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Implementation of maritime education and training (MET) : an exploration of human and technological resources challenges facing MET in Kenya

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Implementation of Maritime Education and Training (MET): An exploration of Human and Technological Resources Challenges Facing MET in Kenya

By

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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Abstract

Dissertation title: **Implementation of Maritime Education and Training (MET): An Exploration of Human and Technological Resources Challenges Facing MET in Kenya**

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Kenyan institutions started offering Maritime Education and Training programmes in 2011. This followed a successful evaluation and confirmation by the IMO Maritime Safety Committee, of Kenya's demonstration of giving the STCW Convention 78, as amended full and complete effect to the relevant provisions in 2010.

This dissertation seeks to explore the background of Kenya's MET and the contemporary situation, in addition to the challenges of human and technological resources facing the MET implementation process. As the STCW Convention seeks to standardize training and certification of seafarers, this exploration focuses on the "T" in the STCW Convention, hence it delves into Section A-I/6, A-I/8 and A-I/12. Further, the analysis of the Convention exposes the link between human and technological resources and their impact on standards of training and competence. Moreover, in an attempt to analyze the global MET position of human and technological resources in comparison with Kenya, data analysis from questionnaires, interviews and observations was undertaken to supplement the literature review and draw feasible conclusions from the analysis.

The findings from the data analysis depict a deficiency in human and technological resources in Kenyan MET, hence an urgent need to develop these resources. In conclusion, the dissertation provides suggestions of good practices from global MET institutions drawn from the literature review and deductions from the data analysis. Furthermore, a matrix is provided with proposed short term and long term responses to the challenges that Kenyan MET faces. If adopted, these responses could augment implementation of sustainable MET and the development of a competent and globally competitive maritime labour force.

Key words: MET, Human resources, Technological resources, Competence, Kenya

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List of Abbreviations

AAST	Arab Academy of Science and Technology
ARPA	Automatic Radar Plotting Aid
BC	Bandari College
BRM	Bridge Resource Management
CMI	Caribbean Maritime Institute
CBT	Computer Based Training
CD	Compact Disk
DMU	Dalian Maritime University
DMI	Dar es Salaam Maritime Institute
DNV	Det Norske Veritas
ECDIS	Electronic Chart Display and Information System
EEZ	Exclusive Economic Zone
EFTA	European Free Trade Association
EMSA	European Maritime Safety Agency
ERM	Engine-room Resource Management
ERS	Economic Recovery Strategy
ESNI	Escola Superior Nautica Infante D. Henrique
EU	European Union
HTW	Human Element, Training and Watchkeeping
IMLA	International Maritime Lecturers Association
IMO	International Maritime Organization
ISF	International Shipping Federation
ISWG	Inter-sessional Simulator Working Group
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KIE	Kenya Institute of Education
KMA	Kenya Maritime Authority

LAPSSET	Lamu-Port Southern-Sudan-Ethiopia Transport Project
LMAC	Lycée Maritime Anita Conti, Fécamp
LMS	Learning Management Systems
MarTEL	Maritime Tests of English Language
MET	Maritime Education and Training
METNET	Thematic Network of Maritime Education Training and Mobility of Seafarers
MIWB	Maritime Institute Willem Barentsz
MOU	Memorandum of Understanding
MRM	Maritime Resource Management
MTTI	Mombasa Technical Training Institute
NESC	National Economic and Social Council
NSR	Northern Shipping Route
OECD	Organization for Economic Co-operation and Development
QS	Quality Standards
QSS	Quality Standards System
RMU	Regional Maritime University
SSR	Southern Shipping Route
STCW	Standards of Training Certification and Watchkeeping
STW	Standards of Training and Watchkeeping
SURPASS	Short-Course Programme in Automated Systems in Shipping
TNI	The Nautical Institute
TUM	Technical University of Mombasa
UFN	University Fiji National
UNCTAD	United Nations Conference on Trade and Development
WMA	Warsash Maritime Academy
WMU	World Maritime University

1.0 Introduction

1.1 Background

The contemporary shipping industry operates perhaps, with the most globalized labour force and shipping companies continue to recruit labour internationally (Sampson, Gekara & Bloor, 2011, pp. 81-92; Cole, 1999). Paradoxically, Sampson, (2003) notes that seafarers from the world's larger flags (Panama, Bahamas, Cyprus, Liberia and Malta) rarely feature in manpower statistics of seafarers, as is evident in the Drewry Manning Report (2012). In addition, the second register fleets and progressively the first, in most Organization for Economic Co-operation and Development (OECD) countries also reflect declining numbers of national crew members. These facts signify the vast changes in the labour market for seafarers (Lane, 2000, p. 5).

Furthermore, the global shortage of officers persists despite the effects of the economic downturn including scrapping, lay-up and stoppage of new building of vessels. To this end, various initiatives of training, recruitment and retention of seafarers have been developed mostly in the European Union (EU), to make seafaring an attractive career for young people (Froholdt & Hansen, 2011).

It is on the same vein that Kenya strategizes to join the global suppliers of maritime labour in the wake of the global shortage of officers, as recorded in the Drewry Manning Report (2012) and Froholdt & Hansen (2011). Its endeavours to provide education and training for seafarers is demonstrated by past dissertations submitted to the World

Maritime University (WMU) by Kenyan students, Olango (1986), Mungai (1989) and Musa (2000). However, a legal framework to facilitate establishment of MET was lacking at the time of writing of the above cited dissertations. There was no Maritime Administration, no national legislation governing maritime affairs and most importantly, Kenya had not ratified the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 78, as amended. Therefore, the Kenyan WMU students made propositions how MET could be established. Their vision started being realized in 2010 when Kenya ratified the STCW Convention 78, as amended.

