

Maritime education and training – responding to the changing role of the seafarer

Tebogo A Mojafi[†]

Abstract

Maritime transport carries more than two-thirds of the world's total cargo and plays an important role in the sustainable development of the global economy. As a derivative of trade, the shipping industry allows citizens of the world to trade and people to gain meaningful employment. According to the 2021 BIMCO ICS Seafarer Workforce Report,¹ there are about 74 000 vessels in the world merchant fleet, employing a total of 1.9 million seafarers (UNCTAD, 2021; Tang and Zhang, 2021).² Abidin and Ismail³ sum the relationship between seafarer and ships by indicating that seafarers play a critical role in facilitating trade, whereas shipping is a critical element in the promotion of international cooperation.

Like other industries, shipping is also impacted by changing developments around the world. The dawn of the fourth industrial revolution (4IR) brings about challenges concerning how the industry ensures that tomorrow's seafarers have the necessary skills to ensure efficiency of the maritime industry. With the changing technologies, Emad, Enshaei and Ghosh⁴ caution against simply focusing on the development of technology and forgetting about getting the seafarers ready for the future maritime landscape. Over time, the role of the seafarer has changed, requiring the shipping industry to devise strategies aimed at developing seafarer skills and competencies. Acomi and Acomi⁵ found that maritime and offshore oil and gas graduates lacked some of the expected competencies including soft skills and industry experience.

Whereas, the BIMCO Workforce Report⁶ estimates seafarer shortages, there are still many seafarers who are still battling to find employment. How should the country manage its seafarer development programme to ensure South African seafarer relevance into the future? This paper explores how the maritime industry should respond to the changing role of the seafarer. It establishes the challenges faced by South African seafarers regarding placement and explores the role of education and training in addressing the competitiveness of the seafarers.

Keywords: seafarer shortage, seafarer education and training, maritime education and training, cadetship, seafarer role change, technology, digitalisation

[†] South African Maritime Safety Authority

¹ BIMCO & International Chamber of Shipping (London) *Seafarer Workforce Report: The Global Supply and Demand for Seafarers in 2021* (London: Witherby Publishing Group Limited 2011).

² United Nations Conference on Trade and Development (UNCTAD) *Review of Maritime Transport* (New York: United Nations Publications 2021); L Tang & P Zhang *Human Resource Management in Shipping: Issues, Challenges, and Solutions* (Abingdon: Routledge 2021).

³ ZZ Abidin & A Ismail 'Challenges and Opportunities for Malaysian Seafarers' in R Harun and S Ja far (eds) *Malaysia: A Maritime Nation* (Kuala Lumpur: Maritime Institute of Malaysia 2021).

⁴ GR Emad, H Enshaei & S Ghosh 'Identifying Seafarer Training Needs for Operating Future Autonomous Ships: A Systematic Literature Review' (2022) 14(2) *Australian Journal of Maritime & Ocean Affairs* 114–135.

⁵ N Acomi & O Acomi 'Diversification of Seafarers' Employability Paths' (2016) 15 *European Proceedings of the Social and Behavioural Sciences*.

⁶ BIMCO Report on cit note 1



I INTRODUCTION

Shipping operates in the globalised environment and, as such, it faces the same challenges that other industries experience. The sector must transcend and adjust to challenges, which include, among others, political, environmental, social, legal and technological. There is a need for shipping to take cognisance of these challenges, continually assess them and take steps to ensure relevance and value provision to the globe. With seafarers being at the forefront of driving shipping operations, it is uncontested that they are the heartbeat of the sector, thereby requiring attention amidst the global challenges that shipping is faced with.

Technological developments in shipping

The changing work environments and structures are a result of technological advancements.⁷ Anvari⁸ posits that the incorporation of information communications and technology (ICT) into the workplace has had a significant impact on human resources utilisation in sectors such as manufacturing and financial services, as well as in other sectors, including shipping, which has transformed its operations and embraced technology.⁹

Shipping companies and operators are constantly seeking ways to reduce costs¹⁰ and ensure compliance with regulatory requirements, while efficiently and

effectively delivering services. Shipping companies must ensure that they deliver their services timeously and safely whilst reducing their carbon footprint and contributing to a clean environment.

Improved shipboard technology is instrumental in reducing the size of the crew required to maintain operations.¹¹ Numerous shipping companies have invested in improved technologies. For economic reasons,¹² thereby opting to reduce their ships' crews.¹³ However, this same technology has created boredom and job dissatisfaction, and, with seafarers' work becoming routine and mundane, many choose to depart for opportunities on land.¹⁴

The increasing dependence on technology for automation and competitive advantage requires shipping companies to upgrade their security capabilities. In considering the threats and vulnerabilities brought about by the developments in technology, Caralli et al.¹⁵ posit that shipping companies will be required to educate their employees about technological security.

Digitalisation

The environment in which seafarers work is constantly changing¹⁶ and globalisation has accelerated these changes. Shipping is international and cannot be seen to be immune to the technological developments that

⁷ M Anvari 'Impact of Information Technology on Human Resources in Healthcare (2007) 10(4) *Healthcare Quarterly* 84–88; CC Lee, SJ Czaja & J Sharit 'Training Older Workers for Technology-based Employment' (2008) 35(1) *Educational Gerontology* 15–31.

⁸ Anvari op cit note 7.

⁹ H Ghaderi 'Autonomous Technologies in Short Sea Shipping: Trends, Feasibility and Implications (2019) 39(1) *Transport Reviews* 152–173.

¹⁰ Ibid.

¹¹ L Caesar, S Cahoon & J Fei 'Challenging the Current Paradigms of Seafarer Training and Careers' (2014) 27 *IAMU AGA 15 Looking Ahead Innovation in Maritime Education, Training, and Research* 348–356.

¹² M Ljung 'Function based Manning and Aspects of Flexibility (2010) 9(1) *WMU Journal of Maritime Affairs* 121–133; JM Silos, F Piniella, J Monedero & J Walliser 'Trends in the Global Market for Crews: A Case Study (2012) 36(4) *Marine Policy* 845–858.

¹³ M Oldenburg & H Jensen 'Merchant Seafaring: A Changing and Hazardous Occupation' (2012) 69(9) *Occupational Environmental Medicine* 685–688; Caesar et al. op cit note 11.

¹⁴ S Cahoon & H Haugstetter 'Shipping, Shortages and Generation Y' in *Proceedings of the Maritime Technology and Training Conference (MarTech 2008)* 13–14; Oldenburg & Jensen op cit note 13.

¹⁵ RA Caralli, JH Allen, J Stevens, BJ Willke & WR Wilson *Managing for Enterprise Security* (Pittsburgh: Carnegie-Mellon University 3004) (available from: <<https://apps.dtic.mil/dtic/tr/fulltext/u2/a430839.pdf>>).

