in something that might yield a high re-

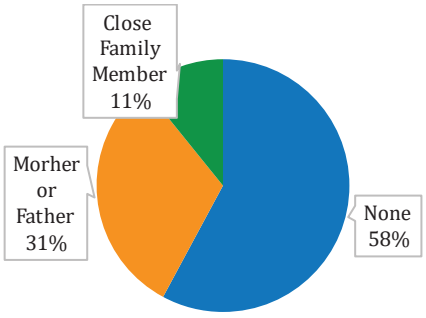


**Figure 3** Distribution of self-employed family members

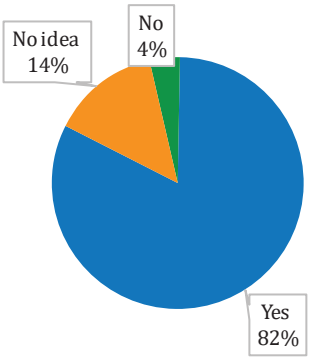


**Figure 4** Students willing to start their own business

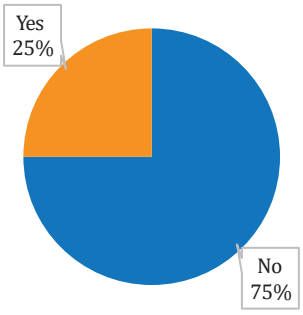


**Figure 5** Students with working experience

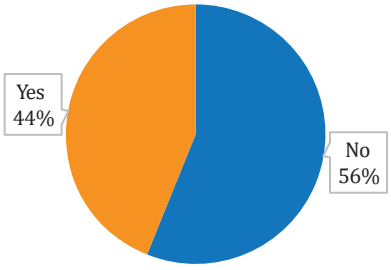


**Figure 6** Students with entrepreneurship education

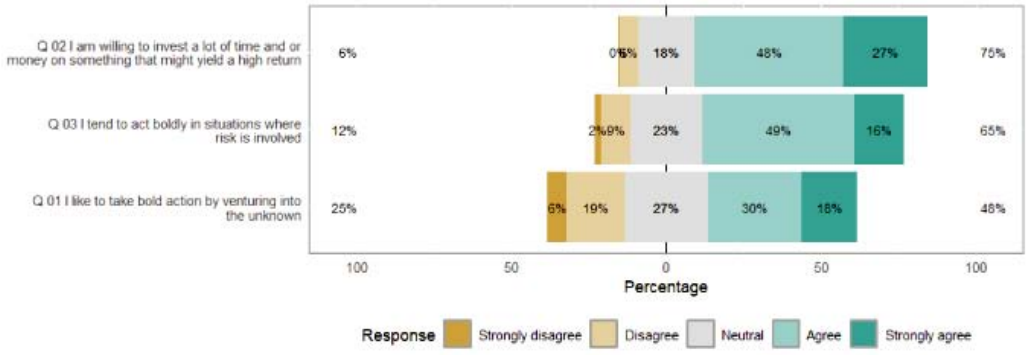


**Figure 7** Distribution of the responses on the risk-taking sub-dimension

turn. The statement that the participants agree with the least is "I like to take bold action by venturing into the unknown", which indicates that they want to take firm steps and are not willing to risk their money or investment. 25% of the participants disagreed or strongly disagreed with this statement while 27% was neutral. On the other hand, slightly less than half of the participants, that is 48% of them, agreed or strongly agreed with this statement. The average percentage of the respondents who agree or strongly agree with the statements in this subdimension is "63", which falls into the "Agree" category in descriptive rating and the "Positive" category in orientation regarding grade ranges.

In entrepreneurship, risk-taking is pushing oneself beyond one's comfort zone, questioning the current status quo, and taking advantage of chances, that others might pass up [76]. Risk takers are ready to risk all that they have to achieve their goals, and the more this behavior is present in entrepreneurs, the more likely their venture is to succeed. The statements related to risk-taking orientation in the scale are prepared to see the participants' tendency to take risks. It is seen that the average of the responses given to them is high which signals that maritime university students have a high inclination to take the risks required for the successful realization of any initiative and they can be good entrepreneurs if they are provided with an environment that supports their entrepreneurial orientation. Based on this result, it can be concluded that the answer to the first research question of the study is positive.

### 4.3 Innovativeness orientation of the participants

The second subdimension measured in the survey is innovativeness. In this subsection, which consists of four statements, the participants agreed with almost all statements to the same degree, as Figure 8 shows. However, the statement they agreed with the most is "I often like to try new and unusual activities that are not typical but not necessarily risky". 73% of the participants agreed or strongly agreed with this statement. The average of the "agree" or "strongly agree" responses to the four items in this subdimension is 71%, which means that most respondents are open to innovation and prefer trying new methods in their daily work. Although they prefer inventing new and authentic methods instead of copying old ones, they take calculated risks when trying these new processes. Innovation is an essential attribute for the success of businesses, so an entrepreneur's ability to innovate and find innovative solutions to problems that arise in unexpected situations and to turn ideas into innovations are important