Kenya has since gone through radical changes in the maritime sector with the establishment of Kenya Maritime Authority (KMA) as stipulated in the Republic of Kenya (2006). The administration drafted the Merchant Shipping Act which was enacted into Kenyan law in 2009 (Republic of Kenya, 2009) and drafted curricula for implementation by MET institutions. These developments resulted to the successful evaluation and confirmation by the International Maritime Organization's (IMO) Maritime Safety Committee of Kenya's demonstration of giving the STCW Convention 78, as amended full and complete effect to the relevant provisions, hence entry to the IMO "white list" in 2010 (IMO, 2009).

Following the establishment of the legal framework and the development of MET curricula, four (4) institutions currently offer MET;[1] three offer Marine Engineering and one Diploma in Nautical Science. However, according to Fuazudeen (2011), the institutions lack appropriately qualified instructors and assessors coupled with inadequacy of simulation equipment and infrastructure for practical training, in addition to the absence of a training ship. The STCW 78 Convention, as amended emphasizes on

[1] Four (4) institutions are offering MET at the time of writing this dissertation.

(competence) the demonstration of the ability to perform the functions and tasks on board ship in a safe, efficient and effective manner (Fisher & Muirhead, 2005).

Additionally, the ongoing implementation of the Manila amendments necessitates appraisal of national maritime education and training. Nevertheless, it is an opportune time to harmonize national educational practices with international achievements. The process of harmonization of standards is not a mechanical adaptation and hence requires careful assessment and tactical development in line with the accepted international minimum standards, for safe and efficient operation of ships (Ziarati, Ziarati, & Acar, 2012).

As a consequence, great efforts are being made to align MET in Kenya to the requirements of STCW Convention 78 as amended. However, having only ratified the STCW Convention in 2010 and effected MET in 2011, it appears to be a demanding task implementing MET concurrently with the Manila amendments which entered into force on 1st January, 2012 with full compliance by 1st January, 2017[2] (IMO, 2011, p.33). It does therefore, seem timely to undertake an analysis of the current MET situation in Kenya, including an assessment of the challenges involved and possibly draw learning experiences from other institutions in the maritime educational sector. The results of the analysis will be used to draft proposals on how the strategy of implementation of MET can continue in a feasible manner and thus enhance the entrance of Kenyan seafarers in the global labour market.

[2] STCW Convention Reg. I/15, p.33 - Manila amendments entered into force on 1st January, 2012 with full compliance by 1st January, 2017

1.2 Statement of the Problem

Since Kenya entered the IMO "white list" in May 2010, it has an obligation to safeguard the minimum standards of training and certification of seafarers as per the STCW 78 as amended**.** However, the implementation and development of MET is facing various challenges including shortage of appropriately qualified instructors and assessors in MET as required by STCW Code A-I/6 (IMO, 2011; Fuazudeen, 2011).

In addition, lack of appropriate simulation equipment and a training ship (technological challenges) is a major impediment for practical training and assessment as stipulated by STCW Code A-I/12 (IMO, 2011; Fuazudeen, 2011). These challenges continue to slow down the implementation process and growth of MET in Kenya. This dissertation therefore, aims at exploring the MET situation in Kenya, analyzing the challenges and suggesting how they can be addressed by identifying good practices for sustainable growth of MET.

1.3 Purpose and objectives

The purpose of this dissertation is to explore the challenges Kenyan MET Institutions are facing in implementing MET with particular emphasis on human and technological resources and analyze lessons learnt from other MET Institutions with the aim of proposing implementation and development strategies.

The specific objectives are to:

1. Explore the contemporary situation of maritime education and training (MET) in Kenya.
2. Analyze how the challenge of human and technological resources impacts on the implementation and development of MET.
3. Review the STCW Convention 78 as amended and Code and its effect on the development of MET.

4. Evaluate MET strategies employed by MET institutions outside Kenya and suggest how MET can be developed for sustainable growth and development.

1.4 Research Questions

The dissertation will seek to answer the following questions.

1. What is the contemporary situation of MET implementation process in Kenya?
2. How are the human and technological challenges influencing implementation and growth of MET in Kenya?
3. What are the impacts of STCW 78, as amended on implementation and development of MET in Kenya?
4. Can MET implementation and development in Kenya benefit from good practices applied in other MET institutions?

The findings of this dissertation will therefore contribute to the body of MET knowledge and provide suggestions to the Government of Kenya, KMA and the MET institutions on how the challenges facing implementation and development of MET can be addressed. The suggestions may provide an insight which can enhance achievement of Kenya's vision of providing globally acceptable standards of MET as projected in the KMA Strategic Plan (KMA 2012c)[3] and the KMA Medium Term Expenditure Fund Report, (KMA, 2012b)[4].

[3] KMA Strategic Plan (2013 - 2018) "…planning, monitoring and evaluating training programmes to ensure conformity with standards laid down in international maritime conventions for purposes of accreditation".
[4] KMA medium term plan (2012 - 2017) "… to position Kenya as a significant supplier of competent seafarers to global shipping industry, to serve as stimuli for investment in maritime industry".

