

# Identification of Maritime Education and Training Institutions (METIs) risk in pandemic restrictions

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The unprecedented COVID-19 crisis apparently has questioned our systems' survivability nationally or even in a global context. The pandemic has proven the indispensable role of international shipping in our societies' sustainability. Still, one of the main challenges for the shipping industry is to secure the supply of competent seafarers. Typically, Maritime Education and Training Institutions' (METIs') core mission revolves around keeping such demand supplied, however in restrictive situations, METIs' capability to achieve their mission is still questionable. During the pandemic restrictions, METIs are likely exposed to many uncertainties that directly threaten their role and may lead to hazardous consequences. In such scenarios, many questions arise to challenge whether the institution/organizational levels of control are sufficient or additional barriers to keep the risk as low as reasonably practicable are needed.

Consequently, this research investigates the possible threats exposed to METIs under such conditions, the potential consequences if they lose control of their operations, and the required barriers to prevent, detect, or protect the METIs from such a failure. To achieve this aim, a survey was designed to capture the expertise of a group of Maritime Education and Training (MET) experts. The survey responses have been quantified and statistically analysed to comprehensively identify these risk factors, their contribution, and their effectiveness.

Keywords: Risk Modelling, Risk Analysis, Crisis Management, Bowtie, Maritime Safety, Maritime Education and Training

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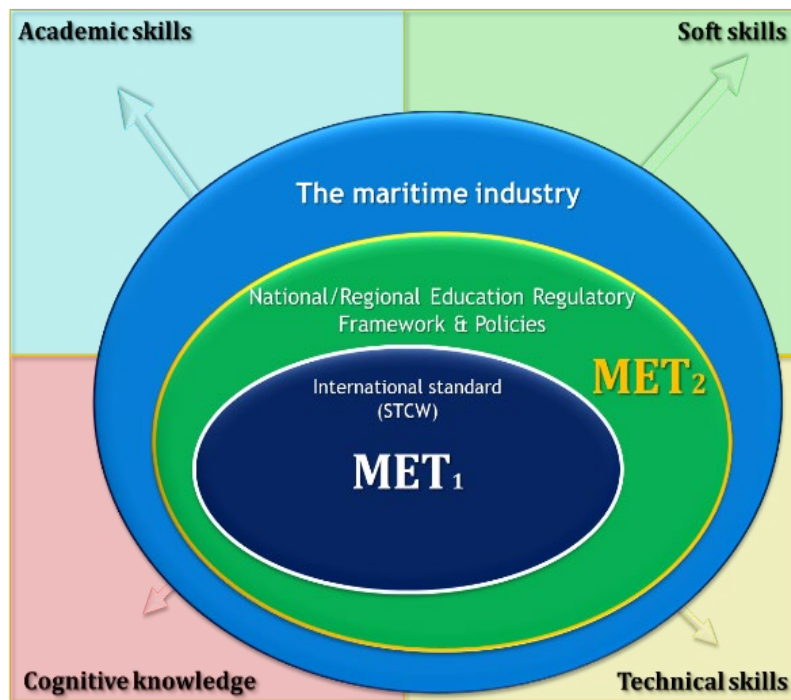
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# 1. Introduction

Shipping is usually considered a traditional industry that develops at a slow pace in adopting new technologies if compared with other transport means. (Turan et al., 2016). Nevertheless, the recent global surge of digitalization, automation and advanced modern technologies is transforming the industry probably faster than ever before (Brooks, M.R., Faust, P., 2018).

Typically, the global Maritime Education and Training (MET) system is responsible for supplying the maritime industry with seafarers equipped with predetermined sets of competencies. These competencies shall at least satisfy the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW-78), which has been adopted by the International Maritime Organization (IMO) last century (International Maritime Organization, 2018).

The MET system consists of three main stakeholders, the Maritime Education and Training Institutions (METIs) with their staff, curricula, and policies, the shipping companies, with their employees, ship technology, and lastly, the international/regional/national regulative bodies.



*Figure 1: The existing gap between the current international, regional, national standards and the maritime industry demand for seafarers' education and training (by authors).*

While METIs shall comply with international and national standards, they also should meet the industry needs. Such a complex framework has lately set the global MET system under enormous pressure as international standards are first and foremost driven by the traditional STCW convention, while the maritime industry recently evolves at a dynamic pace to a more sustainable future (Rowihil & Farag, 2021).

