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PAPER

Emotional Intelligence and Teamwork in a Ship's Bridge: A Proposed Training Framework for Upskilling

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ABSTRACT

The notion that computers equipped with software and artificial intelligence (AI) applications can effectively replace human intelligence is under the existing paradigm of operations. This is the leading facilitator of task automation on board a ship to fulfill various jobs and is often supported by numerous scientists/academics who contribute to gaining today's momentum in public opinion. The discourse of Industry 4.0 in the maritime domain, however, tends to focus heavily on technological contexts and overlooks socio-economic contexts. This gap is evident in the strong emphasis on technical and digital skills for future maritime professionals. This paper, therefore, argues that the socio-economic context of Industry 4.0 can be understood as fostering soft skills for future seafarers. In particular, our focus is on emotional intelligence concerning "future skills" on demand in the maritime industry. This paper reviews relevant theories and conceptualizes how integrating emotional intelligence into maritime education and training can support the transition toward maritime digitalization. The main objective of this paper is to present a framework that effectively incorporates emotional intelligence into a teamwork environment suitable for the ship's bridge and to outline a set of skills training based on Transformative Learning.

KEYWORDS

emotional intelligence, teamwork, training framework, Transformative Learning, maritime, seafarers

1 INTRODUCTION

It is widely anticipated that computers with software and artificial intelligence (AI) applications could replace human intelligence, which remains strongly linked to job performance [1, 2]. The maritime industry is already influenced by digitalization [3]. A wide range of modern technological applications, often termed "Industry 4.0," will fundamentally change the technical domains of existing maritime knowledge and practices, as new insights are gained and used to transform key maritime processes; autonomous shipping is a salient example of this new operating paradigm [4].

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In addition to numerous technical skills, future workers are also expected to possess soft skills. According to the World Economic Forum (2025) report, 39% of employees' core skills are expected to change by 2030. In addition to hard skills, improving social and emotional skills is also considered increasingly important. Skills such as resilience, self-awareness, motivation, leadership, and empathy will enable people to develop their interpersonal and communication skills and be more strategically capable in rapidly changing socioeconomic and technological workplaces [5].

The discourse of Industry 4.0 in the maritime domain, however, tends to focus heavily on technological contexts and overlooks socio-economic ones. This gap is evident in the strong emphasis on technical and digital skills for future maritime professionals. This paper, therefore, argues that the socio-economic contexts of Industry 4.0 can be understood in terms of fostering soft skills for future seafarers. Our primary focus is on emotional intelligence (EI), which is concerned with "future skills" in demand in the maritime industry. EI was also identified as a future skill within the concept of a Global Maritime Professional (GMP) [6]. The paper reviews relevant theories and conceptualizes how integrating EI into maritime education and training can support the transition toward maritime digitalization. While organizations increasingly use teams to carry out work tasks, a notable deficiency remains in normative guidance on effectively harnessing the potential of team collaboration. Specifically, in a ship's bridge environment, teamwork is a crucial factor. Positive and effective interpersonal relationships are essential elements of successful teams. Emotional bonding among team members has a profound effect on the quality of work and the project's overall success. Teams that genuinely care about each other, personally and professionally, are more likely to succeed. The objectives of this paper are to present a framework that effectively incorporates EI into a teamwork environment suitable for the ship's bridge and to explore an EI training framework based on Transformative Learning.

2 MARITIME DIGITALIZATION AND EDUCATION

Researchers emphasize that the maritime industry requires highly capable seafarers who are proficient in digital technologies and artificial intelligence (AI) and possess the necessary technical skills to thrive in a decarbonized future [7]. Terms like "autonomous" and "uncrewed" ships have sparked intense debate regarding regulations, policy, safety, security, and education. The International Maritime Organization (IMO) is an international regulatory body in the maritime sector, responding to this industry-driven debate and completing its scoping exercise on "Maritime Autonomous Surface Ships (MASS)," a specific type of ship [4]. The scoping exercise included tasks such as developing MASS terminology and definitions, as well as the functional and operational requirements of the remote-control station/center where a remote operator, such as a seafarer, may be assigned. The competencies of seafarers in the context of digitalization are, therefore, an urgent issue to discuss among maritime stakeholders. Adapting to a new maritime context of digitalization is under the comprehensive review of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, specifically by the Human Element, Training, and Watchkeeping (HTW) Sub-Committee of the IMO.