1.5 Scope

The scope of this study is defined by duration and geographical span. It covers the period between 2006 and the beginning of 2013. This phase is significant for MET in Kenya as it is during this time a legal framework for operation was established which enabled drafting and passing of the laws governing MET including ratification of IMO Conventions, Merchant Shipping Act, 2009 and entry into the IMO 'white list' in 2010.

The geographical scope covers institutions offering MET within Kenya, Africa, Europe, the Caribbean and the Fiji Islands. Figure 1.1shows the geographical boundaries of the Republic of Kenya within which the Kenyan MET institutions are based.

Key:

Population : 40Million

Area:580,367Sq.km

Water mass:11,227 Sq.km

Coastline:536km

Seafarers:≈ 6000

MET Institutions : 4

Source: KNBS (2012)

Figure 1.1 Map of the Republic of Kenya

Source: Ezilon Maps (2013)

The choice of the geographical span was based on the following reasons: The study of MET institutions in Kenya gives an indication of the contemporary situation. An analysis of African regional institutions is important as it provides a basis for regional comparison. In addition, MET institutions from developing countries like the Fiji Islands, the Caribbean and China were chosen as UNCTAD (2013, p.1-6) classifies Kenya among developing countries, hence the human and technological challenges are likely to be similar in these countries.

On the other hand, since most MET institutions in Europe are developed in both human and technological resources, they provide classic models for MET institutions in Kenya. This is particularly so, in Britain since Kenya maintained the British educational policies after Kenya's independence (Chase, 2006; Buchmann, 1999). These are the main reasons that form the scope of the study.

1.6 Dissertation outline

This dissertation is organized in six chapters. Chapter one introduces the dissertation including the background of the research, purpose, objectives, research questions, statement of the problem and scope. Chapter two explores the literature review, chapter 3 discusses the methodology of the research, chapter four is data collection and analysis, chapter five is discussion of the findings and finally chapter six concludes the dissertation, outlines the limitations of the study and attempts to make suggestions to alleviate the challenges facing Kenyan MET institutions.

2.0 Literature Review

2.1 Introduction

Following the prevailing global shortage of officers, various national and international initiatives encompassing recruitment, research programs and fast tracking of maritime education and training are being undertaken (Wagtmann & Poulsen, 2009, p. 306-23). Yet, research indicates that the challenge is not entirely lack of seafarers but the standard of their training (Li & Wonham, 1999). This statement is supported by the Interreg IVB report (Froholdt & Hansen, 2010, p.6) which alludes that "the level of competence in the European maritime industry is declining both at sea and at shore".

In the same breadth, IMO developed the Standards of Training, Certification and Watchkeeping Convention 78, including the requirements of maritime education and training of seafarers. The Manila Amendments of 2010 augment the competencies required of seafarers, in light of emerging technologies, multicultural and multinational crews hence the necessity of competency in soft skills like leadership and teamwork[5]. These skills are viewed as key elements in reducing accidents caused by human factors.

This is perhaps, the reason why the IMO's Sub-Committee on Standards of Training and Watchkeeping (STW) has now been renamed the Human Element and Watchkeeping (HTW) Sub-committee in recognition of the heightened importance placed on matters relating to the role of human element (IMO MSC\92\22, p. 4, 2013). From the foregoing,

[5] See Hernqvist (2012) the Swedish Club, p.5 – "MRM - resource management, leadership and teamwork… sometimes referred to as human factors… MRM considered as an approved course as a method of demonstrating competence for non-technical STCW requirements…"

it is imperative that MET institutions endeavour to invest in resources, including human and technology that facilitate training of competent seafarers.

However, IMO vests the responsibility for implementation of the STCW Convention to national governments. This exudes concerns how MET institutions implement and maintain STCW requirements and if the standards are effectively monitored. Consequently, the EU established the European Maritime Safety Agency (EMSA) to ensure STCW standards are implemented by the EU member states and non-member states whose seafarers are employed on EU registered ships, for recognition of their certificates (EMSA, 2013).

In order to meet global standards of competency, Kenya is in the process of developing its MET systems. These efforts are aimed at positioning its seafarers strategically to enter the global labour market by furnishing them with the required academic and practical competencies to enable them work safely and efficiently on-board international fleets (KMA, 2012c).

Chapter two describes the contemporary situation of MET in Kenya in light of previous studies undertaken, up to the current position. It explores the impact of STCW Convention 78 as amended to MET. In addition, it examines literature on human and technological resources challenges experienced in MET with a reflection on the implementation and development of MET in Kenya and attempts to draw possible suggestions for Kenyan MET institutions.

2.2 Historical and contemporary overview of MET in Kenya

The roadmap towards the implementation of MET in Kenya started shortly after independence in 1963 through a cadet training scheme undertaken with the aid of the British Government. This training scheme ceased with the collapse of the East African Community in 1977 creating a knowledge vacuum of qualified mariners in Kenya

(Wainaina, 1989; Olango, 1996 & Musa, 2000). Thereafter, Kenyan seafarers desiring to attain internationally recognized Certificate of Competence sought training abroad which turned out to be an expensive venture, hence attracting less people (Musa, 2000, p.19).