¹⁶ LD Caesar, S Cahoon & J Fei 'Exploring the Range of Retention Issues for Seafarers in Global Shipping: Opportunities for Further Research (2015) 14(1) *WMU Journal of Maritime Affairs* 141–157; M Kitada & P Baum-Talmor 'Maritime Digitisation and its Impact on Seafarers' Employment from a Career Perspective' *Proceedings of the International Association of Maritime Universities (IAMU) Conference: AGA20 International Association of Maritime Universities, October 2019* 259–267.

are in evidence across the globe.¹⁷ Across the world, smart vessels and automation are being witnessed¹⁸ and many people are likely to think this provides a fixed solution to the global seafarer shortage.

With the world embracing digitalisation and the 4IR, maritime industry players must keep themselves abreast with technological trends and changes.¹⁹ Such developments are understood to be accompanied by a new set of skills, knowledge and attitudes towards work that will further challenge the industry in how it should respond to digitalisation. There is a need to prepare seafarers to the changes that may be brought by the 4IR, envisioning that seafarers, together with other workers, might find themselves being replaced by artificial intelligence and other future cognitive software.²⁰ Maitland²¹ highlighted that future ships will be different from what we know and currently imagine, warning that robotics onboard vessels will bring sudden, traumatic and far-reaching changes. The future seafarer must have the skills required to handle the requirements and demands of digitalised vessels.

As a result, maritime businesses are investing in research, development and technologies to cut their operational costs and improve their efficiencies in the current competitive market. These organisations are compelled to stretch the utilisation of their crew members, especially officers, to maintain and operate these assets for enhanced efficiency.²²

While there is an understanding that remotely controlling a vessel will be a crucial aspect of smart ship operation, humans will still be the ultimate decider

in most of the processes. For example, for customer service, safety and reassurance, cruise ships will have to continue being fully manned.

These developments require that seafarers be able to independently solve problems and not rely on the technology but rather use it as an aiding factor. This requires that these new vessels be operated by highly skilled and experienced seafarers. The professionals with maritime background will still be required to work on advancing navigational equipment, robotics, modelling, and automation.²³

While Abidin and Ismail²⁴ are of the view that school leavers are likely to be discouraged from considering seafaring as a possible career because of automation and digitalisation, and that the demand for seafarers is likely to be reduced due to digitalisation and vessel automation, Belcher, Wojnarowicz and Lehmacher²⁵ are adamant that technology cannot replace seafarers, as seafarers are required to conduct maintenance, assist in berthing the vessel, mooring and in emergency operations. What is evident is that technology does not compete with people but is useful in aiding the seafarer to work more efficiently and improve onboard communication. It is worthwhile noting that the industry appears to have embraced the current technological advances.

Maritime autonomous surface ship

A Maritime Autonomous Surface Ship (MASS) is defined as a ship that, to varying degrees, can operate independently of human interaction.²⁶

¹⁷ R Apostol-Mates & A Barbu 'Is Maritime English the Key in Solving Communication Problems within Multinational Crew?' (2015) 21(2) *International Conference Knowledge-based Organization*.

¹⁸ Kitada & Baum-Talmor op cit note 16.

¹⁹ Abidin & Ismail op cit note 3.

²⁰ Ibid.

²¹ Cited in Abidin & Ismail op cit note 3.

²² Kitada & Baum-Talmor op cit note 16.

²³ Abidin & Ismail op cit note 3.

²⁴ Ibid.

²⁵ Cited in L Kinthaert 'Digital Transformation: How will it Change the Seafarer's Role (2017) *Informa Connect, Published, 4* (available from: <<https://knect365.com/maritime/article/842b789d-aa16-411f-95c9-6393715daf35/digital-transformation-how-will-it-change-the-seafarers-role>>).

²⁶ International Maritime Organization (IMO) 'IMO Takes First Steps to Address Autonomous Ships' *IMO* 25 May 2018 (available from: <<https://www.imo.org/en/MediaCentre/PressBriefings/Pages/08-MSC-99-MASS-scoping.aspx>>).

The IMO has the responsibility to put in place regulations that will ensure a standardised global approach in the shipping industry. To facilitate this process, the IMO has organised degrees of autonomy, as follows:²⁷

- Conventional ship with automated processes and decision support – a ship with some automated operations with a crew on board to operate and control shipboard systems and functions.
- Remotely controlled ship – a ship with a crew on board but the ship is controlled and operated remotely.
- Remotely controlled ship without crew on board – the ship is controlled and operated remotely.
- Fully autonomous ship – the ship's operating system can make decisions and determine actions without human intervention.

On land, manned shore control centres (SCC) will need to be established to drive the safe and efficient operations of autonomous ships without crews.

The market for autonomous ships is projected to reach US\$12.2 billion by 2030.²⁸ Many shipping companies view these developments as providing significant potential, with the vessels expected to promote safe, efficient and sustainable operations. Countries such as South Korea have established projects aimed at developing safe navigation technologies for autonomous vessels, estimating that in commercialising such,

the country will be able to capture 50% of the global market by 2023.²⁹

The automation of vessels is accompanied by an increased risk³⁰ for online threats and attacks and hackers threatening³¹ the safety of operations. Integrated technology platforms such as those introduced by Kongsberg Maritime in 2018 are aimed at supporting situational awareness using sensor fusion technologies and combining radar and sonar with cameras and lasers. It is evident that marine automation systems are complex and operate in coordination with several other systems such as radar, Electronic Chart Display and Information Systems (ECDIS) and gyrocompasses.³²

Mallam, Nazir and Sharma³³ posit that it is critical to develop an understanding of how autonomous maritime operations will impact the future role of seafarers. They assert that technological advances are continually redefining and transforming the role of humans within complex socio-technical systems.

To safely operate autonomous vessels, designated personnel operating the marine automated systems must be highly trained and continuously developed.³⁴ Abidin and Ismail³⁵ indicate the importance of such operators to also have the maritime background. Meeting the minimum training requirements is not enough. To achieve this, Maritime Education and Training (MET) institutions of learning must acquire high-quality simulators that are required to

²⁷ OJ Rodseth 'From Concept to Reality: Unmanned Merchant Ship Research in Norway' (2017) *Proceedings of Underwater Technology (UT)*, IEEE, Busan, Korea; IMO op cit note 26; Abidin & Ismail op cit note 3.

²⁸ MarketsandMarkets. Autonomous Ships Market by Autonomy (Fully Autonomous, Remote Operations, Partial Automation), Ship Type (Commercial, Defense), End-Use (Linefit, Retrofit), Solution (Systems, Software, Structures), Propulsion and Region (North America, Europe, APAC and the Rest of the World' – Forecast to 2030' (2021) *Autonomous Ships Market* (available from: <https://www.marketsandmarkets.com/Market-Reports/autonomous-ships-market-267183224.html?gclid=EA1aIQobChMI4qqF44-b7wIVEL_tCh0LdQtNEAAYASAAEgK45_D_BwE>).

²⁹ Ibid.

³⁰ Caralli et al. op cit note 15.

³¹ Ghaderi op cit note 9.

³² MarketsandMarkets op cit note 28.

³³ SC Mallam, D Nazir & A Sharma 'The Human Element in Future Maritime Operations – Perceived Impact of Autonomous Shipping' (2020) 63(3) *Ergonomics* 334–345.