Research underscores a moderate-to-high positive correlation between EI and job performance, which predicts seafarers' success. Consequently, to leverage this relationship and proactively address operational and personnel challenges, the findings strongly support the implementation of comprehensive seafarers'

soft-skills strategies [8]. In the STCW table of competencies for seafarers, there are a few points where soft skills are identified. For example, "leadership and teamwork" is an essential soft skill added in the 2010 Manila Amendment of STCW. Later in this paper, we argue how important EI is in fostering the seafarers' competence in "leadership and teamwork." However, there is minimal research on EI in "leadership and teamwork" training.

In this paper, we consider EI an essential skill for future seafarers to work in complex socio-technical environments, demonstrating the leadership and teamwork competencies prescribed in the STCW.

3 EMOTIONAL INTELLIGENCE AND SEAFARERS

In his book "Nicomachean Ethics," Aristotle [9] approached emotions in the light of intelligence. Defining emotion as passion, he believed that, when properly cultivated, it leads to wisdom and influences our judgment and values. According to Aristotle, the issue is not with the emotions themselves, but rather how they are expressed in different situations [10].

Emotions extend beyond simple reactive mechanisms. They are grounded in a profound neurobiological and functional basis and represent an evolutionary adaptation that supports human survival under adverse conditions [11]. Emerging initially as biological processes, they subsequently evolve into subjective, cognitive, and psychological experiences [12]. They contain valuable information about relationships, behavior, and every aspect of the human world. According to Reeve [13], emotions can be understood as short-lived, experiential, purposive, and bodily responses that enable individuals to adapt to opportunities and challenges arising from significant life events. Researchers often focus on individuals' cognitive processes and emotions, investigating individual differences in the recognition and expression of emotions, their emotional states, and their correlation with cognitive processes, which is a matter of particular concern [14]. Rowe and Fitness [15] argue that emotions motivate potentially adaptive behaviors, allowing individuals to resolve intrapersonal and interpersonal challenges.

Until very recently, the concept of EI has been largely overlooked due to the rise of scientific management and the prevailing myth that emotions of any kind are disruptive in the workplace. However, the label "emotional intelligence" implies that EI is one of multiple group factors of intelligence related to the processing of emotional stimuli. Emotional Intelligence (EI) or emotional quotient (EQ) is assumed to be the perception, evaluation, and manipulation of emotions in self and others. It is a conceptual framework that combines emotion, cognition, and metacognitive processes [16]. Specifically, EI refers to the extent to which a person effectively manages information or data [17]. The development of EI in organizations is crucial, as it is correlated with a range of factors, including performance, teamwork and collaboration, effective leadership, job satisfaction, motivation, lower counterproductive work behavior, and lower stress levels [18].

According to Zhang and Adegbola [19], most EI definitions emphasize that it is both self- and other-directed (self-interested and prosocial). Goleman's explication of the EI's concept highlights five dimensions: self-awareness, as the ability to recognize and understand one's own emotions and their effects on others, evidenced by one's self-confidence and humility; self-regulation (or emotional labor) as the ability to control or redirect disruptive impulses and moods, the inclination to suspend judgments and to think before acting, indicated by one's tolerance for ambiguity and

adaptability to change; empathy as the ability to understand the emotions of others or "putting oneself in the shoes of others"; social skills as the abilities which are vital managing relationships, reaching consensus and building rapport with others; motivation as one's persistence and commitment to organizational goals in the face of adversity or failures. The concept of EI, crucial for managing people and working with others, has gained traction in organizations and has generated a substantial body of research. It has generated grand expectations and promising findings in Human Resources Management (HRM) [20, 21].

3.1 EI and teamwork

EI has attracted significant attention among researchers and Human Resource (HR) practitioners due to its importance for leaders and employees and its crucial role in organizational effectiveness and excellence. An increasing number of researchers acknowledge EI's contribution to team performance [22]. Teams are essential in many organizations. Teamwork is defined by Harris and Harris [23] as "... a work group or unit with a common purpose through which members develop mutual relationships for the achievement of goals/tasks" (p. 23). Teamwork entails individuals working cooperatively to achieve a common goal by sharing knowledge/skills and being flexible enough to assume multiple roles [24].