Although the STCW represents the minimum international standards for the education and training of seafarer's competencies, there are higher standards that may apply depending on the region or state policies/regulations in force. However, in both cases, there is a clear gap between the available standards and industry demand and expectation as illustrated in Figure 1 ([International Association of Maritime Universities \(IAMU\), 2019](#)) ([Manuel, 2017](#)).

## **2. The impact of the COVID-19 pandemic on MET and its stakeholders**

The unprecedented COVID-19 crisis apparently has questioned our systems survivability nationally or even in a global context. The pandemic has proven the indispensable role of international shipping in our societies' sustainability. Still, one of the main challenges for the shipping industry is to secure the supply of competent seafarers. Typically, METIs core mission revolves around keeping such demand supplied, however in restrictive situations, METIs capability to achieve their mission is still questionable ([Toquero, 2020](#)).

Following the pandemic spread of COVID-19, there was a global lockdown and a worldwide travel ban. This ultimately caused a chaotic backlash on Seafarers' education and training, especially when it came to the renewal of Certificates of Compliances (COCs) and other mandatory training certificates which caused a major confusion in the maritime domain in general ([Hebbar & Mukesh, 2020](#)) ([Doumbia-Henry, 2020](#)).

The first impact of such circumstances had fallen on shipping companies when they faced their seafarers' certification problems, among many other logistic problems, with almost no access to METIs due to the global lockdown. As advised by a fleet personal manager in one of the major oil shipping companies, the first and quick solution was circling seafarers with valid certificates around their fleets, effective as it is, but with prolonged lockdown period, high levels of stress and fatigue showed on ships crews which affected their mental health and personal safety due to extended time onboard ([Whiting, 2020](#)). Nevertheless, the economic burden on both the company and the seafarers caused by seafarers' extended leave time at home. Shortly, the problem was transferred to the METI, when the revalidation inquiries reached numbers beyond negligence. In response, the METIs tried to employ the available technological solutions to deliver the courses remotely. Non-STCW courses were a moderate challenge, the METI only had to develop an adequate LMS and a platform to deliver the course on, with an appropriate online registration and payment system. The major problem was the delivery of the STCW courses, which always require approval from local administrations.

After a while, the problem had shifted to national maritime administrations with their usual reference to the STCW. Although the STCW code, section A, explicitly specifies the competencies

required by each CoC holder with supplementary examples of how to demonstrate and evaluate these competencies, yet it does not clearly state how these competencies should be obtained, leaving national administrations to infer alternative methods according to their interpretations ([International Maritime Organization, 2018](#)). Accumulatively, this has led each administration to independently approach the challenge of delivering the STCW Courses online according to their initial understanding of the code ([IMO, 2021](#)).

The Egyptian administration, for example, had issued local decrees allowing the delivery of all theoretical courses online. On the other hand, it contended on the physical/direct delivery of all STCW courses that involve marine simulators and/or physical training such as firefighting, medical first aid, and survival techniques courses. Therefore, the Egyptian administration, as a temporary solution, approved the extension of all certificate's validity by three months, as their initial stand could still leave a massive number of seafarers with expired certificates due to their physical inability to attend these courses. ([The Government of the Arab Republic of Egypt, 2020](#)).

The COVID19 restrictions had clearly shown the complex nature of the MET domain. First, the shipping companies tried to adapt swiftly to the situation powered by their technical and organizational resources. The METIs were slowed down by the uncertainty of the situation and the need for administrations' approval every step of the way. while the administrations must deal with massive legislative challenges governed by the static framework of the STCW in such unprecedented conditions.

In pandemic restrictions, METIs are likely exposed to enormous uncertainties that directly threaten their mission and may lead to hazardous consequences. In such scenarios, many questions arise to challenge whether the institution levels of control are sufficient or additional barriers are needed to keep the risk as low as reasonably practicable.

Therefore, this research aims to investigate the possible threats on METIs under such conditions, the potential consequences on METIs if they lose control of their operations, and the needed barriers to prevent, detect and protect METIs from such a failure. To achieve these aims, a survey was designed to capture the expertise of a group of Maritime Education and Training (MET) experts.