The pressure to establish MET institutions continued with an unsuccessful attempt to enter the IMO "white list" in 2002. The Government of Kenya realised that is was necessary to establish a legal framework in order to develop the maritime Kenya. This initiative led to the establishment of the KMA in 2004 resulting with the enactment of the Merchant Shipping Act, 2009 and subsequent entry into the IMO "white list" in 2010 (KMA, 2006).

2.2.1 Promotion of MET in Kenya

During the years when there was no maritime training for officers in Kenya and particularly before the year 2000, there were seafarers who ventured in to the shipping industry as ratings and progressed up the ladder through promotions but lacked academic qualifications. This cadre of seafarers created a perception in parts of the Kenyan society that seafaring does not require academic qualification and can be learnt through apprenticeship. This is perception is in contradiction of the requirements of the STCW Convention which stipulates "mandatory education and training for masters', officers' and radio operators' certificates of competency" (Fisher & Muirhead, 2005, p.2).

Furthermore, changing societal perception towards seafaring career by the young generation, as any other professional career is a hurdle that has to be dealt with globally to develop sustainable maritime human resources (Zade, 2003, pp.21-25). In this regard, KMA embarked on an intensive awareness campaign among Kenyan stakeholders, high school students and the general public to facilitate a paradigm shift towards the benefits of the maritime profession as depicted in figure 2.1 and 2.2 (Marete, 2013). These

campaigns are still on-going, they target all Kenyan stakeholders in the 47 Counties as stipulated by the Constitution of Kenya (Republic of Kenya, 2010).


Figure 2.1 KMA Staff travelling to Pate Island to sensitize stakeholders

Source: Author (2012)

Figure 2.2 Promoting MET awareness to members of the public and schools

Source: KMA (2013)

Despite possessing the much required competency, experienced seafarers without academic qualification cannot be utilized to train in MET institutions since they lack the academic, pedagogic and didactic skills. In response, the Kenya Institute of Education (KIE) conducted a survey for training needs of the maritime sector in 2011. The report expressed concern that neglect of MET training over the years has eroded the benefits that would have otherwise been accrued from the sector (KIE, 2012).

In addition, statistics from the Kenya National Bureau of Statistics (KNBS) (2012) illustrated by Table 2.1 does not feature the maritime sector among the employment providers. While this may be true, the statistics could also mean that the maritime sector

is classified under the transport and communications sector to which the Kenya Ports Authority (a major employer) belongs. The above facts notwithstanding, perhaps the development of the maritime Kenya could increase employment opportunities for Kenyans and be a contributor to national economic growth.

Table 2.1 Employment by Industry

Kenya Facts and Figures 2012 — Employment and Earnings

EMPLOYMENT BY INDUSTRY, 2008-2011

Employment by Industry	Unit	2008	2009	2010	2011
Agriculture & Forestry	000	340.7	340.3	343.8	345.9
Mining & Quarrying	000	6.6	6.5	6.6	8.8
Manufacturing	000	264.1	266.4	268.1	275.7
Electricity & Water	000	19.3	19.6	19.6	20.7
Building & Construction	000	84.8	93.4	101.3	109.0
Trade, Restaurant & Hotels	000	202.4	215.4	226.9	238.6
Transport & Communications	000	157.4	143.5	151.3	157.4
Finance , Insurance, Real Estate & Bus	000	94.5	97.2	99.3	107.3
Community, Social & Personal Services	000	774.1	817.7	843.7	835.7
Employment in Informal Sector	000	7,942.3	8,388.9	8,826.2	9,272.1
Real Average earnings	KSh p.a	393,989.6	372,986.4	371,513.8	341,584.4

Source: KNBS (2012)

In recognition of the economic potential in maritime sector, the Government of Kenya has shown interest in maritime affairs by embedding “Marine Navigation” in Schedule 4 of the Constitution of Kenya (Republic of Kenya, 2010). This legislation requires the Maritime Administration to provide an enabling environment to develop the maritime sector and maintain Kenya’s status in the IMO “white list” through enforcing globally recognized MET standards (KMA, 2012c). This is demonstrated in the KMA flagship project, “Training the Kenyan seafarer’s for the international job market (KMA, 2012a).

On the whole, Kenya is in the process of implementing an Economic Recovery Strategy (ERS) for wealth and employment creation. Education is earmarked as one of the key sectors to drive the ERS strategy. MET is a potential tool to empower the Kenyan seafarers to be competitive in the global shipping labour market and at the same time increase their knowledge to enable them exploit the numerous resources endowed in the vast Exclusive Economic Zone (EEZ) and beyond (KMA, 2012a). If this objective is realized, it will enhance economic expansion and possibly contribute the projected 10% growth estimated by the Kenya Vision 2030 depicted in Figure 2.3.

