Chapter 13
Enhancing Maritime Education Through Online Distance Learning in Developing Environments: Case Study of South Africa

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13.1 Introduction

Maritime cluster is one of the key enablers of growing global industry and trade. It requires skilled and competent people in administration, business and industry, including those who operate modern ships and port equipment for cargo transportation and handling. Maritime cluster should respond effectively to permanently growing demand of international trade and ongoing changes in shipping business and industry, which are mostly based on virtual intelligence and advanced technology. Seafarers are on the first line to implement the conventions and regulations developed by maritime entities in such dynamic setting. Improving seafarers’ competences by all means would help in enhancing safety and efficiency of navigation and marine environment protection.

The International Maritime Organization (IMO) reported that the human element and poor competence are among the main causes of accidents at sea, whereas competence of the seafarers can be described as the worthy performance on board. This steams the need for more effective Maritime Education Training (MET) system aiming to overcome the problem of human errors and keep pace with rapid changes in maritime. Ships are only good as the officers who operate them correct-

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1 IMO (2014). Maritime Education and Training. World Maritime Day, IMO: London
2 Li (2017). Implications of Distance Learning Competence-based, maritime education and training

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ly. For this reason, the need for proficient seafarers seems to be a global concern for maritime effectiveness, especially in the light of shifting shipping trends, increasing ships’ size and speed, increasing their cargo capacities, as well as the demand for marine transport.

Due to some research studies, the need for 38,500 skilled officers by the end of 2018 has been projected. The IMO endorsed Maritime Education and Training as the theme for World Maritime Day in 2015. The same source reported that maritime education should be focused on, considered, discussed, analysed, and continuously improved upon. Moreover, during the 112th session of the IMO Council meeting (16–19 June 2014), the IMO Secretary General, Mr Koji Sekimizu, has pointed that: “effective standards of training remain the bedrock of a safe and secure shipping industry, which needs to preserve the quality, practical skills and competence of qualified human resources”.

The national (South African) legislation has to be modernised in the sphere of higher education in terms of recognition and proper interpretation and implementation of the STCW Convention requirements and in terms of faster deployment of virtual learning as a supplement or substitute to the traditional education and training of the seafarers. Within the context we should not lose sight of the fact that STCW Convention itself calls for a proper education as the foundation of successful training and acquiring competences. In order to confirm this observation, the quotations from the STCW Manila Amendments, Chapter II, Section B-II/1, Paragraph 14 are given: “Scope of knowledge is implicit in the concept of competence. This includes relevant knowledge, theory, principles and cognitive skills which, to varying degrees, underpin all levels of competence. It also encompasses proficiency in what to do, how and when to do it, and why it should be done. Properly applied, this will help to ensure that a candidate can: work competently in different ships and across a range of circumstances; anticipate, prepare for and deal with contingencies; and adapt to new and changing requirements”. Additionally, of importance within the context is that the newest STCW Code amendments concern and not only concern but strongly recommend the introduction of modern training methodology including distance learning and web-based learning in seafarers’ knowledge acquiring and upgrading.

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1 Alop (2004). Education and training or training contra education. In safety at sea through quality assurance in MET institutions. IMLA Conference. St Petersburg: Admiral Makarov State Maritime Academy
2 Drewry (2014). Manning 2014, Annual report. London: Nigel Gardiner
3 IMO (2014). Maritime Education and Training selected as World Maritime Day Theme for 2015. Retrieved from: http://www.imo.org/en/MediaCentre/PressBriefings/Pages/21-council112wmdtheme.aspx#.XhnqcX9KiM9 (last access: 11th January 2020)
4 Ibid
5 Bauk S., Kopp M., Avramović Z., “A Case Study on Introducing E-learning into Seafarers’ Education”, JITA - Journal of Information Technology and Applications, Vol. 3, No. 1, June 2013, pp. 34-43
13.2 Motives for Implementing ODL

It should be noted that many ODL and e-Learning initiatives and proposals for South Africa and other developing nations are still presented with numerous core social, political, economic, environmental, cultural, experience and other disadvantages, constraints and challenges, needing to be considered or resolved preconditions for their success. One study on postgraduate black students in South African higher education mentions the difficulties not only in accessing Internet and resources but also in being able to adapt towards full digital literacy and learning participation for those from traditional learning and communities [1].