### **3. The experts' survey<sup>6</sup>**

The survey has three main sections to identify the METIs' risk of losing control during pandemic restrictions. All the survey questions follow the Likert Scale with 5 alternative answers as

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<sup>6</sup> The experts survey link: [https://docs.google.com/forms/d/e/1FAIpQLSc8dqwawFzg\\_Qel43DQ3GGI7Nw0unVDWhnI-sTZJBFBgQHYfQ/viewform](https://docs.google.com/forms/d/e/1FAIpQLSc8dqwawFzg_Qel43DQ3GGI7Nw0unVDWhnI-sTZJBFBgQHYfQ/viewform)

illustrated in Figure 2. At each section, there was an optional open question for the respondent to add new alternative answers which are not covered in the respective section.

The first section seeks to verify the possible threats by survey respondents. It also requires them to identify the level of contribution of each threat and the frequency of its occurrence. The second section aims to evaluate the consequences and their impact when METI loss of control event occurs during pandemic restrictions. The last section is dedicated to the validation of the proposed barriers and their effectiveness level to mitigate the aforementioned risk.

Threats			Consequencies			Barriers		
Agreement Levels (ALs)			Agreement Levels (ALs)			Agreement Levels (ALs)		
Alternative	Code	W	Alternative	Code	W	Alternative	Code	W
Strongly agree	SA	5	Strongly agree	SA	5	Strongly agree	SA	5
Agree	A	4	Agree	A	4	Agree	A	4
Undecided	U	3	Undecided	U	3	Undecided	U	3
Disagree	D	2	Disagree	D	2	Disagree	D	2
Strongly disagree	SD	1	Strongly disagree	SD	1	Strongly disagree	SD	1
Contribution Level (CL)			Impact Level (IL)			Effectiveness Level (EL)		
Alternative	Code	W	Alternative	Code	W	Alternative	Code	W
Very high contribution	VH	5	Loss of control (total failure)	Fail	5	Excellent	Ex	5
High contribution	H	4	Major concern	Maj	4	Good	G	4
Moderate contribution	Mod	3	Medium concern	Med	3	Fair	F	3
Low contribution	L	2	Minor concern	Min	2	Poor	P	2
No contribution	No	1	No concern	No	1	Very poor	VP	1
Frequency (Freq)								
Alternative	Code	W						
Continuous	C	5						
Yearly	Y	4						
Monthly	M	3						
Weekly	W	2						
Never	N	1						

Figure 2: Survey alternative answers (Likert Scale)

### 3.1. Identification of the possible "Threats" to METIs under pandemic restrictions

The respondents are given a set of (10) threats proposed by the authors. Four groups of questions are prepared for each threat to achieving the first section's aim. The questions are as follow:

- **Q1.1:** To what extent do you agree that the following factors can be considered as "Threats" to the METI mission during pandemic restrictions (such as the current global COVID19 pandemic)?
- **Q1.2:** Define the contribution level of each of the following potential "Threats" to a METI to lose control over its operations/services during pandemic restrictions.
- **Q1.3:** Specify the occurrence frequency of each of the following potential "Threats" to a METI during pandemic restrictions.
- **Q1.4:** Please add below other possible "Threats" that you think are relevant and are not listed in the previous questions (optional).

### 3.2. Evaluation of potential "Consequences" when METI loses control.

The respondents are given a set of (08) Consequences proposed by the authors. Three groups of questions are prepared for each consequence to achieving the second section's aim. The questions are as follow:

- **Q2.1:** To what extent do you agree with the following potential "Consequences" if the METI loses control during pandemic restriction (such as the current global COVID19 pandemic)?
- **Q2.2:** Define the impact level of each of the following potential "Consequences", if METI loses control during pandemic restrictions.
- **Q2.3:** Please add below other potential "Consequences" that you think are relevant and not listed in the previous questions (optional).

### 3.3. Validation of the proposed barriers/solutions and their effectiveness:

Likewise, to the previous sections, the respondents are given a set of (11) barriers/solutions proposed by the authors. Three group of questions are prepared for each barrier to meet the third section's aim. The questions are as follow:

- **Q3.1:** To what extent do you agree with the following proposed "Barriers" as possible solutions for METIs to minimise their risk during pandemic restrictions (Such as the current COVID19 pandemic).
- **Q3.2:** Define the effectiveness level of each of the following "Barriers", if effectively implemented, to prevent/detect/protect the METI from losing control during pandemic restrictions and potential consequences.
- **Q3.3:** Please add below other barriers/solutions that you think are relevant and not listed in the previous questions (optional).