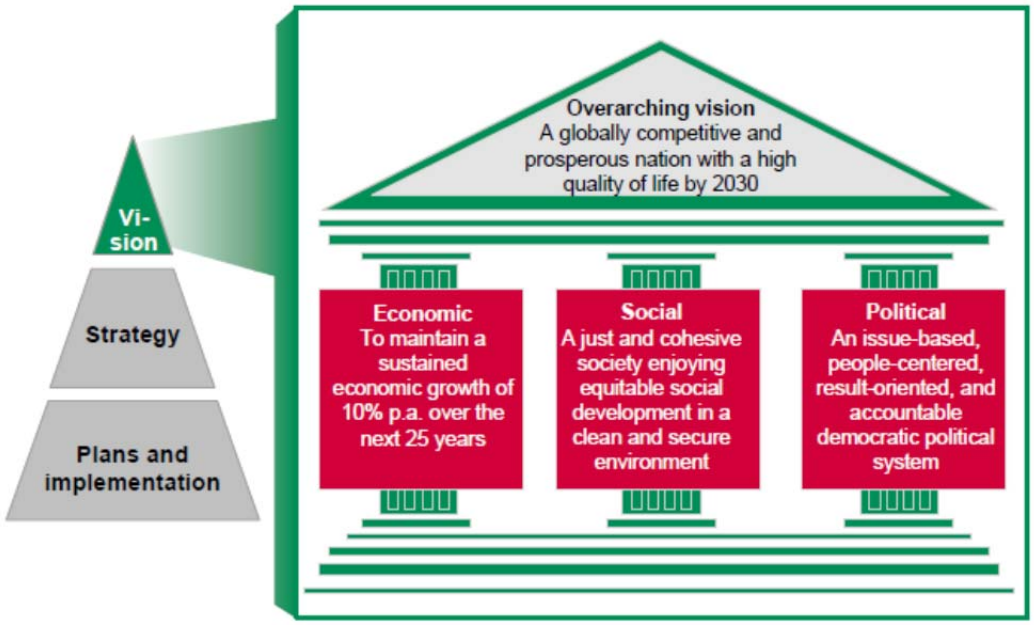


Figure 2.3 Thematic Review of Kenya Vision 2030

Source: Republic of Kenya (2007)

2.2.2 Contemporary situation of MET in Kenya

Kenya's entry into the IMO's "white list" in 2010 and the ratification of the STCW Convention 78, as amended coincided with the STCW Manila amendments. These significant events might place the country in a challenging position, not only to comply with the STCW Convention but at the same time implement the Manila amendments.

While other IMO Member States are grappling with the implementation of the Manila Amendments (IMLA[6], 2010. p.121; Ziarati et al, 2012) Kenya is in addition dealing with the basic challenges of implementation of the MET system including human, technological resources and creating an enabling environment for development of MET (KMA, 2012c).

On the other hand, this situation could be seen as an advantage for Kenya, to deal directly with the STCW Manila amendments as a new project and not changing the existing paradigm since change management is often difficult (Todnem, 2005, pp. 360-380).

Furthermore, seagoing service is a fundamental requirement in training of seafarers. At least 12 months for officers taking charge of navigation watch and 6 months for officers taking charge of an engine room watch (STCW Section A-VII/2). This is a technological challenge as Kenya does not have a training ship and therefore urgent action needs to be taken to secure cadet berths for the Kenyan trainees (KMA, 2013, p.14). Currently, Pacific International Lines (PIL) has entered into an agreement with KMA to offer cadet berths to its trainees undertaking training in the United Kingdom and Singapore. However, one shipping company may not be sufficient to accommodate all trainees from the Kenyan MET institutions; hence the challenge of shortage of cadet berths remains a challenge for MET in Kenya.

Other challenges facing MET in Kenya include recruitment of appropriately qualified MET instructors (human resources) as stipulated under STCW Section A-I/6 and Section A-I/6[7] and obtaining the requisite equipment for practical training (technology) STCW Reg. A-I/12. Furthermore, STCW Convention lays emphasis on competence based

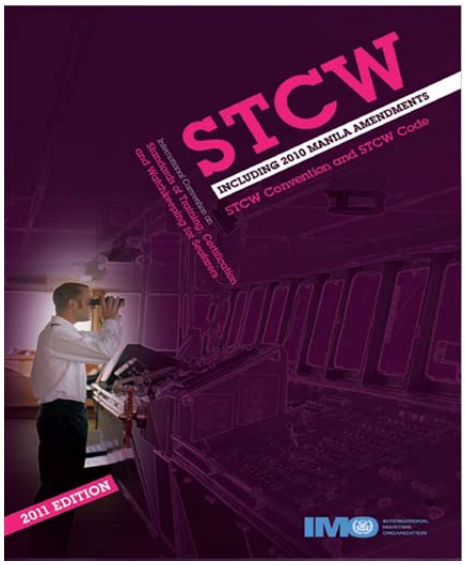
[6] IMLA – International Maritime Lecturers Association

[7] Section A-I/6, Part 3 on qualifications of instructors, supervisors and assessors… "each party shall ensure that instructors, supervisors and assessors are appropriately qualified and experienced for the particular types and levels of training and assessment of competence of seafarers either on board or ashore, as required under the Convention…"

approach to training which means the ability of qualified seafarers to perform their tasks competently. This principle is reflected in the education, training and seagoing service requirements underscored in the STCW Tables of Competence. It is further elaborated in Section 2.3 of this dissertation which is an in-depth discussion on the effects of the STCW Convention on implementation and development of MET.

2.3 STCW Convention 78, as amended and its impact on Implementation and development of MET

According to International Shipping Federation (ISF) (2010), "the competence of seafarers is critical to the safe and efficient operation of ships since it has a direct impact on safety of life at sea and protection of the marine environment". Therefore, the STCW Convention establishes a comprehensive set of regulations aimed at ensuring the highest standards of competence globally by placing responsibilities on maritime administrations, employers and training institutions (ISF, 2010). For the purpose of this dissertation the focus is on the "T" in the STCW hence this discussion will explore Sections A-1/6 on training and assessment, Section A-I/8 on quality standards and Section A-I/12 on the use of simulators which directly impact on training and assessment of seafarers as illustrated in Figure 2.4.