Specifically, high EI teams are increasingly creative, cooperative, and practical. Hence, they can differentiate their work to improve the team's and the organization's outcomes. Employees with high EI are more capable of managing their emotions and using empathy to understand the feelings of other team members. Research has shown that employees with high EI can manage conflict more effectively than those with low EI [25]. Ultimately, positive and effective interpersonal relationships are crucial to team success. To promote positive, progressive, and effective working environments, team members must have technical knowledge and well-developed EI, including self-awareness, empathy, and social awareness, and be able to inspire and motivate their colleagues [24].

In contrast to corporate environments in the broader EI literature, the ship's bridge working environment has specific characteristics that intensify the functional demands of EI. The psychosocial characteristics that shape relationships among seafarers of different nationalities, combined with the demanding conditions, make the cultivation of EI a prerequisite for both maintaining seafarers' physical and mental health and protecting human life at [26]. Teamwork and collaboration on the bridge aims to establish a shared understanding of the maritime situation and to facilitate coordinated decision-making. A key component of this dynamic is the use of clear and affirmative communication, which helps to reduce misunderstandings and, by extension, prevent maritime accidents [27]. Research findings from bridge simulator tests indicate that seafarers' uncontrolled emotions during maritime operations influence their behavior and collaboration and can lead to human error [28]. Nevertheless, the ability to maintain self-control and communicate clearly during maritime incidents—particularly under conditions of stress and time pressure—can significantly enhance seafarers' effectiveness. Emotional management plays a crucial role in this regard, as it equips seafarers with the capacity to navigate and resolve conflicts that may arise across a variety of maritime situations [29]. In this context, seafarers must ensure collaboration among the bridge team to accomplish their duties effectively [30].

3.2 Ship's bridge teamwork

Navigating the seas and oceans of our planet is a challenging and skilled endeavor, and effective communication within a ship's bridge is essential [31]. The term "bridge team" refers to the primary unit responsible for decision-making during navigation. That team comprises individuals with relevant competencies and similar experience and knowledge. These officers must complete the same initial training as the ratings and progress to the rank of Captain after completing each rank. Hence, the Captain's professional knowledge should theoretically encompass that of all the bridge team members.

Research on bridge officers highlights the importance they attach to soft skills, as they recognize their decisive role in the effective performance of their duties. The importance of situational awareness, decision-making, and teamwork in preventing maritime accidents is widely acknowledged [32]. Furthermore, the need to develop structured training programs to enhance these skills in the particularly demanding bridge environment is also emphasized [33]. In this context, the bridge environment, generally characterized by noise, proximity, and layout, provides a challenging interactional frame for situated action and navigational decision-making [34].

4 TRANSFORMATIVE LEARNING

Transformative learning (TL) is an adult learning theory that has evolved over time, gaining prominence with the work of J. Mezirow. TL has emerged as a contemporary theory in adult education for understanding adult learning. Specifically, TL theory provides a framework for understanding how an individual makes sense of a disorienting event or conflicting information and incorporates it into a more comprehensive worldview [35]. TL is also steeped in constructivism, humanism, and critical social theory. Mezirow's theory is structured around two pillars: a) critical reflection and b) rational discourse. However, experience is considered the key point of discourse, resulting in the critical examination of the learner's hypotheses and a transformational perspective. Utilizing learners' experiences helps eliminate dysfunctional perceptions and stereotypical assumptions, exposing them to criticism before forming new knowledge [36].

TL can also be implemented using digital technologies to foster dialogue and critical reflection, drawing on learners' past experiences [37]. TL is a learner-centered theory considered interactive, allowing for learner engagement throughout the learning process. The role of the educator is also crucial, as they guide learners to achieve their goals, enabling them to become more autonomous, thoughtful, and responsible individuals. This is achieved by abandoning the rigid teaching styles of traditional methods and adopting entirely different educational strategies [36]. In engaging and promoting discourse, the educator should foster an environment that encourages freedom of expression, emotional expression, empathy, mutual respect, and understanding. Typically, TL theory follows the subsequent phases in learning procedure [38]: A disorienting dilemma (the first and essential stage); Self-examination with feelings of fear, anger, guilt, or shame; A critical assessment of assumptions; Recognition that one's discontent and the process of transformation are shared; Exploration of options for new roles, relationships, and actions; Planning a course of action; Acquiring knowledge and skills for implementing one's plans; Provisional trying of new roles; Building competence and self-confidence in new roles and relationships; A reintegration into one's life based on conditions dictated by one's new perspective.