For the survey results quantification, one of the techniques used to statistically exploit the Likert Scale-based surveys outputs is calculating the Relative Importance Index (RII) for each alternative. The RII could be used to indicate the respondents' preferences for each alternative (Johnson & LeBreton, 2004). Hence, The RII was used to analyse the level of agreement for questions Q1.1, Q1.2, and Q1.3. The RII can be calculated by using the following formula:

$$RII = \frac{\sum w}{A \times N} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5 \times n} \quad (0 \leq RII \leq 1) \quad \text{Equation (1)}$$

Where:

**W:** weight given to each alternative by the respondents and ranges from 1 to 5, (where "1" is "Strongly disagree" and "5" is "Strongly agree").

**A:** the highest weight (i.e., 5 in our case).

**N:** the total number of respondents.

Additionally, to measure the central tendency of the Likert Scale data for questions Q1.2, Q1.3, Q2.2, and Q3.2., and due to the nature of the sample data, the authors have used the Median (M) to estimate the level of the respondents answer for each question (Sullivan & Artino, 2013).

#### 4. Data collection and analysis:

The survey was distributed among experts having a wide range of experience in MET. (39) responses were received from respondents belong to (11) MET organizations from Egypt, Turkey, the UK, Greece, India, Japan, Saudi Arabia, Croatia, Finland, and the USA. Figure 3 shows the responses count per each organization.

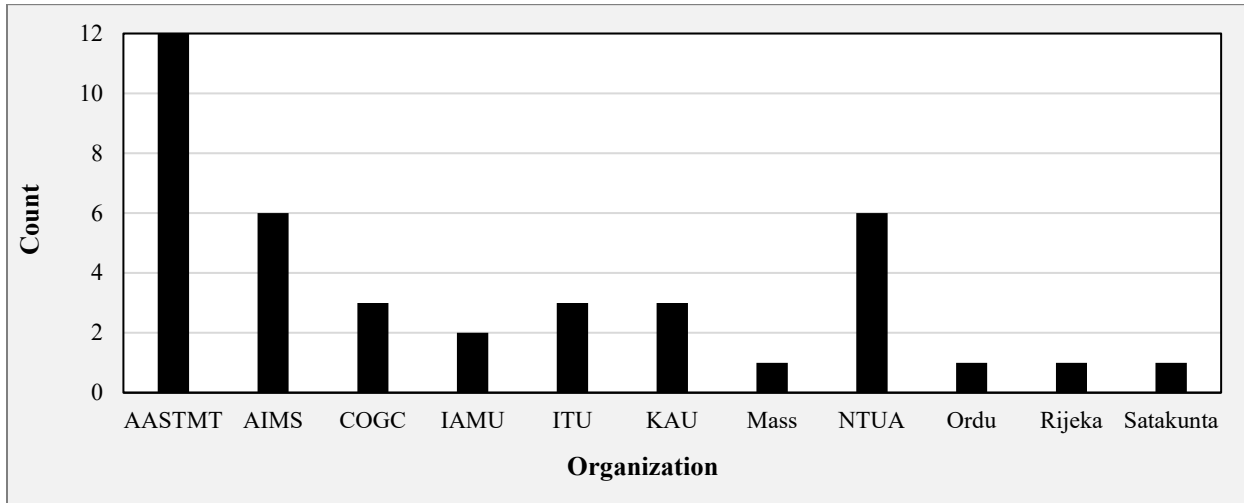


Figure 3: Count of survey respondents by their organizations

Figure 4 demonstrates the respondents' count by their different role levels in their respective organizations and years of experience.