I/6 Training and assessment
- within an institution
- competence assessment

I/8 Quality standards
- training programmes
- examinations
- personnel qualifications

I/12 Use of simulators
- performance standards
- programmes/assessment
- personnel

Figure 2.4: Regulations on Training of Seafarers

Source: IMO (2011)

2.3.1 STCW Section A-1/6: Training and Assessment

MET institutions are required under STCW 78 Convention, Section A-I/6 to ensure that training and assessment of seafarers is structured in accordance with written programmes. The structure should therefore take into consideration media of delivery, procedures and course material necessary to achieve the prescribed standard of competence and training. Training and assessment should, in addition be monitored, evaluated and supported by qualified personnel (Fisher & Muirhead, 2005; Cross, 2013).

Although Tables of Competence in the STCW Code emphasize on proficiency and competency of seafarers, the importance of academic knowledge and education has not been diminished especially for the operation and management levels. Therefore, it can be a daunting task for MET institutions to determine the type of education required and strike a balance between competence based and knowledge based learning. This

determination influences decisions on appropriately qualified instructors in addition to training and assessment tools (Fisher & Muirhead, 2005; ISF, 2010, p. 40).

Part 4 of section A-I/6 emphasizes on teachers' clarity in training objectives for the particular type of training in addition to being qualified for the task for which training is being conducted. At the same time, development of learning objectives is perceived as a major challenge for MET instructors (Fisher and Muirhead, 2005). However, direction may be sought from the IMO model courses which can provide guidance during development of curricula and learning objectives (Nakazawa, 2013).

In addition, if an institution is conducting simulator training, the instructor should have trained in the instructional techniques involving simulators and gained practical operational experience of the particular type of simulator being used (Reg. A-I/6 part 4). Besides, it is expedient for instructors to be equipped with basic simulator pedagogics especially if they only have operational experience (Cross, 2013; IMO, 2001).

The STCW Convention Section A-I/6 requires maritime administrations before approving a course, to ensure that MET institutions have clearly defined the course goals and learning objectives, curriculum details, entry standards, course structure, syllabus and means of delivery. Moreover, they should exhibit examination methods including assessment of competency and evidence of supporting resources (Fisher & Muirhead, 2005). This is a challenge that institutions intending to offer MET in Kenya have to contend with before being accredited to implement the seafarers' curriculum. The instructors must possess, in addition to academic qualifications, sea going experience and simulator instructors be trained on the use of simulators (KMA, 2013, p.5).

In view of the obvious shortage of instructors, the following suggestions provided by Fisher & Muirhead (2005) can be taken into consideration. Newly trained instructors should be facilitated to receive appropriate guidance in instructional technique

(pedagogy), enabled to gain practical simulator operational experience, receive appropriate guidance in assessment methods and practice, thus enabling them to gain practical assessment experience on different types of simulators. Additional guidance can be obtained from relevant IMO simulator model courses for example (1.07, 1.08, 1.22, 2.06 and 2.07).

2.3.2 STCW Section A-I/8: Quality Standards

Quality standards (QS) Section A-I/8[8] is one of the new developments in the STCW Convention 78, as amended which has a great impact on MET institutions. Many MET institutions fall short of compliance by failing to establish quality standards systems. The situation is aggravated by lack of experienced personnel working within the quality standards system, occasioning failure in quality assurance [9](Fisher & Muirhead, 2005).

Section A-I/8 part 2 exemplifies the scope of quality standards encompassing the administration of certification system, training courses and programs, examinations and assessment, qualifications of instructors and assessors. The system should enforce policies, systems, controls and internal quality assurance reviews which are established to monitor achievement of the defined objectives (IMO, 2013b).

(a)The framework of a quality management

The STCW Convention demands that external assessment of activities and administration of the certification system should be carried out at intervals not exceeding 5 years. This regulation ensures that MET institutions produce seafarers of the required standard. It is for this reason; the European Maritime Safety Agency (EMSA) for example, carries out audit in institutions within the European Union and non-European union countries for recognition of certificates at European Union level (EMSA, 2013).

[8] STCW Convention 78, as amended Sec.A-I/8 "… education and training objectives and related standards of competence to be achieved, be clearly defined and levels of knowledge, understanding and skills appropriate to the examinations, assessments required under the Convention identified…"
[9]Fisher & Muirhead (2005) "In MET quality assurance means fitness for purpose to achieve the stated objectives"

Figure 2.5 displays the framework and process of MET certification including the elements of a Quality Standards system (QSS).