³⁴ M Kim, TH Joung, B Jeong & HS Park 'Autonomous Shipping and its Impact on Regulations, Technologies, and Industries (2020) 4(2) *Journal of International Maritime Safety, Environmental Affairs, and Shipping* 17–25; Editorial Team 'New Training Standards for Autonomous Shipping to be Developed' *Safety4Sea Singapore Forum* 19 February 2021 (available from: <<https://safety4sea.com/new-training-standards-for-autonomous-shipping-to-be-developed/>>).

³⁵ Abidin & Ismail op cit note 3.

re-create real-life situations depicting the operations of autonomous vessels.

Caution should always be exercised to avert accidents that could occur due to an overdependence on automated systems.³⁶ Consequently, the United Kingdom (UK) joined MASSPeople, the MASS International Training Standards Working Group, looking at developing training standards for people operating autonomous vessels to ensure that these vessels are safe.³⁷ This is with the understanding that the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) is inadequate to address the MASS operations. To this effect, the UK, working with the IMO, reaffirmed its commitment to innovation in the shipping industry.

Kim et al.³⁸ conclude that autonomous ships will require seafarers and operators highly skilled in technology and IT systems. The new remote and autonomous operations will transfer more jobs to the land, opening opportunities for more people to find onshore maritime careers attractive, while enhancing the quality of life for seafarers, preventing accidents and affording them more time to spend with their families. This opportunity is not only for the young seafarers. It is worth noting that Lee et al.³⁹ found that, while older workers experience a lack of technology skills, they are generally open to learning and developing their technological skills. This will ensure that the maritime operations are conducted by skilled young and old seafarers.

Rodseth⁴⁰ highlighted that fully unmanned vessels will be designed differently due to no crew onboard. Crewless vessels translate into lower operational costs. Rodseth opined that with these developments, there are likely to be more smaller ships coming into operation.

Inland waterway shipping and coastal shipping may become serious competitors to the long-distance truck transport.⁴¹ This affords the seafarers with an opportunity to work domestically and within the high-tech shipping environment.

The changing role of the seafarer

According to the STCW, shipboard tasks are classified by function and three levels of responsibility, namely management, operations and support. The seven functions are navigation; cargo handling and stowage; controlling the operation of a ship and the care of persons on board; marine engineering; maintenance and repair; electrical, electronics and control engineering; and radio communications.

Ljung⁴² stresses the importance of the continual professional development of seafarers to enable them to work effectively with the IT systems that are brought about by automation and computerisation and the administrative requirements brought about by new regulations and safety systems within the shipping industry. According to Cahoon and Haugstetter,⁴³ other than understanding new technologies, seafarers must know how to interact with technology. In that way, they may be able to utilise technology developments for their own advantage.

Ljung posits that safety on board is likely to increase as a result of more crew members mastering technology, computer programmes and IT systems.⁴⁴ More capacity and competence could be built by means of professional development, resulting in crew members being able to repair technical errors and computer problems. Acquiring such skills and competences would save costs for the employer, create operational efficiency onboard vessels and broaden the seafarer skills.

³⁶ MarketsandMarkets op cit note 28.

³⁷ Safety4sea op cit note 34.

³⁸ Kim et al. op cit note 34.

³⁹ Lee et al. op cit note 7.

⁴⁰ Rodseth op cit note 27.

⁴¹ Ibid.

⁴² Ljung op cit note 12.

⁴³ Cahoon & Haugstetter op cit note 14.

⁴⁴ Ljung op cit note 12.

The crew members should view the increased administrative work as part of the job enrichment process and not as extra work. Other than safety and crew participation, Ljung is convinced that greater knowledge, not the least in cognitive skills, is of increasing importance in the workplace and that crew members need to constantly update their knowledge through continual professional development aimed at addressing the changing nature of their work.⁴⁵

Today's vessels are technologically developed, with high levels of automation, environmentally friendly with energy efficient capabilities and require limited human intervention.⁴⁶ These developments have led to less maintenance required at sea, with major work done onshore by outsourced maintenance companies.

Only minor work has to be performed on board by crew members as part of their housekeeping schedule.⁴⁷ Manual charts have been replaced by electronic charts and, rather than being manned, the bridge is now monitored. The previous role of cargo officers having to plan cargo movements when in port is now being done on land by ship or cargo planners.⁴⁸ Roles such as radio officer and carpenter no longer exist, while jobs like electrical technician and administration officer, which were previously not in existence, are now available.⁴⁹ This is indicative of some of the changes and adjustments that seafarers are required to undertake in order to remain relevant to their employers.

Bagoulla and Guillotreau⁵⁰ are of the opinion that the global seafarers' labour market now relies more on the quality of seafarers than the number of available seafarers. This reliance is indicative of shipping companies streamlining their resources by seeking to achieve more efficiency with fewer workers. The planned automation of certain jobs functions also

creates competition of employment amongst the seafarers. Kitada and Baum-Talmor⁵¹ warn seafarers of the need to become digitally inclined through skills adjustment and advancement.

As autonomous shipping rapidly moves closer to real-world implementation, it is critical to understand the future roles of humans in autonomous maritime operations.⁵² This is with the understanding that with automation, the most affected stakeholder will be the seafarer. Kitada and Baum-Talmor⁵³ caution that the majority of management practices tend to be focused more on the effects of organisations than on the physical environment and neglect human and social environment for sustainability purposes. They highlight the importance of the human element in particular seafarers and their career prospects in helping the maritime industry's socioeconomic sustainability.

In conclusion, it is evident from the literature that the shipping environment continues to face challenges that require the industry, including seafarers, to plan and adjust to continue providing a service to the global economy. The global changes brought by technology developments may be seen as likely to replace the seafarers, however, the 2021 BIMCO ICS Seafarer Workforce Report study points to a shortage of seafarers, while, on the contrary, there are seafarers who are battling to find employment.

To better understand the issues that impact and result in the battle to find employment, it becomes critical that seafarers are granted an opportunity to identify and highlight the challenges that they face when searching for employment.

The maritime employers are also critical, highlighting factors that they consider when hiring seafarers, while maritime training institutions are better placed

⁴⁵ Ibid.

⁴⁶ Kitada & Baum-Talmor op cit note 16.

⁴⁷ Cahoon & Haugstetter op cit note 14.

⁴⁸ Ibid.

⁴⁹ Kitada & Baum-Talmor op cit note 16.

⁵⁰ C Bagoulla & P Guillotreau 'Shortage and Labour Productivity on the Global Seafaring Market' in P Chaumette (ed.) *Seafarers: An International Labour Market in Perspective* (Gomylex: Université de Nantes 2016) 15–27.

⁵¹ Kitada & Baum-Talmor op cit note 16.

⁵² Mallam et al. op cit note 33.

⁵³ Kitada & Baum-Talmor op cit note 16.

to assist in responding to the changes. As a result, this paper deals with the challenges that are faced by seafarers in finding employment. It also highlights the management factors that maritime employers consider when recruiting seafarers. In conclusion, the paper deals with how maritime training institutions should be responding to the challenges and changes impacting on the role of the seafarer.