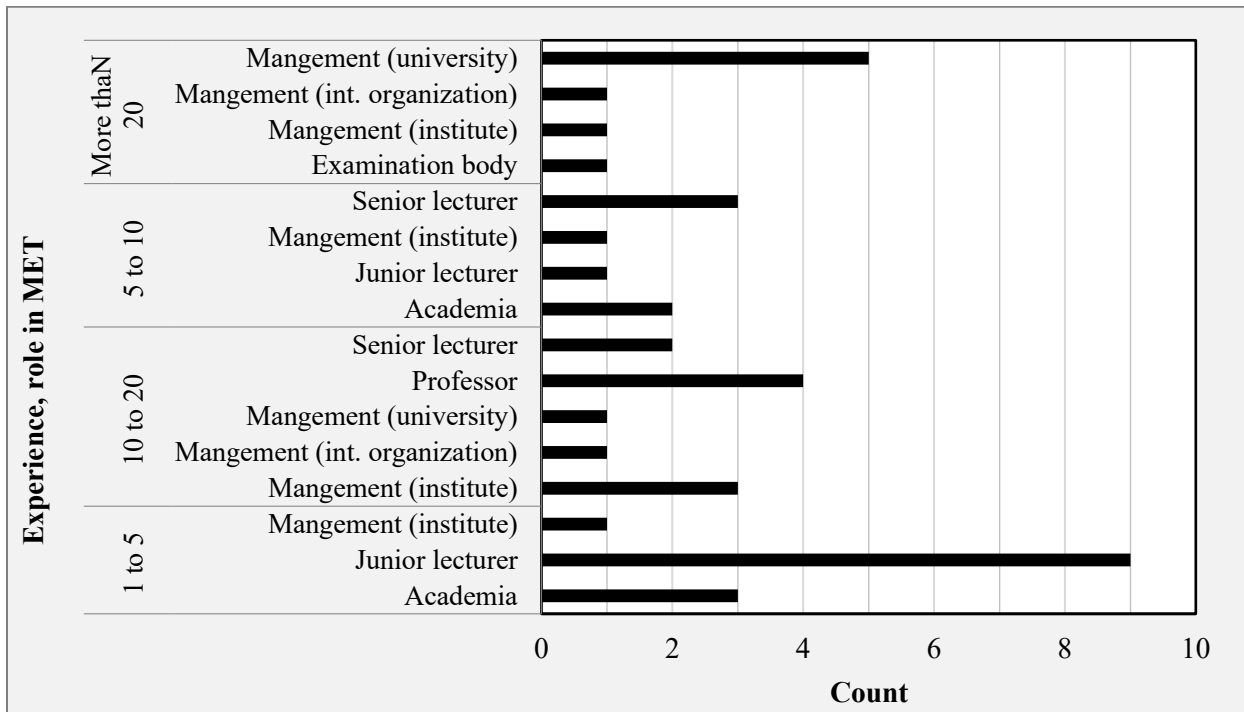


Figure 4: Count of survey respondents by their role and years of experience in MET

The obtained results were collected, organized, and quantified by using the Likert Scale shown in Figure 2. The data was also verified against any possible anomalies.

#### 4.1. Threats:

The respondents' inputs were processed through Equation (1) to rank threats by their importance. The obtained results are detailed in Table 1.

*Table 1: Identification of possible Threats to the METI's processes and operations in pandemic restrictions.*

Code	Possible threat	RII	Rank	Contribution to the loss of control event (M)	Frequency (M)
T1	Non-conformity of the METI facilities and resources.	0.71	6	High	Yearly
T2	Non-conformity of the available Learning Management System (LMS).	0.72	5	High	Yearly
T3	Some of the program/course contents require direct/physical interaction with students/trainees.	0.95	1	Very high	Continuous
T4	The available technological solutions are not robust enough to ensure the security/verification of the registration, delivery of the education/training and assessment processes.	0.78	2	High	Yearly
T5	Staff are not able to efficiently implement the education program.	0.69	9	Moderate	Yearly
T6	Medical and mental health issues of staff (infection, overload, stress, etc.).	0.70	8	High	Yearly
T7	The current institution management system is not updated/fit to manage the situation.	0.64	10	Moderate	Yearly
T8	The current international/national standards/legislations. are not updated/fit to manage the situation.	0.75	3	High	Yearly
T9	Administrative constraints.	0.75	4	Moderate	Yearly
T10	Insufficient funds/budgets.	0.71	7	Moderate	Yearly

Moreover, the results show a consensus agreement on the importance of threat (T3): "Some of the program/course contents require direct/physical interaction with students/trainees". The collected data as well declare the very high contribution of the after mentioned barrier as declared by the collected responses. Figure 6 also show that threats T7, T5 and T6 scored the least importance, respectively. The respondents' uncertainty about threats T9 and T10 was the highest as 29% and 26% selected the "Undecided" answer.