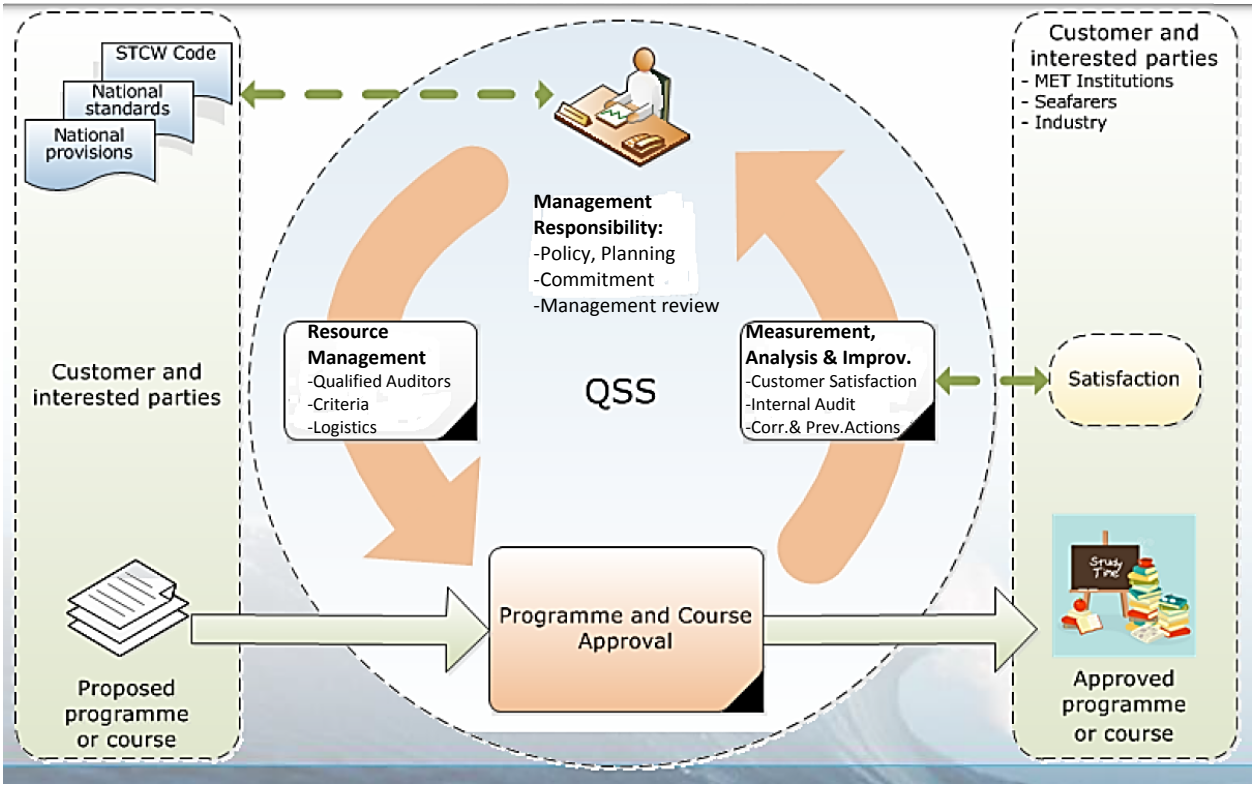


Figure 2.5: The process of MET Certification system

Source: EMSA (2013)

As illustrated in Figure 2.5 MET institutions exist and operate in an open environment and are interdependent with elements and conditions existing in the system. When designing quality standards, MET institutions need be sensitive and responsive to industry and regulatory requirements and provide programmes relevant to client needs. Karma, (1997) holds that MET institutions should be prepared for scrutiny by certifying authorities, clients, sponsors and the public. This is a practical strategy to gain credibility, significance and ensure sustainable growth and development.

(b) Ensuring "Quality Standards" in a QSS

Whereas Section A-I/8 of the STCW Convention has not precisely defined quality standards, it is important to establish what a certification organization would perceive as quality; for example, realism in the case of simulators or training conditions. There seems to be no universally accepted right or wrong way of establishing a quality system. Yet, the snag is how to interpret the relationship between objectives and actual achievements, as these are core quality elements (Waters, 1996).

From the foregoing, different arguments have been made on quality management systems. However, many researchers acknowledge that MET institutions ought to take into consideration the national system, the institutional mission statement, organizational structure, courses offered, examination procedures, resources available (human, technological, financial) national authorities, industry, internal and external monitoring and evaluation system (Fisher & Muirhead, 2005; DNV[10], 2005).

2.3.3 STCW Section A-I/12: Standards governing the use of simulators

Section A-I/12 of the STCW Code lays down performance standards for mandatory simulator training and assessment which MET institutions must implement to achieve compliance as per the STCW Convention, 78 as amended.

The STCW Convention makes the use of simulators mandatory for Automatic Radar Plotting Aid (ARPA) and Radar training and outlines their performance standards. Similarly, for parties using simulators for the purpose of training and assessment of any competence or continued proficiency, such simulators must comply with performance standards laid down in the STCW code (IMO, 2011; Fisher & Muirhead, 2005).

[10] DNV – Det Norske Veritas

According to Singh (1997) there are a myriad of issues encountered by MET institutions during installation of laboratory equipment and particularly simulators in addition to national and international regulations and standards relating to simulation. These include the goals of the training program; simulator instructor qualifications; simulator fidelity; and simulator characteristics; fiscal quantification of installation, maintenance, development and power supply among other issues. Some of the key issues which could aid simulation implementation decisions are discussed as follows.

(a) Goals and objectives/characteristics of the training program

The program characteristics determine the simulator or equipment to be implemented for practical training. Deniz, Kusoglu & Hashimoto (2004) explain that simulator I for example, facilitates learners to understand operations during watch duties and respond to emergency situations. This simulator is suitable for lower levels of training. They state that simulator II is suitable for higher levels of training as it reinforces the learners' comprehension of team and resource management, communication and other managerial skills.