5 CONCEPTUAL TRAINING FRAMEWORK

This paper proposes a training framework to enhance the EI skills of the ship's bridge personnel. EI is the human ability to recognize and understand emotions in others and to use this awareness to manage one's behavior and relationships. It is a crucial skill for seafarers, as communicating in noisy, spacious environments and making decisions through talk-in-interaction are essential [34]. In general, the benefits of emotional skills may be indirect and depend on the organizational context [39]. More specifically, we propose a training program (Blending Training Program of EI skills for Seafarers—BTPEISS) based on TL theory (TL is strongly related to emotional learning) [40] in a blended learning environment (a combination of traditional and e-learning). The main target of this framework is shown in Table 1. In this table, the attributes required for successful ship's bridge teams were linked with the EI competencies defined by Goleman [41]: self-awareness, self-regulation, motivation, empathy, and social skills. These relationships were derived through synthesizing the literature [24].

Table 1. EI concept of the proposed training program (BTPEISS)

EI Competencies	Educational Goal	Proposed Courses (Cognitive Areas) of BTPEISS
Self-awareness	The team was aware of their emotions and their possible impact on the team.	Self-management
Self-regulation	The team was product-focused and regulated their emotions.	Self-management
Motivation	The team was very goal-oriented and focused on the "big picture."	Relation management
Empathy	Team members respected the diverse personalities, cultures, and sensitivities of their colleagues.	Social Awareness
Social skills	The team never took issues personally and socialized together.	Social Awareness

The learning and teaching approach (TL theory) of BTPEISS contains Disorienting dilemmas, Critical reflection, Discourse, Meaning-making, and Perspective transformation (Figure 1). In addition, the e-learning approach (asynchronous and synchronous methodology) was proposed for learning, supporting LMS (i.e., Moodle), and Web conference Tools (i.e., Webex, MS Teams, etc.). The main goals of the proposed framework are effective communication between member-seafarers (G1) and efficient, reliable decision-making (G2).