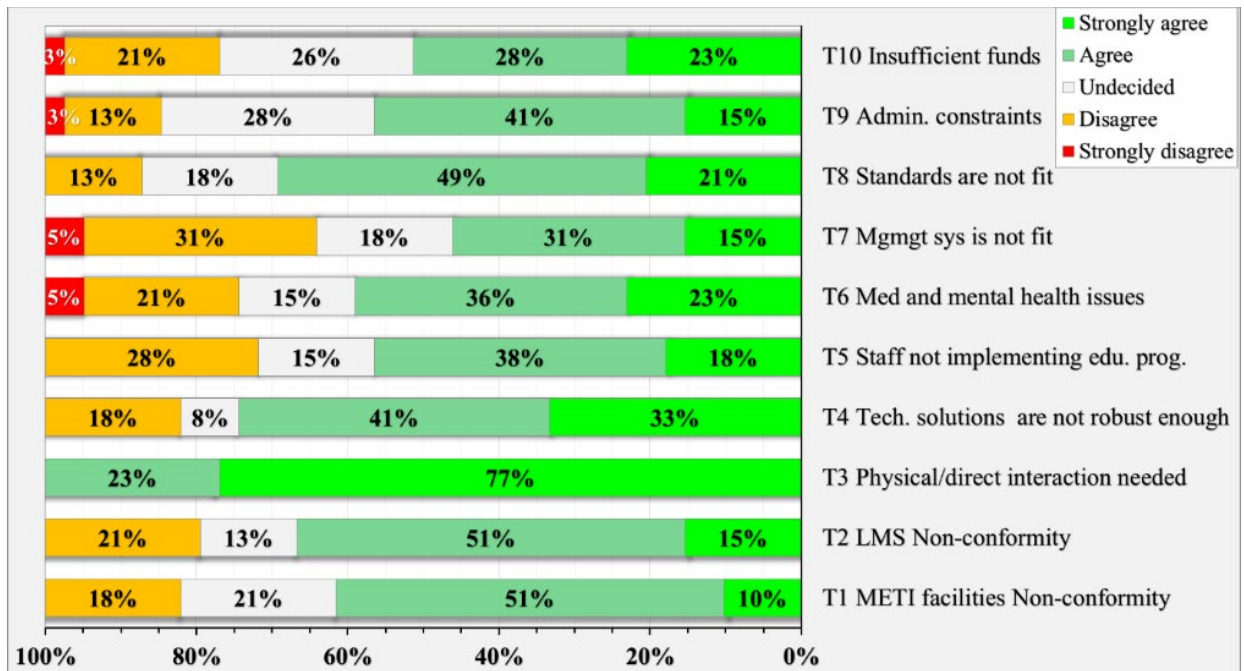


Figure 5: The survey respondents' evaluation of the possible threats to METIs during pandemic restrictions

#### 4.2. Consequences:

Similarly, the consequences section was analyzed using the same method explained in section 4.1. The results shows that most of the survey respondents are concerned from C1 for the “Insufficient quality of educational/training services” occurrence. While 31% of them is uncertain with C7 for the “Closure of METI” occurrence. The consequences of METI loss of control in pandemic restriction are ranked according to their RII score with their potential impact in Table 2.

Table 2: Potential Consequences when METIs lose control in pandemic restrictions.

Code	Potential consequence	RII	Rank	Impact/concern (M)
C1	Insufficient quality of educational/training services	0.85	1	Major
C2	Failure to create favourable conditions for education and training activities of the students (their satisfaction)	0.83	2	Major
C3	Not efficiently achieving the program/course learning outcomes	0.77	3	Major
C4	Not fulfilling the accreditation and licensing requirements	0.72	5	Major
C5	Losing customers of the METI's services (students/trainees)	0.70	6	Major
C6	Extended program/course delays	0.75	4	Medium
C7	Closure of METI	0.65	7	Medium
C8	Harm to Institution's reputation	0.52	8	Major