II RESEARCH METHODOLOGY, DATA COLLECTION AND ANALYSIS

This study employed both the quantitative and qualitative research approaches. In adopting quantitative research, data that is used to quantify opinions is measurable and allows the researcher to formulate facts. By using quantitative research methods, objectivity is maximised.⁵⁴

The data collection method that was adopted in this study was the administering of questionnaires to South African seafarers to obtain their perspectives on the challenges they face regarding placement. The questionnaire was sent out to 395 South African seafarers and a total of 324 responded to the survey, resulting in 82% response rate. Seafarers were the most appropriate subjects, as they have first-hand experience of the challenges experienced in finding placement. The collected data was analysed utilising the SPSS software.

The researcher adopted a qualitative research approach using interviews as data sources because interviews are one of the most commonly used data collection methods.⁵⁵

Maritime employers were interviewed to determine why it is difficult to place South African seafarers, how technology impacts the role of the seafarer and how this

changing role should be managed, and how it can identify the managerial decision-making factors associated with seafarer development and placement. Maritime employers are best placed to provide insights into what they consider when placing a seafarer and could indicate issues they might encounter in placing South African seafarers. Non-probability sampling was employed until no new information came to light (saturation).

Representatives of MET institutions were also interviewed to determine how technology impacts the role of the seafarer and how this changing role should be managed. The rationale for conducting these interviews was the understanding that, as training providers, they could provide insights into technology trends and curricula that affect seafarers' work, including their current capacity challenges, to respond to the identified challenges and issues. The collected data was analysed following a thematic process.

By adopting a mixed methods research approach, the researcher was attempting to evaluate the current setup of the South African maritime industry to establish what could be the challenges that are experienced by seafarers and what policy intervention and management framework could be implemented to position the country as one of the preferred maritime labour supplying nations.

Mukumbang, Kabongo and Eastwood⁵⁶ are in support of integrating both quantitative and qualitative research methods, and assert that this method is used for policy evaluation and intervention, along with the exploration of multifaceted, complex and broad issues. Conversely, the researcher may strategically decide whether to give quantitative or qualitative research methods an equal status, or whether one of the two methods may become dominant while the other becomes privileged.⁵⁷

⁵⁴ MR Harwell, MR 'Research Design in Qualitative/Quantitative/Mixed Methods' in CF Conrad and RC Serlin (eds) *The SAGE Handbook for Research in Education: Pursuing Ideas as the Keystone of Exemplary Inquiry*. (Thousand Oaks: SAGE Publications 2011); R Kumar, *Research Methodology: A Step-by-step Guide for Beginners* (London: Sage Publications 2011).

⁵⁵ R Janghorban, RL Roudsari & A Taghipour 'Skype Interviewing: The New Generation of Online Synchronous Interviews in Qualitative Research' (2014) 9(1) *International Journal of Qualitative Studies on Health and Well-being* 24152.

⁵⁶ FC Mukumbang, EM Kabongo & JG Eastwood 'Examining the application of retroductive theorizing in realist-informed studies' (2021) 20 *International Journal of Qualitative Methods*.

⁵⁷ RB Johnson, MW McGowan & LA Turner 'Grounded Theory in Practice: Is it Inherently a Mixed Method?' (2010) 17(2) *Research in the Schools*.

III FINDINGS AND RESULTS

To explore the structure of the data and reduce the 23 survey questions to a small number of underlying latent variables, factor analysis with Promax rotation was applied. A Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of 0.706 and a significant Bartlett's test indicated that successful factor extraction had occurred. Six factors, accounting for 46.09% of the variance in the data, were extracted. Rotation converged

in seven iterations. During the process, two questions were dropped because they did not sufficiently load onto any factor.

The factors extracted and the factor loadings for each item are summarised in Table 1. It is also evident from the table that construct validity, including convergent and divergent validity, was attained.

Table 1: Structure of the Data: Factors and Factor Loadings

Description	Factor					
	1	2	3	4	5	6
1 Some of the recruitment and crewing agencies charge applicants a fee to find employment for them.	0.661					
7 The shipping companies are unreasonable when requiring experience but do not allow new graduates to build experience.	0.636					
2 Some of the applicants fall prey to online scams offering recruitment and crewing services.	0.634					
3 The absence of a centralised recruitment system makes it difficult to find employment.	0.560					
9 New graduates are not able to find employment, as they lack the technical skills required by shipping companies for their day-to-day vessel operations.	0.489					
8 It is difficult to get a job if you do not have a reference (family member, friend or mentor).	0.455					
14 Cadetship does not provide the specific skills required by potential employers.		0.774				
12 Cadetship programmes do not provide the experience required to find employment.		0.681				
13 South Africa's training vessel (MV Agulhas) did not provide the learners with the required/recognised experience to find employment.		0.623				
15 There is a lack of job opportunities within the maritime industry, making it difficult for new graduates to find placement.			0.496			
11 Training institutions do not have the capabilities to prepare new graduates to find placement amid the continual technological changes onboard vessels.			0.475			
17 The long waiting period to become a cadet discourages potential seafarers from actively seeking employment.			0.465			
6 Shipping companies are reluctant to employ female workers.			0.384			
18 Non-exposure to working with people of other nationalities adversely affects one's chances of finding employment.			0.346			



Description	Factor					
	1	2	3	4	5	6
4 Shipping companies are not receptive to employing applicants with chronic health challenges.				0.840		
5 Shipping companies are reluctant to employ physically challenged applicants onboard vessels.				0.759		
23 New graduates are not prepared to accept jobs that pay less than their reservation wages.					0.750	
22 New applicants have unrealistic salary expectations that shipping companies are not prepared to meet.					0.721	
16 New graduates prefer to work on coastal trading vessels rather than long-haul merchant vessels as they want to be closer to their families.					0.408	
21 Lack of dual-purpose training (a mix of deck and engineering/generalist) contributes to difficulty finding employment.						0.895
20 Traditional training (specialising in deck or engineering) limits one's chances of finding employment.						0.546

Reliability of the composite scores

Single composite measures for each factor were formed by calculating the average agreement scores across the items included in the factor. The reliability of these

composite scores were measured using Cronbach's alpha coefficient. A value of at least 0.7 is generally accepted as indicating good reliability for a scale. This is summarised in Table 2.

Table 2: Summary Results of Factor Analysis on the 23 Items

Factor	Construct	Items included	Variance extracted (%)	Cronbach's alpha
1	Placement	1-3; 7-9	17.9	0.743
2	Cadetship	12 - 14	8.5	0.746
3	Access to employment	6, 11, 15, 17, 18	6.6	0.615
4	Health-related issues	4-5	5.3	0.802
5	Conditions of employment	16, 22, 23	4.5	0.632
6	Type of training	20, 21	3.2	0.721

While two of the reliability measures were below the generally accepted minimum requirement, they were adversely affected by the small number of items included in the composite measure and can be considered adequate. The remaining constructs show adequate reliability.