The need for effective institutional and senior management support is perceived as vital to aid e-Learning’s functionality along with sound leadership/commitment from the tutors/lecturers and active responsibility for self-learning among the students. Core identified challenges aside from the digital divide and technology/access to computers are issues of securing data, limited Internet bandwidth, initial starting costs and lack of capacity to enforce student participation. Even when facilities are provided, students may face high queues for printers and computer laboratories. Lecturers also express concern about being subject to peer critical appraisal in placing their materials online and losing potential copyright as the institution asserts intellectual property ownership. Teachers also lack financial incentives to participate, given the time pressures involved and low prestige in valuing teaching capacity far less than focusing on publishing score at most colleges and universities.

South African Maritime Safety Authority (SAMSA) have not specifically proven their commitment to considering ODL for the maritime sector. It remains conspicuously absent in their Annual Performance Plans and reports among their maritime operations, governance, sector development, seafarer development and welfare programme [2].

13.3 Purpose of the Study

South Africa is a developing country. Uprising the level of people’s education, knowledge and skills is a key for overcoming transitional period and making South Africa a developed country. Twenty-five years ago, people in South Africa did not have access to higher education. Today circumstances are positively changing, but there is still a room for improvements. People need sound education in their young ages, but also during the whole life, they need to learn and acquire new knowledge and skills to keep up with modern, technology-driven, complex and growing society. Lifelong learning becomes necessity. It can be realised through formal and informal learning channels. Internet as a huge virtual library can help a lot in this regard. However, people should have a certain level of knowledge and education in
order to use its potentials purposefully. A good way of using Internet smartly for educational purposes is online distance learning.

The purpose of this study is to explore the lecturers’ and students’ awareness regarding the benefits and impediments of online distant learning at a high maritime educational institutions in South Africa, along with their readiness to adopt this form of knowledge transfer.

The research has been conducted among lecturers and students/ex-students-seafarers at Maritime Studies Department (Faculty of Applied Sciences, Durban University of Technology (DUT)). Choosing this specific focus group has been motivated by the fact that there is no online distance learning (ODL) programmes at high maritime education and training (MET) institutions in South Africa. Maritime students have to upgrade their knowledge and skills permanently to be competent at world maritime labour market. Since they have to work as seafarers, upgrade their knowledge and refresh the certificates at the same time, ODL might be a good solution.

The findings of this study aim to assist South African METs to model and evaluate the feasibility of pioneering ODL programmes using innovative educational methods and technology. Once successfully implemented, ODL programme could serve as a model for METs that function in different developing environments.

13.4 Advantages of ODL

Online distance education programme in MET can give a flexible alternative on time and location, whereas the traditional classroom training programme requires the seafarers to fix time and location. Distance education can also relatively decrease the training fees and allow the students to learn without coming to school. Moreover, with the rapid change of maritime technology and legal requirement, many refresher courses can also be delivered through distance education [3].

According to Chen, it is believed that online distance learning can save these costs; again it can not only significantly reduce the cost of classroom infrastructure but also reduce travel expenses and shorten the training time. Additionally, students can study while working through in-service training. This will not affect the work, but will save on many cost types and improve the efficiency [4]. It should be noted that online distance learning has strongly support personalised learning. Furthermore, e-learning can provide more independent learning space for different learning style students. According to their working time, study habits, learning needs and learning capacity, students can independently adjust learning style, and they can learn the knowledge and skills over and over again, thereby, to improve their efficiency of learning. In addition, e-learning system could be combined with the characteristics of adult training, which emphasises students don’t have to learn step by step. To make learning become more free and more flexible, they can flexibly choose between autonomous learning and collective learning.

Aside from the previously stated advantages, it is gradually proving to assist in ensuring competency-based training and assessment. Blended learning advantages
have been identified as saving time, ensuring more effective use of class time, easier differentiation of individual student needs, more active students and more creativity for students. It is perceived as being great in aiding students to prepare better, teaching twenty-first-century digital skills and involving less paperwork which is more ecologically sustainable and cost-effective (Its Learning Inc 2015). It centralises learning resources in one remote location so they can be accessed anywhere by anyone as needed. It retains them longer than physical copies may exist and can help better inform parents, family and others not directly involved in the education.

Lastly, it can greatly improve the learning effect. E-learning training system can not only through a simple document permeate traditional theoretical knowledge to students but also can provide numerous picture, audio and video files to make training courses become lively and interesting. It also however allows students to feel fun in learning and creates a relatively relaxed learning environment and atmosphere.

13.5 Disadvantages of ODL

It is noteworthy that though e-Learning has advantages, there are also existing disadvantages. Lack of social interaction has been identified as one of the main disadvantages. While the student can have some interaction through email, chat rooms and other online platforms, it is relatively different than traditional classroom education. Moreover, not all courses can be offered online. Some courses with practical skills are hard to deliver by distance education; therefore, they need direct contact. These provide implications for seafarers requiring social skills as part of their duties and standard English.