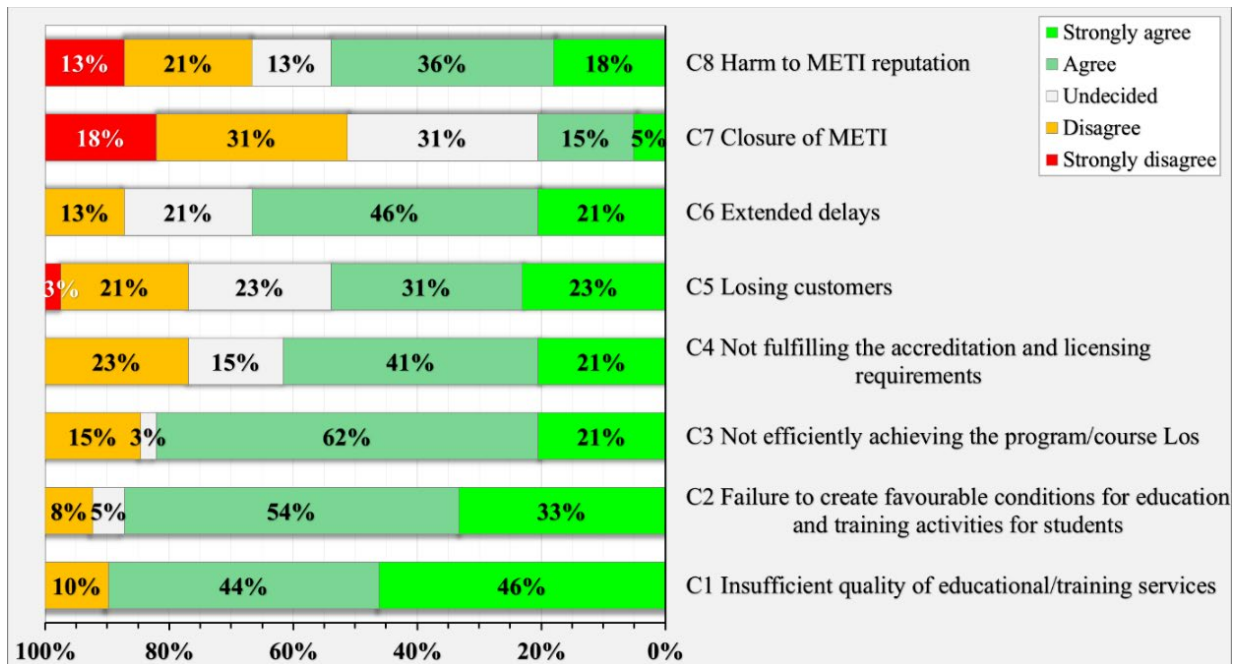


Figure 6: The survey respondents' evaluation of the potential consequences when METIs lose control in pandemic restrictions.

#### 4.3. Barriers and solutions:

The proposed barriers were validated by the survey respondents. The respondents highly agreed with proposed barriers B6, B11 and B5, respectively as shown in Figure 7.