Analysis was conducted on these six composite variables that describe the types of challenges experienced by seafarers. Results from a one-sample t-test to determine whether there is significant agreement or disagreement that these challenges exist (Table 3) show that there is significant agreement that challenges exist around

placement, access to employment, health-related issues and conditions of employment. On the other hand, there is a significant disagreement that there are

challenges around cadetship and the type of training received.

Table 3: Analysis of the Six types of Challenges

Construct	N	Mean (SD)	T	df	p-value
Placement (PL)	325	3.8 (0.738)	19.748	324	<0.001*
Cadetship (C)	325	2.8 (0.979)	-3.192	324	0.002*
Access to employment (AE)	325	3.6 (0.726)	15.473	324	<0.001*
Health-related issues (HI)	325	4.0 (0.898)	20.547	324	<0.001*
Conditions of employment (CE)	325	3.2 (0.903)	3.459	324	0.001*
Type of training (TT)	325	2.9 (0.988)	-2.050	324	0.041*

* Indicates significance at the 95% level

Challenges experienced by seafarers regarding placement

Following the factor loading analysis, the challenges that are experienced by seafarers regarding placement can be classified under the themes: type of training;

cadetship; access to employment; conditions of employment; placement; and health-related issues.



Figure 1: Seafarers' Challenges in Finding Placement

Source: Author

Type of training

The standards for training seafarers are globally accepted as outlined in the STCW Convention. South Africa follows a traditional MET delivery whereby the graduate qualifies as either an Officer of Marine Engineering or Officer of Deck and Navigation. The challenge of placement does not appear to be related to the system of training (ie dual-purpose or specialisation) that the seafarer received. Both dual-purpose and traditional seafarer training are beneficial to the seafarer and the shipping company. With the advent of advanced ship technology, automation, reduced crew size and cost containment, shipping companies may, in the future, prefer to employ seafarers with dual skills.

Cadetship

Cadetship ensures that seafarers acquire the practical skills and competency necessary to work on seagoing vessels and an opportunity to work under supervision while acquiring the necessary skills. Maritime countries need a well-structured cadetship programme supported by industry with a fully equipped and well-funded training vessel. In managing cadetship, it is important that the challenges experienced by cadets are identified and addressed and long-lasting solutions are found for the betterment of the programme.

The unfunded training vessel, MV Agulhas, has added value to the maritime industry in South Africa, although it has drained the South African Marine Safety Authority's (SAMSA) financial resources. This lack of financial assistance to maintain the training vessel is in line with Nguyen et al.'s⁵⁸ findings that shipping companies have reduced their commitment to training. As Ghosh and Bowles,⁵⁹ the direct and associated costs of running a training vessel are high and SAMSA cannot continue funding the training vessel alone. With the limited berths available for a cadetship, numerous seafarers lose interest in the maritime industry and there is a dire need for more training vessels to complement the MV Agulhas.

Access to employment

The shipping industry has not been able to create sufficient jobs and cadetship opportunities for South Africa's recently graduated seafarers. Despite the interest shown by women in shipping, they constitute only a small percentage of the workforce and encounter numerous obstacles to working onboard vessels. The doubling of the number of women seafarers between 2016 and 2021, as indicated by the BIMCO/ICS Seafarer Workforce Report of 2021, is an indication of progress, however limited.

There is no clear indication that shipping companies are reluctant to employ women seafarers, however, crewing managers and employers interviewed in this study highlighted some of the operational risks and conditions of work that must be considered before deciding on placement. These considerations may also be viewed as discriminatory towards female seafarers, as they are likely to reduce their chances of placement. South Africa's two MET institutions are currently not fully capacitated to prepare seafarers to develop the technical skills that are required onboard vessels because of the limited funding they receive.

Considering the multiracial crewing systems, the ability to communicate in English is one of the most critical elements that influence placement onboard vessels. The language requirement does not impede South African seafarers, as they are mostly instructed in English from their foundational schooling through to their tertiary education years.

Conditions of employment

The young and inexperienced seafarers are mostly affected by the placement challenge. This may be a result of having not been tested in the marketplace and having no point of reference or previous relationship with an employer. In seeking placement, they generally do not have a set reservation wage, which, if not met, would persuade them to not accept the job. They have

⁵⁸ TT Nguyen, H Ghaderi, I Caesar & S Cahoon 'Current Challenges in the Recruitment and Retention of Seafarers: An Industry Perspective from Vietnam (2014) 30(2) *The Asian Journal of Shipping and Logistics* 217–242.

⁵⁹ S Ghosh & M Bowles 'Management of Berths at Sea for Seafarer Students' (2013) 5(1) *Australian Journal of Maritime & Ocean Affairs* 11–21.

an understanding that salaries are defined by shipping companies' ability to pay and the seafarers' experience, competence and qualifications. As a result of interaction with peers, they have an idea of what certain job grades are paid.

Based on the foregoing discussion, the salary expectations held by new graduates are generally not unrealistic. New graduates seem to be most interested in gaining experience and ranking so that they may improve their earnings. In doing so, they are open to being placed on any vessel irrespective of whether it sails in coastal or international waters. It can be concluded that the graduates do not experience placement challenges as a result of unrealistic salary expectations and only seek job opportunities on coastal trading ships.

Following entry into force of the Maritime Labour Convention, 2006 (MLC 2006), shipping companies engaged and reached agreements with trade unions and labour federations such as the International Transport Workers' Federation (ITF) on salaries and wages. Maritime administrations have the responsibility to enforce compliance with the Labour Convention.

Placement

The difficulty and time taken to secure placement can lead to desperation and job seekers becoming victims of job scams, including agreeing to pay unscrupulous crewing agencies, in contravention of the MLC 2006. The absence of a centralised recruitment system is a possible contributor to placement challenges, as this allows online scammers to take advantage of seafarers. Shipping companies may be viewed as unreasonable in requiring experience while not facilitating cadetship or assisting to capacitate the training institutions with the required capacities, for example, simulators. The shipping companies play a significant role in assisting both the seafarer and the training institutions to acquire the necessary capabilities.

Without experience, some seafarers struggle to find a placement and are lost to the maritime industry when they seek employment in other sectors. Shipping companies need to contribute to the cadetship programme by offering placements.

Ghosh and Bowles⁶⁰ posit that shipping companies are reluctant to employ cadets, as they will have to spend valuable resources on training and ensuring their certification. However, the active participation of shipping companies in building training capacity will ensure that the seafarers of the future are competent. Networking in person or on social media platforms is an important skill that every seafarer should develop. Without networking, it is difficult for a seafarer to acquire a placement.

Health-related issues

Because of the requirements for safe manning, operations and navigation, as well as the physical demands of working onboard vessels, shipping companies seems to be reluctant to employ physically challenged seafarers and those on chronic medication. This may be attributed to the physically challenging setup on board vessels, whereby seafarers are expected to move around, including in constricted spaces, requiring physical movements which may not be easy for some.