Furthermore, online distance learning goes against face-to-face communication between teachers and students or students with each other. Online distance learning has been recognised as the technically supportet interaction between teachers and students, such as tele-conferences. However, when compared with the traditional face-to-face interaction, online distance learning still deprives students the opportunity of direct emotional communication and more reflects the “human-computer interaction”. Increased global digitisation trends and the Fourth Industrial Revolution, creating increasingly automated vessels, digital ports and interconnected maritime logistics supply chains, further increase the pressure for virtual rather than real-time training and need for fewer, more technically sophisticated seafarers/staff. Associated studies have shown that when students are in a team learning environment and atmosphere, their learning effect will be better and learning proficiency is also higher. Based on the findings, it should be noted that more and more organisations have been attentive of this; therefore, they began to accept blended learning theory, which still emphasises traditional face-to-face training methods besides using the e-learning for network training and learning.

An alternative source focuses on the current challenges presented by e-Learning for teachers less familiar with it [5]. Comparatively few teachers and lecturers across many countries are quick and responsive to utilising all the potential of
myriad forms of e-Learning. Acquiring information, social and administrative uses deserve more attention than dynamic and interactive communication and learning platforms. Implementation challenges remain as few universities, colleges and high schools which utilise e-Learning actively monitor their lecturers’ and student’s efficient utilisation of these platforms, tools and technology and subsequently take remedial measures or actions. Nor do they focus on the potential to subsequently improve educational outcomes via upgrading technology and e-Learning tools/techniques. Results indicated that the majority of 76 surveys and 15 interviews showed technology such as interactive white boards, Social Network Service and LMS-VLE Cloud-based services/the Internet were employed to locate information and complete and create online activities/lessons and social communication.

13.6 Durban University of Technology and ODL

Of the few South African maritime-orientated tertiary institutions, Durban University of Technology (DUT) are becoming more alert and progressive at envisioning e-Learning as an integral part of their curriculum. The Nautical Science degree specifically targets navigation, meteorology, shipboard management, construction and stability. This extends to short professional courses with simulators in ECDIS, electronic navigation, maritime education and human elements in thought and leadership. It appears on their website and within their handbook [6]. Students and lecturers employ blended and web-based learning via Blackboard where lecturers are trained and encouraged to upload course materials. It even asks as part of the recruitment process lecturers’ ideas and potential approaches towards integrating e-Learning techniques. However, DUT does not currently focus on distance learning… This further motivates the subsequent methodology and survey participants recruited from locations such as DUT.

Other maritime education and training institutions within South Africa have yet to fully embrace e-Learning but include Cape Peninsula University of Technology, University of Stellenbosch, South African Maritime School and Transport College, SAMSA and several TVET colleges.

13.7 Applied Methodology

In order to highlight the most significant issues regarding the importance of ODL, quantitative analysis, by the form of survey questionnaires, was carried out with students and lecturers. The choice of the research methodology techniques empowered the respondents to express their genuine opinions regarding implementation of ODL in MET.

In developing countries, there is very little preliminary research on the adaptation of Cloud resources in education. The model proposed here (Fig. 13.1) has been
inspired by a study which has been carried out in sub-Saharan Africa [7]. This model represents the basis for designing a questionnaire, by means of which the readiness of the high education institutions in the developing country (South Africa) to implement this type of education could be analysed. The model is based on triangulation (reconciliation) of two theories of adoption and expansion of ICTs: theory of diffusion of innovations [8] and the theory of a technologically acceptable model [9]. The model, which is proposed here, includes one dependent variable: intention to adopt Cloud into education. The independent variables in the model are organised in several subgroups: innovative, economic, technical, contextual and organisational factors (attributes). The last, but not the least, is the independent variable: actual use of Cloud in high education. In Fig. 13.1, direct and indirect links between dependent and independent variables are presented.

![Diagram](image)

Fig. 13.1 Relations between relevant factors for moving education into Cloud. (Source: [10])
13.8 Data Collection and Analysis

Data will be collected through a questionnaire. A questionnaire is a preformulated written set of questions to which respondents record their answers. Respondents will have to answer the questions in such way to choose one number of Likert interval scale due to the best of their knowledge, experience and/or intuition. The Likert scale is designed to examine how strongly respondents agree or disagree with the statements on a five-point scale with the following anchors, which can be modified depending on the question formulation: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4) and strongly agree (5). The Word document with questionnaire will be sent via email to the respondents. After completing it, the respondents will send it back. In the case on need, responders will be kindly reminded via mail to send their response in due time.