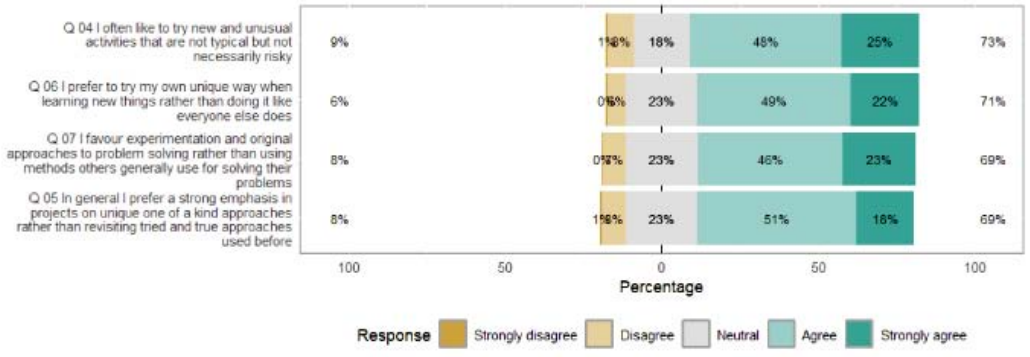


**Figure 8** Analysis of the responses on innovativeness sub-dimension

for the long-term survival of businesses [77]. In addition, another added value of innovation is that it provides technological leadership through R&D (Research and Development) in new processes and contributes to the development of new products/services by increasing creativity and experimentation [78].

Since 71% of the respondents "agree" or "strongly agree" with these statements, the answer to the second research question is positive, that is, the innovativeness level of the students studying maritime-related subjects is high. That means taking proper entrepreneurship education and training can make them successful entrepreneurs who can shape the future of maritime through new approaches and innovations giving way to sustainable success.

### 4.4 Proactiveness orientation of the participants

The last dimension measured by the survey is proactiveness, which is one of the key characteristics used to define entrepreneurial orientation [79]. This describes a person's propensity to develop or enhance goods, services, and procedures by using some or all of their creativity and innovation, problem-solving skills, and ability to think and experiment in new ways [80].

The importance of proactiveness is emphasized by research that reveals a proactive personality positively affects the relationship between entrepreneurial intention and entrepreneurial behavior.

The survey has three statements to measure the proactiveness of the participants. Of these, the statement that was agreed the most is "I prefer to 'step up' and get things going on projects rather than sit and wait for someone else to do it". Other statements, both of which are about being proactive in taking measures for the problems or needs that are likely to arise, have also been responded to positively by the majority of the participants. The average percentage of the participants who agreed or completely agreed with the statements about proactivity was "82". Figure 9 shows the percentage of the responses given to these statements.

As can be seen in Figure 9, the highest average among the sub-dimensions belongs to proactivity. In other words, participants want to participate in innovative activities and are willing to take preventive measures and find solutions for the potential problems or needs that are likely to arise. Considering the students' responses to the items in this subdimension, it is concluded that the proactivity level of the students studying maritime-related subjects at the university is high. This is the answer to the third research question.

Being proactive entails taking action before an issue develops. Entrepreneurs are supposed to take action to avoid problems in the initial stages rather than waiting for them to occur. Protecting intellectual property, drafting appropriate business contracts, and regularly seeking advice from a business law expert are all examples of being proactive [81]. The students need to have a high level of proactiveness since it was proved by a study that it was a feature that can be developed by entrepreneurship education which can help features like entrepreneurial intentions, entrepreneurial actions, and entrepreneurship innovation to be increased [82]. These competencies are important for the creation of new ventures as well as their retention. The high level of proactiveness in students is a sign that they will be successful entrepreneurs when appropriate conditions are created.

A high score on the Entrepreneurship Orientation Scale indicates the respondents have a high entrepreneurial orientation [83]. In this study, the average percentage of the three subdimensions is "72", which means the students have a positive attitude toward entrepreneurship. This also implies that 72% of the participants agreed or strongly agreed with the statements in the scale, indicating that they are inclined to exhibit the processes, practices, and decision-making activities that lead to new ventures, which is called entrepreneurial orientation [71, 83].

This conclusion answers the fourth research question; that is, the overall entrepreneurial orientation of the students studying at this maritime university is

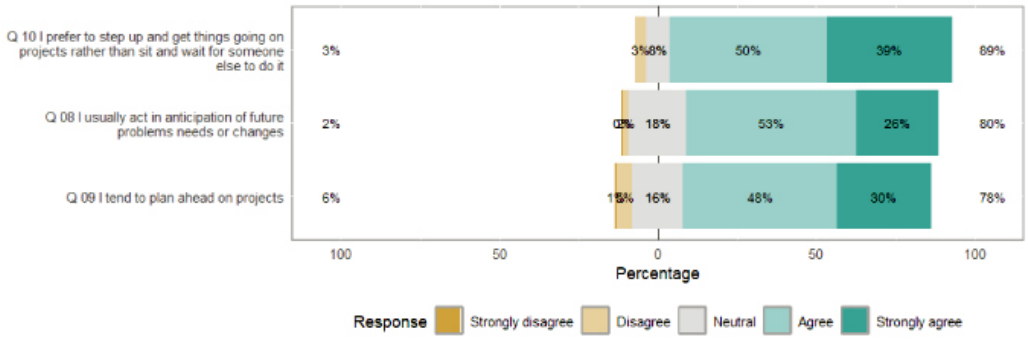


**Figure 9** Analysis of the responses on proactiveness sub-dimension

quite positive. Their characteristics measured by the scale, which is risk-taking, innovativeness, and proactiveness, are among those that enable people to become successful entrepreneurs. Those being high with the students indicate that they can make successful maripreneurs.