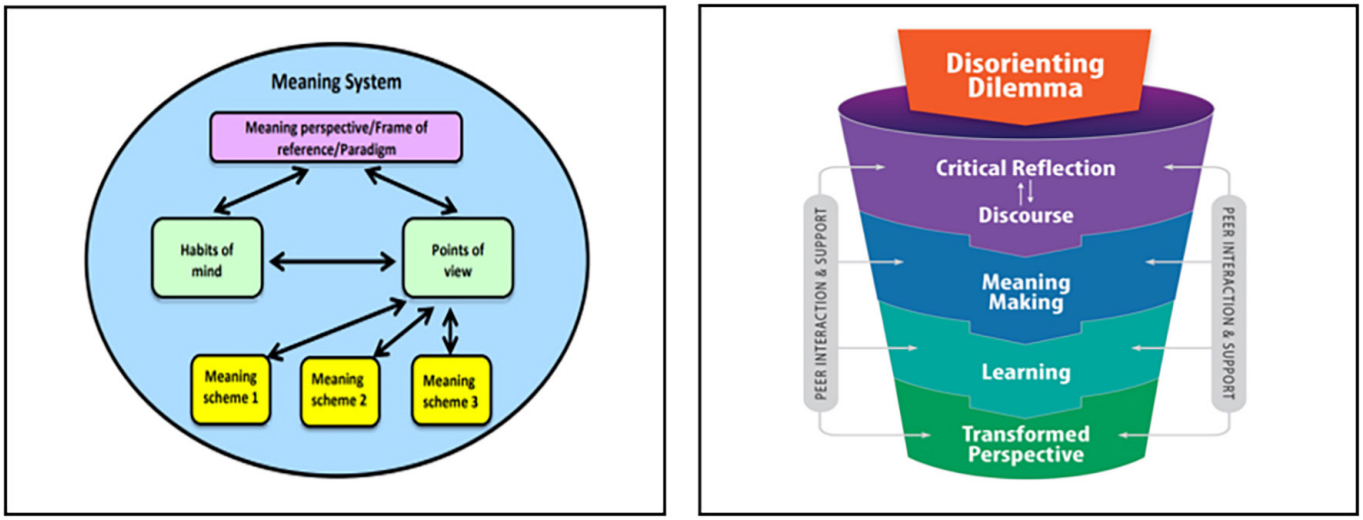

Fig. 1. The learning and teaching approach (based on TL) of BTPEISS

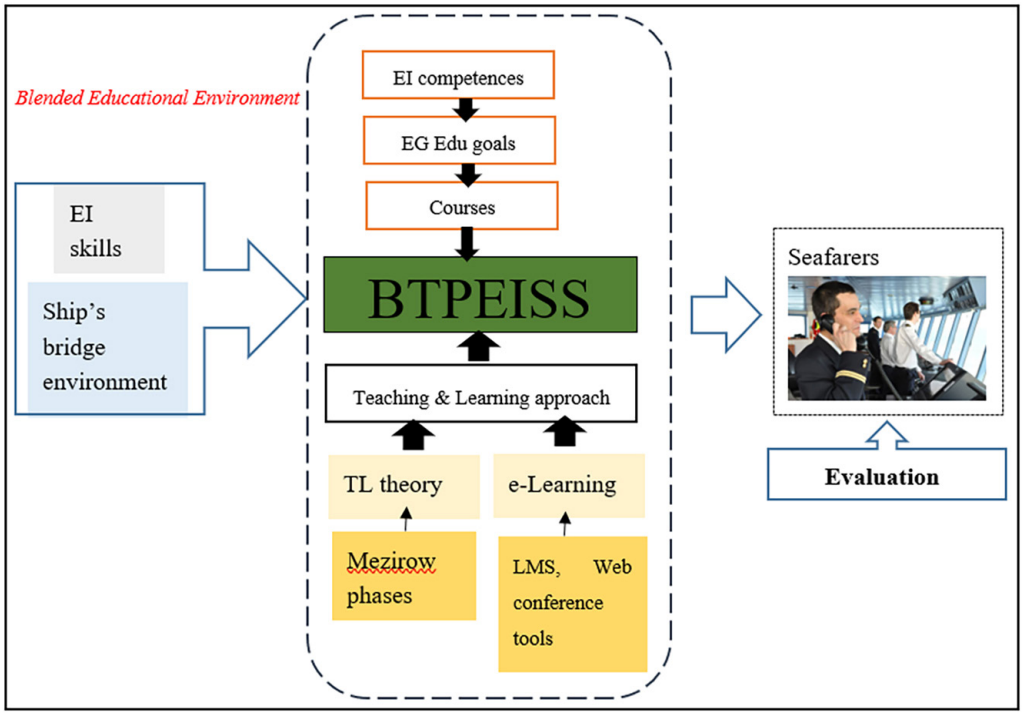

Fig. 2. Synopsis of the proposed framework BTPEISS

Finally, the proposed program (BTPEISS) includes an evaluation stage with essential measures of pedagogical and emotional intelligence (Figure 2). This process should be repeated twice: at the start and end of the relevant educational or training program to effectively assess the improvement of skills such as emotional intelligence and overall satisfaction with the program as per the trainees' expectations [42].

6 DISCUSSION AND CONCLUSIONS

In recent years, the wider maritime transport industry (including ports) has undergone a digital transformation to address emerging business challenges, optimize existing business and operational processes, and introduce new capabilities, with automation and real-time operational monitoring standing out [43]. Meanwhile, GMPs, including seafarers, must enhance EI competencies in an increasingly competitive and rapidly changing working environment. Ships' bridge personnel with high EI can make better decisions, manage their own emotions, and understand their colleagues' emotions by demonstrating empathy and communicating constructively. This is crucial in the maritime industry, as it fosters a safe and trusted work environment where conflicts are handled constructively. In this framework, seafarers with high levels of EI are a valuable asset for the maritime industry, delivering benefits and increasing productivity.

The proposed framework focuses on upgrading the EI competencies of seafarers by adopting TL as a teaching and learning method within the evolving landscape of Industry 4.0. Implementing TL, based on teamwork sessions, seafarers critically reflect with their colleagues, challenge their beliefs and assumptions, and modify them to be more functional.

This framework provides a modern and forward-looking training design that is both innovative for the maritime industry and aligned with the broader trends of

a digital society shaped by Industry 4.0. Adopting TL to facilitate the educational process for developing and improving seafarers' EI competencies is an approach that can provide valuable results for additional application and research in the future. Although the discussion has remained primarily within the framework, it offers insights that can be pragmatically applied by academics and practitioners, serving as a suitable basis for implementing the strategy in the marine industry. Consequently, this paper makes a significant contribution to IAMU's work on GMP and to the growing body of EI training and development, providing unique insights into the maritime industry and conceptualizing TL and contemporary learning environments.

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