The preliminary version of questions contains question for lecturers 37 and 35 for students; after the consultation with the experts, that number is reduced to 25 for teachers and 25 for students. Questionnaires at the end were in accordance with code of conduct at WMU and ethical requirements. The final version of questionnaires for both lecturers and students is given in Appendix (1). After getting approval, questionnaires were sent via email to 40 teachers and 200 students at DUT, CPUT and UMA. Then the prospective despondences were reminded twice to send back their response in due time. Thanks to their kindness after less than a month, all responses were collected. The collected data were stored, and their validity was tested as well. Majority of the responses were numerical (Likert scale), and all responses passed preliminary test. Responders’ additional narrative comments were left for the discussion in conclusion.

Since we have applied hypothetico-deductive approach, it commonly corresponds to quantitative analysis of collected data. The multiple regression analysis has been used, since the whole set of independent variables regarding both lecturers and students attitude towards ODL and e-Learning, were considered. Prior to multiple regression analysis, basic statistical descriptors of the data set were tested. Quantitative analysis has been conducted in SPSS and Excel Module for multiple linear regression graphical analysis. Simulation has been done. They were realised in a very short time frame over a couple of minutes.

Proposed hypothesis was tested upon the strength of correlation between dependent and independent variables when it comes to lecturers’ and students’ sets of responses. Statistical relevance of observed correlations has been tested via ANOVA in SPSS, and it has been proven over the set of analysed data. Upon the proven hypothesis, we offered a theoretical proposal for high MET stakeholders in terms of faster and more effective implementation of ODL and e-Learning. It is to be emphasised once again that emergency situation such as Covid-19 urges the whole process. All teaching and learning activities at DUT currently are moved to virtual platforms as Moodley and MS Teams, while all communications between lecturers and students are conducted via Zoom, WhatsApp and social media (Facebook, Twitter and Instagram).
13.9 Results and Discussion

The research and discussion are drawn from the responses of the lecturers and students interviewed through questionnaires sent to them via email. In total 35 responses from the lecturers (from DUT, CPUT and UMA MET higher institutions) are received in due course and 99 responses from students (from DUT, CPUT and UMA MET higher institutions).

Due to the extensive literature review including textbooks, journals, theses, conference proceedings, reports, newspapers, personal experiences and informal and formal discussions with colleagues, two sets of questions for both lecturers and students at examined METs were conceived. The questions are organised logically and neatly in appropriate sections along with the instructions on how to complete them. This helps the respondents to answer the questions without difficulty. All questionnaires are personally administrated. Through such approach doubts can be clarified, respondents can be motivated easily, almost 100% response rate is ensured and anonymity of respondents was high. The questionnaires were sent to the respondents via mail. Consequently, a wide geographical area in South Africa was reached. In addition, respondents can take more time to respond at convenience.

As a measurement tool, Likert scale has been used as a commonly exploited method of measuring opinions and attitudes. It measures the extent to which participants agree or disagree with given statement and typically ranges from 1 (strongly disagree) to 5 (strongly agree) with a neutral point in the middle (i.e. neither agree nor disagree). It is in the same time semantic differential scale and the numerical scale.

The applied approach was quantitative. After collecting data, in the next step, the data were analysed in order to answer the research questions. Before statistical analysis, data accuracy, completeness and suitability for further analysis were ensured.

On the basis of key statistics, in particular mean values of examined variables, upon the sets of 35 lecturers’ response and 99 students’ response, the following has been concluded:

(i) Lecturers: The interviewed lecturers have assessed real needs for introducing ODL in MET in SA as relatively high one (3.6 at 1–5 Likert scale). They have emphasised the need for free Internet access to lecturers and students (4.5), as well as the need for permanent institutional technical support in realising ODL (4.4). On another side, they express scepticism towards hypothesis that ODL can enable access to higher maritime education to the students living in rural areas and to those who are somehow socially marginalised. Also, lecturers are sceptical towards the assumption that ODL can upraise lecturers’ and students’ digital skills. This opens room for further investigation through in-depth interviews with lecturers.

(ii) Students: The interviewed students have assessed the real need for introducing and adopting ODL at METs in South Africa as a high one (4.03 at 1–5 Likert scale). They believe that ODL can support them to reach higher digital skills (4.29) and to upraise their thinking skills (4.14). But, they are also highly aware
that the number of South African maritime higher education institutions, which can provide lecturers and students Internet access and computer labs, is constrained (4.01). The investigation reveals that insufficient percentage of students has personal tablet, laptop or smartphone (2.28). They are not well informed about similarities and differences in meaning of blended learning, e-Learning, computer-based learning, web-based learning and Cloud learning (2.43). And students are bit sceptic in terms that ODL is a good way of knowledge transfer for seafarers’ knowledge refreshment and lifelong learning (2.91). All above noticed should be further interrogated through in-depth interviews with the students.