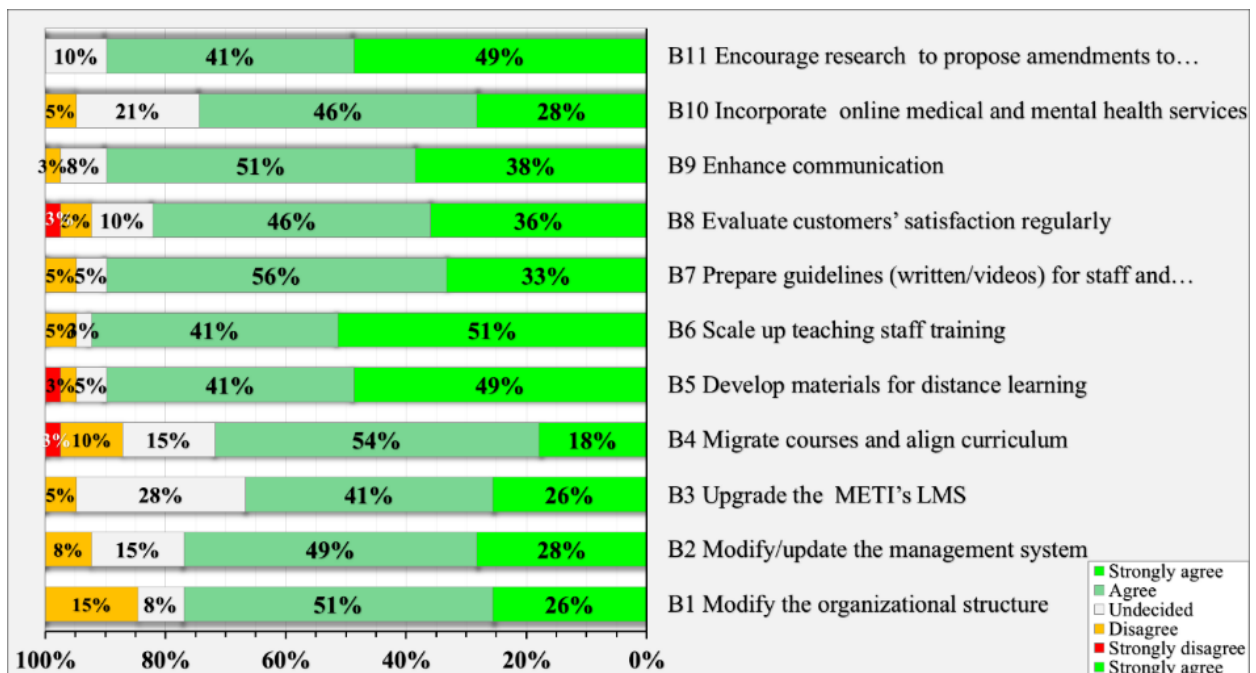


Figure 7: The survey respondents' evaluation of the proposed barriers and solutions

This, in turn, highlights the importance of METIs to adopt the following measures to mitigate the METIs risk under such conditions:

- scale up the teaching staff training for online teaching,
- develop new materials/techniques that incorporate distance learning/online teaching, and

- encourage research activities to propose amendments to the current international/national standards/legislation.

Moreover, most of the survey respondents think that barriers B5 and B6 have an excellent effect in mitigating the loss of control risk of their organization in pandemic restrictions. While 28% of them are uncertain of the importance of upgrading the institute Learning Management System (LMS).

Table 3 contains more details about the proposed barriers, their function, rank, and degree of effectiveness.

**Table 3: The proposed barriers & solutions**

Code	Proposed barrier	Function	Type	RII	Rank	Effectiveness (M)
B1	Modify the METI organizational structure	Preventive	Internal	0.774	9	Good
B2	Modify/update the METI management system	Preventive	Internal/ External	0.795	7	Good
B3	Invest more fund to upgrade the METI's LMS	Preventive	Internal/ External	0.774	10	Good
B4	Migrate courses and align curriculum competencies	Preventive	Internal/ External	0.749	11	Good
B5	Develop new materials/techniques that incorporate distance learning/online teaching.	Preventive	Internal	0.862	3	Excellent
B6	Scale up teaching staff training for online teaching.	Preventive	Internal	0.877	1	Excellent
B7	Prepare guidelines (written/videos) for staff and customers for better engagement with the new communication means.	Preventive	Internal	0.836	5	Good
B8	Continuously measure and evaluate customers' satisfaction (trainees, shipping companies, manning agencies).	Detective	Internal	0.815	6	Good
B9	Enhance the communication with staff and customers.	Detective	Internal	0.851	4	Good
B10	Incorporate an online mental health and medical services for staff.	Protective	Internal	0.795	8	Good
B11	Encourage research activities to propose amendments to the current international/national standards/legislation.	Preventive	Internal/ External	0.877	2	Good

## **5. Conclusion and future work.**

This research has investigated the possible threats exposed to METIs under pandemic restrictions, the potential consequences if a loss of control occurs, and the required barriers to prevent, detect, or protect the METIs from such a failure. To achieve this aim, a survey was designed to capture the expertise of a group of Maritime Education and Training (MET) experts. The survey responses have been quantified and statistically analysed to comprehensively identify these risk factors, their contribution, and their effectiveness.

This study can provide the required control measures for METIs to achieve their mission despite the plethora of activities, customers, regulators, governance instruments, and stakeholders with their different interests, especially under restrictive conditions.

### **Future work:**

The obtained survey data will be employed in a Bowtie model to link the identified risk threats and consequences together and assess the effectiveness of the proposed barriers.

Additionally, the current study only focused on METIs' perspective; still, further investigation is needed for other MET stakeholders as well, such as shipping companies, manning agencies, regulators ... etc., for a more inclusive result.

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