The perspective on training institutions

The changing role of the seafarer requires that training institutions also respond to the demands brought by international shipping. Maritime and offshore oil and gas graduates were found to lack some of the expected competencies,⁶¹ including soft skills and industry experience.

To respond adequately, training institutions must understand how the business of shipping is evolving and what such changes mean to the type of training

⁶⁰ Ibid.

⁶¹ Acomi & Acomi op cit note 5.

they should deliver to the industry.⁶² This is critical considering the changing role of the seafarer in line with the technological developments including digitalisation.⁶³ This also require that such institutions identify the challenges they experience in ensuring that they deliver quality training that meet the needs of the shipping industry.⁶⁴

Emad et al.⁶⁵ caution against just focusing on the development of technology and forgetting about getting the seafarers ready for the future maritime landscape. Preparing for the changing role and technologies impacting on the seafarer, require training institutions to establish if they have the necessary resources such as simulators⁶⁶ to deliver on their mandate, as well as identifying the various role players who are key in ensuring a well-managed seafarer development programme. This requires that the training institutions adjust themselves to meet the changes.⁶⁷ As opined by Abidin and Ismail,⁶⁸ maritime training institutions must understand that the delivery of quality courses, exams and assessments is critical to the future of the seafarers.

The perspective on maritime employers

Employers advertise their job opportunities by various means and platforms, and follow processes that include amongst others, looking for referrals, insourcing and using recruitment agencies.⁶⁹ By identifying qualifications and perceived or actual characteristics that they can correlate with job performance, employers may not be sure of the graduate's capabilities.⁷⁰

Nevertheless, they must make the hiring decisions. In seeking job opportunities, the seafarer goes through the process of searching for opportunities that exist in the market. It is during this period that they can establish the requirements that maritime employers are looking for in filling the positions that they have.

Understanding the requirements of maritime employers provides an avenue for the seafarers to gauge their competencies against the job adverts and ensure that they devise their own developmental plans to prepare them for these kinds of opportunities. This process provides an opportunity to understand how seafaring job adverts have changed in line with the future of seafarer work and how seafarers can prepare themselves to still be relevant.

The maritime employers are also best positioned to identify the factors that are associated with seafarer development and placement. With the continual technological changes within the industry, maritime employers are best positioned to indicate how such changes are impacting the role of the seafarer. By means of their adverts, they are able to indirectly influence the teaching, skills, knowledge and abilities that must be taught to help develop seafarers.

Engaging with maritime employers also helps to understand whether there are specific challenges with regard to recruiting South African seafarers and how this can be addressed. It is through this process that maritime training institutions can also learn about the factors that impact on the placement of seafarers, thereby developing their curriculum to address the

⁶² ME Manuel 'Vocational and Academic Approaches to Maritime Education and Training (MET): Trends, Challenges and Opportunities' (2017) 16(3) *WMU Journal of Maritime Affairs* 473–483.

⁶³ Abidin & Ismail op cit note 3.

⁶⁴ Ghosh & Bowles op cit note 59.

⁶⁵ Emad et al. op cit note 4.

⁶⁶ A Vagale, OL Osen, A Brandsæter, C Hovden, HT Kristiansen & RT Bye 'On the Use of Maritime Training Simulators with Humans in the Loop for Understanding and Evaluating Algorithms for Autonomous Vessels' in *Proceedings of the 4th International Conference on Maritime Autonomous Surface Ships (ICMASS)* 4–6 April 2022 Singapore City, Singapore 6–7.

⁶⁷ Cahoon & Haugstetter op cit note 14; Manuel op cit note 62; KM Aboul-Dahab 'The Readiness of the Maritime Education for the Autonomous Shipping Operations' (2021) 18 *Arab Academy for Science, Technology and Maritime Transport*.

⁶⁸ Abidin & Ismail op cit note 3.

⁶⁹ N Ruparel, A Dhir, A Tandon, P Kaur & JU Islam 'The Influence of Online Professional Social Media in Human Resource Management: A Systematic Literature Review (2020) 63 *Technology in Society* 101335.

⁷⁰ P Moleke *Finding Work: Employment Experiences of South African Graduates* (Cape Town: Human Sciences Research Council Press 2006).

challenges and exploit the identified opportunities that can be addressed by way of training. This can be addressed by a collaborative effort between the maritime training institutions and the maritime employers.⁷¹

While higher education provides a competitive advantage for graduates in the labour market, there are other factors influencing the economic outcomes. Moleke⁷² highlights factors such as geographic area, gender, race, institution of learning and occupation as some of the factors that play a role in the economics of the labour market. It is therefore critical that such factors are explored if they are contributing to the challenges of placement as experienced by South African seafarers, and whether the same factors are considered as part of the managerial placement decisions by maritime employers.

Technology effects on the seafarer

In the past, technology was confined to the engine room on a vessel. This has changed with the extension of technology into navigation, communication and the handling of cargo. Today's navigation bridge is fitted with integrated systems and it has now become the ship's operation centre. Technology continues to be the driving force in revolutionising numerous industries, including shipping, and is used to improve the efficiency and effectiveness of business processes and operations. Technology has significantly improved the speed, safety and stability of seagoing vessels.

Work activities that in the past required strong manual labour have now been automated. By means of a combination of electrical, electronic and mechanical engineering capabilities, today's vessels are sophisticated efficient, and fitted with modern navigational and engineering equipment that has changed how the seafarers undertake their jobs.

In the past, seafarers needed to focus on paper navigational charts. These have been replaced by technologies such as ECDIS and radios have been replaced by the Global Maritime Distress Safety System (GMDSS), making the work of the seafarer much easier. There is indication from literature and several of the respondents that various technologies have been rolled out in the past, and seafarers have adapted to these quite smoothly. The ease of adaptation is a result of highly trained seafarers.

However, the challenge is to persuade seafarers to show an interest in the new technologies that are being rolled out and learn about them. The seafarers' fundamental work has not changed but is being enhanced by technology. Continuous learning and quality training are fundamental requirements to prepare seafarers to remain abreast of technological changes.

With the changes in technologies, seafarers must ensure that they do not forget their seamanship. They need to work on their ability to learn and focus on improving their technical skills and psychological well-being, as these will make it easier for them to adapt to the continual changes.

Technology has been in the shipping industry for many years, and seafarers have always managed to adapt to the changes. The changing role of the seafarer requires seafarers to adopt a positive attitude to technology and familiarise themselves with the technologies that are implemented.

Managerial decision-making factors associated with seafarer development and placement

Crewing agents and employers consider various factors in the management process of placing seafarers. These factors are explained in the ensuing subsections.

⁷¹ M Mourshed, D Farrell & D Barton 'Education to Employment: Designing a System that Works' *McKinsey Center for Government* 1 January 2013.

⁷² Moleke op cit note 70.

Job requirements

Crewing agents carefully consider the job requirements as advertised. This process indicates the job content and the experience, qualifications, knowledge, skills and competencies that are required, the type of vessel that the successful applicant will be working on, and the certifications required to work on that particular vessel. This consideration is a normal recruitment process.