Due to the cross-correlation analysis among each pair of analysed variables in the model, the following conclusions can be drawn:

(i) Lecturers: Uprising students’ thinking skills is in positive linear correlation with integration of formal and informal learning styles; level of ODL adoption in South African METs is in positive correlation with availability of Internet access and computer labs; lecturers’ readiness to adapt curricula is positively correlated with availability of online assessments, etc. On another side, easier learning through ODL is in negative correlation with allowing ODL access to socially marginalised groups, which can be explained through the assumption that such way of learning might not be the most convenient one for those learners. Also, reducing costs due to introducing ODL is in negative correlation to making learning easier to socially marginalised students. It might be explained by the assumption that they are anyway prevented to participate due to the absence of Internet access, gadgets, etc. By analogy, the other pairs of constructs which are in strong correlation with certain significance can be argued.

(ii) Students: The level of students’ preparedness for ODL is in strong positive linear correlation with their ability to manage their time well, their self-discipline and belief that ODL is more interesting than classical face-to-face learning. Also, upraising students’ digital skills through ODL adoption is in strong positive correlation with significance with fostering their curiosity, innovativeness and virtual engagement in global e-classroom. On another side, students’ belief that ODL can increase their digital skills is in strong negative linear correlation with the low level of their familiarity with e-Learning terminology and basic principles, including the lack of their personal laptops. In a similar manner, the rest of the positively and negatively correlated pairs of constructs in the model can be discussed.

On the basis of multiple regression analysis over the set of available data, the following has been found:

(i) Mean absolute per cent errors in the analysed cases of lecturers and students are, respectively, 15.08% and 21.80%.

(ii) Calculated $\bar{Y}_v$ value by multiple linear regression can vary based on standard error of regression estimate (SE) for the values ±0.709 in the case of lecturers’ response and ±0.859 in the case of students’ response.
(iii) Correlation coefficient values ($r$) are both above 0.56 that indicates strong linear correlation among considered dependent and independent variables in both analysed cases.

(iv) Coefficient of determination ($r^2$) indicates that $\overline{Y_s}$ is determined in 31% of samples in the first analysed case, suggesting a satisfying linear dependence, while in the second case, it is 40%, suggesting also satisfying linear correlation.

### 13.10 Conclusion

In conclusion, it should be noted that scattering in research topics and results when it comes to ODL and e-Learning in South Africa is more or less similar in other developing environments. Nevertheless, there is a need for upgrading high and continuous education through employing ODL and e-Learning mechanisms, since it is imperative of digital age in which we live and the necessity of digital literacy and team work in virtual environment advocate for ODL and e-Learning. Furthermore, everything goes globally and classrooms are on the road to become global to at least certain extent, especially when it comes to MET, which should be globally recognised and accredited to ensure safety, efficiency and effectiveness requirements. In addition, developing and implementing agreeable and effective policies in South Africa context still lags behind the countries of the first world, slowing down MET development and its harmonisation with the highest standards in the field.

It is noteworthy to mention that Covid-19 pandemic has proved the necessity of e-Learning in developing environments and the result of the study has shown the positive interest of online distance learning from the respondents.

**Recommendations for Further Research**

Further investigations should be done among the larger cohort of lecturers and students at METs in South Africa. Also, relevant stakeholders should be involved as respondents from DHET, SAMSA and EMSA, researchers in the field of high education, etc. In some cases, in-depth interviews should be conducted instead of questionnaires. This can give us better insight into the analysed preferences, needs and constraints when it comes to introducing and adopting e-Learning at METs in South Africa. Besides quantitative analysis, in-depth interviews will be better background for additional qualitative analysis. Also, instructional design component shall be involved in further investigation in the field. Benchmarking with METs in some other African countries should be done, as well as benchmarking with some METs from developed countries in Europe, for instance. This will give us broader picture of the issue. In addition, opportunities of collaborative online international learning with other developing and/or developed countries should be explored in some more detail. The issues of lecturers’ intellectual properties should be examined as well, since it is an important dimension of the problem. In actual conditions, the impacts of Covid-19 on METs should be explored, since this can reveal some important
facts about (un)successful practices in implementing e-Learning in emerging situations. Besides pragmatics of raising competences and achieving positive economic effects, exploring e-Learning adoption in high METs in South Africa should include social dimension, along with lecturers’ and students’ emotions and feelings if they work separately and in a kind of isolation. This important constructivist component should be among others a part of further, more rigor investigation.

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