There are some specific actions by educational institutions and sector professionals to encourage students with high entrepreneurial tendencies to adopt entrepreneurship as a career goal and to support their journey into entrepreneurship. First of all, an entrepreneurship-friendly campus can be created. The following steps should be taken to achieve this:

Entrepreneurship should be integrated into the curriculum and experiential learning should be promoted. Educational institutions should offer specialized courses on maritime entrepreneurship, innovation, and business management including foundational concepts like financial planning, risk management, and supply chain logistics, with a focus on the maritime industry. They should foster a culture of innovation by organizing industry-focused hackathons or business idea competitions in maritime logistics, green shipping, or port technologies. Creating innovation labs or incubators on campus dedicated to maritime-related startups, and providing access to resources like mentorship, funding, and technical tools should be encouraged.

On the other hand, sector professionals should support educational institutions by allowing them to collaborate with maritime businesses to provide internships or apprenticeships where students can observe entrepreneurial operations. The students should be encouraged to take part in interdisciplinary projects and collaborative ecosystems to work with maritime industry associations, shipping companies, and trade organizations to establish partnerships that provide students with insights and opportunities. Representatives from shipping companies and port authorities should visit schools to present students with real-world challenges that require entrepreneurial thinking. Successful maritime enterprises should cooperate with educational institutions to form advisory boards to align education with industry needs and foster collaboration.

## 5 Conclusions

The 21st century is characterized by change in many areas due to various factors, especially technological advancements. Parallel to this, the skills that employees need to possess have undergone significant changes, and schools have begun to take many measures to provide the students with these skills. One of these measures is to offer courses on entrepreneurship, which is considered the driving force of the economy and the key to employment. Research shows that entrepreneurship can be taught and people with entrepreneurship orientation are better at recognizing new opportunities. This means that entrepreneurship education, which helps people become entrepreneurs, is more effective for people with high entrepreneurial orientation.

This study, which set out to measure the entrepreneurial orientation of students studying at a maritime-focused university, revealed that their entrepreneurial orientation is above average and close to high.

The results of the survey in this study, which evaluated students in three different aspects that are risk-taking, innovativeness, and proactiveness, showed that their orientation in all three aspects is quite strong, proactiveness being the strongest. This was followed by innovativeness and risk-taking.

That means the students are strong in anticipating changes and taking the necessary measures to adapt to change. Instead of reacting to changes after they occur, they try to predict them before they happen and try to take precautions for possible threats of any kind or even direct them to maximize the benefits of the situation.

The students are also innovative. Innovation is the ability to find new ideas and new approaches to existing or expected problems. It is about being creative and flexible. This implies that students who will shape the future of the maritime sector tend to either do different things or do the same things in different ways to achieve change.

Another conclusion of the survey results is that students have high risk-taking tendencies, and they are often not averse to taking risks with innovative ideas. Risk-taking is a characteristic that entrepreneurs should have; however, entrepreneurs should also know how much risk they need to take and have sufficient knowledge about risk management. It is important to increase the probability of success by eliminating or minimizing risks.

As students score highly on the three key characteristics associated with entrepreneurship, it is evident that equipping them with entrepreneurial skills will facilitate their journey toward becoming successful maripreneurs. Nevertheless, it would be unreasonable to expect all individuals who receive entrepreneurship training to become entrepreneurs. However, it is widely acknowledged that entrepreneurship education provides individuals with a range of perspectives, develops characteristics such as self-confidence, measured risk-taking, and social skills, and strengthens the features that will enable them to succeed professionally. On the other hand, even if they do not prefer to be entrepreneurs, or cannot succeed as entrepreneurs, they can become intrapreneurs, that are people who initiate change within their workplaces instead of establishing a new business.

As the literature review reveals, technological advances will probably cause robots or machines to par-

tially, if not fully, replace people in the maritime sector as in all sectors. As a result, there will be an unemployment problem, and creating new jobs for those who will lose theirs will become increasingly crucial. For this reason, it is considered that providing entrepreneurship education to students studying in maritime-oriented departments will contribute positively to their development, and help them strengthen their entrepreneurial mindset and perspectives, thus raising the maripreneurs of the future, who can be job creators instead of job seekers, since their strong potential for entrepreneurship is supported.

Future studies in this field may focus on what the most effective method can be for maritime students, and whether an entrepreneurship curriculum can be developed specifically to train and educate maripreneurs.

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