Applicant profiling

The crewing agents also assess the applicant's profile to determine the applicant–position fit. This includes an assessment of the elements described hereunder.

- **Compatibility and alignment** (with the job and the company). Is the applicant a perfect fit for the job and the company that is recruiting?
- **Experience** (on the specific ship type and in the present rank). Does the applicant have the required minimum experience specific to the vessel?
- **Management capabilities, leadership style and conduct.** Does the applicant have management and leadership experience?
- **History.** What was the applicant's conduct in the past?
- **Soft skills** (communication abilities, teamwork, and collaboration capabilities). What interpersonal relationships does the applicant have?
- **Health, age, training, statutory requirements met.** Does the applicant meet the health, training and mandatory requirements?

System of training

One of the managerial considerations is the type of training that the applicant has received. Depending on the requirements of the vessel, it may sometimes be necessary to determine if the applicant underwent traditional training, that is, deck or engineering specialist or dual-purpose training.

This kind of decision may be based on the safety level of the vessel's requirements, and on cost and operational efficiency. Although it is accepted that the system of training does not disadvantage the seafarer, crewing agents must sometimes consider this factor, especially when shipping companies are trying to minimise their costs by adopting a reduced number of crew members. It must be pointed out that both systems of training have pros and cons in producing either specialist or generalist seafarers.

Travel requirements

With vessels expected to call in at different ports on their journeys, seafarers must have the necessary travel documentation that will allow for ease of access to the various countries they visit. The seafarer's country of origin should establish sound diplomatic relationships with its counterparts to ensure that its passport holders can transition through the ports with ease and ensure seamless crew changes. With the onset of Covid-19, travel restrictions have become more of a challenge, requiring more systematic considerations of the continually changing environment.

Ability to learn

Crewing agents are also interested in assessing the applicant's ability to learn. This assessment seeks to determine the seafarer's interest and attitude towards lifelong learning. A seafarer may be offered a job that they do not fully suit, with the understanding that they will adapt and learn on the job as soon as possible.

Accepting that an employee can learn is a developmental and progressive view that employers adopt that creates a mutually beneficial relationship. It is therefore necessary for the applicants to demonstrate their competence and qualification in the interviewing stage and, if they are unable to prove their experience, demonstrate their willingness to learn. Providing an opportunity to an inexperienced seafarer is also likely to promote employee loyalty. Caesar, Cahoon and Fei⁷³ advised that a psychological contract can be devised by way of succession planning, which will lead to loyalty.

⁷³ Caesar et al. op cit note 11.

Flexibility and adaptability

In some instances, the seafarer might be expected to work on a longer contract than originally anticipated due to unforeseen circumstances. The vessel owner may wish to have that flexibility with the crew. However, this flexibility might be used to exploit the seafarers and be in breach of the MLC, 2006. Crewing agents and shipping companies may also take advantage of the flexibility and at times the desperation of cadets by exploiting their situation to assist them in securing placement.⁷⁴

Flexibility might also be related to the teamwork that is expected on board the vessel, especially during challenging times, such as the current Covid-19 pandemic. Cadets should also be assessed on their ability to work in a team. The seafarer has to be able to adapt their behaviour in line with the challenges that are presented; this includes being open-minded and always looking for opportunities to help solve and avert challenges.

Tolerance and sensitivity

Seafaring, like shipping, is international. Shipping crews comprise numerous nationalities and people of different races, genders, cultures and religions. Numerous vessels are crewed by a mix of seafarers who are confined together over a long period at sea. Successful seafarers are those who can do away with stereotypes, and view others professionally and humanely. They will not judge the orientation of others but rather allow others the space to be themselves, while respecting their professional presence.

Seamanship

This refers to the art, competence and knowledge of operating a vessel. It is not what the seafarer will do when encountering challenges but rather how to avoid and mitigate the risks. Seafarers must have a plan on how to manage a particular challenge if it were to occur but also mitigate and avoid such challenges. This will save time and resources for the organisation.

Managerial decision-making factors associated with seafarer development and placement

In managing the placement of seafarers, crewing managers and employers are interested in finding the best fit for the position. The person-position fit is in areas such as qualifications, skills, knowledge and attitudes.

It is important that the recruiter completely understands the type of ship on which the successful person will work, and any requirements for special certifications and permits. In conducting this process, there is a need to profile the applicant in detail, considering issues such as compatibility and alignment with the job and company, experience and management capabilities, soft skills and fitness.

Whether an applicant has gone through the traditional type of specialist training (deck or engine) or dual-purpose training (a mix of deck and engine), is also a consideration, especially when shipping companies are looking at operational efficiency and cost savings. However, this is done equally considering the safe manning level requirements of the vessel

With vessels calling in at different ports globally, seafarers must have the necessary travel documents to enable them to access ports and airports with ease during crew changes. This consideration is particularly important during the Covid-19 pandemic, considering the restrictions that are put in place from time to time. This calls for countries such as South Africa to have strong diplomatic relations and build authenticity into the travel documents to facilitate the free and easy movement of its seafarers.

How applicants approach the possibility and opportunity to work with new colleagues in different working environments, and tackle new challenges, influences the decision when making a placement. The willingness to assist others to learn is one of the hallmarks of a true seafarer. With the nature of work onboard vessels, whereby decisions are to be made promptly, while considering the safety of property and

⁷⁴ M Zhao & MS Amante 'Chinese and Filipino Seafarers: A Race to the Top or the Bottom?' (2005) 39(3) *Modern Asian Studies* 535–557.

life, all onboard work as a team and need to be flexible and adaptable to ever-changing situations. This may include having to work longer contracts for reasons beyond the control of the shipowner.

Considering the multinationalism of crews on board, proficient communication in English is an important element that gives a seafarer an advantage in landing a job opportunity. To facilitate ease of work on a seagoing vessel, employers and crewing agents consider communication in English to be one of the deciding factors in placing a seafarer.

Discrimination is frowned upon globally in shipping. With the mix of nationalities on board and in ports, comprising of different races, genders, cultures and religions, seafarers are required to be tolerant and sensitive to these differences. There is an acceptance that there is unity in diversity. Crewing managers and shipping companies do consider diversity in placing seafarers. The ability to fit in with other nationalities and genders is an important factor that crewing managers are concerned about.

Identifying and mitigating risks are critical skills that all seafarers require. Although crewing managers are interested in the competence of a seafarer to deal with issues that might arise in operating a vessel, they are more concerned with the seafarer's ability to avoid and mitigate any possible risks, as prevention is better than cure. Seafarers must demonstrate their ability to adapt, avoid and mitigate against risks in conducting their daily operational activities.

Considerations on seafarer training and education

Shipping technology developments are ongoing and improve the efficiency and effectiveness of the shipping industry. With technology, the speed, safety and stability of vessels have increased significantly. These changes are also impacting the normal shipping business operations and procedures, as well as the role of the seafarer. Previous manual work such as the

use of paper navigational charts has been replaced by technologies such as ECDIS.

Seafarers must take a positive approach to the introduction of technologies and learn and adapt accordingly. Future seafarers will require pragmatic competencies comprising Science, Technology, Engineering and Math (STEM), which will allow them the agility to deal with the continuous digital changes. However, it is important to also note that the core of the seafarer's work will continue, that is, technical and seamanship. The role of training institutions continues to be important in developing seafarers' skills.

Simulator and computer-based training are two of the available training options that may be investigated to the benefit of seafarers. With the current challenges of accessing the latest technologies, training institutions should use simulators as an alternative to traditional practical training. However, these are expensive to purchase and operate.⁷⁵ Although simulators are not the perfect solution, they do offer an opportunity to progress the process of learning and development, thereby supporting the traditional onboard training. To access these, financial assistance is required from stakeholders in the maritime industry.

Technology will not replace seafarers but will assist and facilitate the work that is currently being undertaken by seafarers. Technology is developed by humans and it is humans who will have to identify and evaluate technology's workability. Embracing the change will assist seafarers to learn and become part of the new seafarer profession going forward.

Training institutions must be able to prepare seafarers for their changing role by adopting innovative technologies and psychologically preparing the seafarers to adapt and learn new skills. Technology will usher in new opportunities for seafarers who have embraced the change and can participate in managing and controlling the system onboard or virtually from the ship. Seafarers must use various platforms, such as mobile phones, to practice using the new technology. This can be done anywhere in the world.

⁷⁵ Ghosh & Bowles op cit note 59.

In addition to the technological considerations that must be incorporated in seafarer training, it is equally important to consider other training aspects such as:

- *Human Element* – it is critical that seafarers are prepared on how to deal with the frustrations and stresses that they encounter in their daily operations. This also includes how to deal with and avoid matters such as harassment on board vessels and supporting those who may be experiencing such harassment. The Covid-19 pandemic has taught humans about the importance of good mental spirit, considering the isolation and other stresses that seafarers have to deal with.
- *General Management* – it is critical that with movement from sea to land, seafarers interact among themselves, including with those who are not seafarers. Learning about management

principles assists with ensuring a smooth transition between land and sea. It is also critical as ships must also be managed and operated like any business organisation. General management should also include management reporting, financial reporting, risk management and strategy.

- *Interpersonal Development* – considering that ships are mostly crewed by seafarers from a mix of nationalities, seafarer training must also consider incorporating business communication, interpersonal skills including networking

In considering the above, it becomes important that MET institutions assist seafarers by equipping them with specific competencies, including the skills and attitudes necessary to navigate the shipping industry.

Table 4: Skills and Attitudes to Develop

Skills and Attitudes	
Adaptability	Leadership
Accommodative	Honesty
Communication	Mental health
Compliance	Mobility
Computer literacy	Monitoring
Continuous learning	Motivation
Cooperation	Negotiation
Critical thinking	Networking
Cross-cultural communication	Organising
Cybersecurity	Persistence
Diligence	Planning
Digital	Proactive
Discipline	Problem solving
Dispute resolution techniques	Prudence
Diversification	Research
Diversity	Resilience
Emotional intelligence	Role- and self-awareness
Empathy	Safety



Skills and Attitudes	
Ethical	Selfcare
Explorative	Self-development
Financial	Situational awareness
Information management	Soft skills
Innovation	Sustainability
Interpersonal	Systems controlling
Investigative	Teamwork
Judgement	Time consciousness

Source: Author

In order to address the skills shortage of maritime educators, it is critical that MET Institutions develop their own teaching capacity by encouraging both ex-seafarers and other non-maritime academics to develop an interest in MET. Additionally, other than traditional face-to-face classroom teaching, MET institutions must also explore other delivery methods, such as Augmented Reality (AR), e-learning, gaming, Virtual Reality (VR), simulations and webinars. Exploring these delivery methods will ensure that more students are able to access the training opportunities that are availed. Digital skills that comprise of the ability to analyse data and program systems is critical for the seafarer of tomorrow, who will need to be competent in controlling the systems that navigate the ship. This competency is additional to the current skill of having to physically navigate ships or undertake day-to-day ship engineering tasks.

While it is important for the seafarer to possess the technical skills that are important in undertaking the day-to-day operations on board vessels, there is a need to also ensure that the skills, knowledge and attitudes of the future seafarer must take cognisance of today's realities and what is expected into the future. Such competencies must be developed and maintained, taking into consideration the requirements of good seamanship and compliance factors related to environment, safety and legal. This becomes critical considering that new fuels are being developed and utilised on board vessels, as the maritime industry seeks to reduce greenhouse gas emissions. The seafarers must possess the skills and competencies required to ensure that these fuels are safely handled on board vessels.

With climate change and the 4IR being contemporary subjects, the seafarer of tomorrow must ensure that they can adapt and make a meaningful contribution into the future. This requires an open and proactive mindset and attitude, yearning to continuously learn. While the seafarer must be able to work independently, working in teams is an essential element that improves compliance and effectiveness. The team and the individual seafarer must know that they can depend on each other during the challenging operations on board the vessel. This requires that mentoring programmes and networking opportunities be made available to the seafarers.

Working on board vessels requires seafarers to be competent with regard to diversity, considering the internationality and mix of crews. This also relates to the issues of welfare that may emanate from possible poor working conditions, including being in a confined space, namely a vessel. The seafarers must be taught the skills necessary to ensure that they can navigate matters of diversity, harassment, bullying and racism, and are able to access and maintain good sound mental health.

What is evident is the need to ensure that seafarers are equipped with a positive psychological mindset that enables them to navigate the challenges experienced in their profession. This requires being aware of self and the environment and having the courage to deal with the issues being encountered with discipline and emotional intelligence.

Limitations of this study

Considering the historical challenges experienced by South Africans, this research did not consider participants' demographics, as it was more concerned with receiving input without linking it to a participant's background. Future research may establish whether the challenges faced by South African seafarers differ based on their demographics or not.

This research did not assess the resources and capabilities of the MET institutions in preparing seafarers to transition to the new technology. It may be beneficial to establish a capacity needs analysis of the MET institutions, in line with the skills and competencies that maritime employers require.

IV CONCLUSION

Like other industries, shipping is exposed to many challenges, in line with the globalised environment. One of the major challenges that shipping is not able to avoid is the changes brought about by technology. Seafarers are therefore required to adapt to the changes and recognise that there is a need to respond to their changing roles.

Whereas the BIMCO/ICS Workforce Report points to a shortage of seafarers, it is evident that seafarers continue to experience challenges in acquiring placement. To understand the challenges, maritime employers and training institutions are best placed to contribute insights into how to respond to the changing role of the seafarer. Such responses can be informed by understanding placement decision-making factors by maritime employers and considering the effects and other aspects of training and education.

By so doing, new skills and competencies necessary for seafarers to adapt to the changing environment can be developed with the contribution of both the seafarers and the maritime employers. MET institutions must position themselves as apex institutions, build own capacity and develop the required skills and competencies needed in the maritime environment.

Responding to the changing role of the seafarer requires a strong collaboration by various stakeholders, including the seafarers.

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