There are four broad categories of simulators including; single task, limited task, multitask and full mission simulators as illustrated on Figure 2.6. Nevertheless, a decision to install a simulator or any other equipment for practical training should be made after a training needs assessment. This assessment enhances determination if the equipment meets training goals and objectives and appraises its compliance with approved training and course design.

Figure 2.6: Simulator Pyramid Source: Cross (2011)

(b) Competency of Simulator Instructors and Assessors

Instructors and assessors play a key role in delivering competency based training as stipulated in Section A-I/12 of the STCW 78 Convention as amended. This regulation is reinforced by Section A-I/6 which underscores that instructors and assessors should be experienced on the tasks being trained and assessed (Barnet, 1997). This claim is further promulgated by Pols (1997) who asserts that instructors and assessors should be properly trained, qualified and experienced. Furthermore, training of instructors on of simulator operations can be provided by the simulator manufacturer or a simulator training institute (Cross, 2013; Kongsberg, 2013).

(c) Simulator Realism

Simulator systems should provide a relationship between what the trainee is practicing while undergoing training and on board ship experience. The simulator system should include environmental realism, psychological, physical and functional fidelity. In

addition, the ambience and lighting conditions should be as close as possible to those being depicted onboard to reflect a sea environment (Barnet, 1997).

(d) Flexible and user friendly

Simulation equipment should be versatile and be capable of upgrading, user friendly for trainees and instructors to facilitate setting up of initial conditions and insertion of malfunctions. They ought to be flexible and capable of recording, playback, freeze, fast forward and provide a feedback mechanism for both instructors and students (Barnet, 1997).

(e) Power supply

Power supply is an integral part of simulation installation and therefore requires careful consideration. This is particularly so in Kenya, where power fluctuations are very prevalent ("Large parts of Kenya hit by power outage," 2013, May 29)[11]. Computer based systems and simulators require a stable power source. Frequency variations, power disruptions and transients are detrimental even to the most powerful installations (Singh, 1997).

On the whole, the discussion on the impact of STCW Convention 78 as amended to MET shows a significant relationship between human and technological resources in MET. Section A-I/6, A-I/8 and A-I/12 highlight competencies of teachers/instructors and assessors in both academic and simulation instruction. In addition, Regulation A-I/12 places further emphasis on simulation equipment, classified as technology in this dissertation. This section of the discussion therefore provides a link between the human and technological resource challenges, explored in section 2.4 and 2.5 of the literature review.

[11] The Star of May 29th 2013) "Large parts of Kenya hit by power outage"

2.4 Human resources challenges in MET

This section of the literature review investigates the human resources challenges in MET that Kenya faces according to the dissertation objectives.

2.4.1 Human resources defined

Brantton and Gold (1999) define human resources as people in organizations, endowed with a range of abilities, talents and attitudes. They are referred to as human resources by virtue of the roles they assume in the organization.

In a publication on education and competence development in a maritime EU, Froholdt and Hansen (2011) endorsed maritime education and competence development as "part and parcel of a company's human resource strategy". Consequently, they argued that human resource strategy requires urgent attention in order to retain and develop competencies and maintain a competitive position in the global labour market.

2.4.2 Shortage of seafarers

A shortage of officers in the shipping industry has been reported globally over the past decade. According to the Drewry report (2012) the projected growth in cargo carrying fleet between 2012 and 2016 is expected to raise the demand of officers to about 31,000 thus increasing the officer requirement from 560,000 to 591,000 as illustrated in Table 2.2. On the other hand, the report highlights a substantial increase in officer supply from Eastern Europe and the Indian subcontinent with a little improvement from the Western and Central Europe.

Table 2.2 Projected officer supply/demand balance ('000)

	1990	1995	2000	2005	2011	2016
Officer Demand	448	427	420	476	560	591
Officer Supply	403	409	404	466	544	575
Apparent Surplus/ (Shortfall)	-45	-18	-16	-10	-16	-16

Source: Drewry Manning report 2012

In addition, the Drewry Report (2012) further explains that despite a notable increase in officer quantity globally, developed economies continue to register a decline in officer supply. This report concurs with the Thematic Network of Maritime Education Training and Mobility of Seafarers (METNET) report of 2003 which asserts that "…The European seafarer continues to be an endangered species and the sustainability of the maritime skills base is still in jeopardy" (Zade, 2003, p. 20).

The irony is that while the developed countries are addressing a shortage of officers and pooling resources towards revitalizing MET the developing countries like Kenya are pooling resources to develop MET as a strategy to create employment opportunities. These are two different scenarios addressing human resource challenges. Nevertheless, due to economic differences in the two scenarios, the strategies to alleviate the challenges may differ considerably. (KMA, 2012c; Ziarati, 2012, p. 36).

Cahoon & Haugstetter (2008) claim that the maritime industry is faced with a shortage of qualified officers as seafaring is not a common career of choice among the young people; and when they take it, they soon leave for shore employment. An intensive and far-reaching approach by all stakeholders in the maritime industry is proposed to make the shipping industry the industry of choice for the younger generation in order to attract and retain them in shipping companies globally[12].

[12] See Video clip "World Careers" – http://worldcareers.dk/about-the-blue-denmark/ and ISF -

While there is a need to promote seafaring career among the young generation in developing countries, retention may not be a major problem since there exists unemployment onshore as established from the National Economic and Social Council report (NESC report, 2011). For instance, currently Kenya has only one port (Mombasa Port) although another one is under construction in Lamu,[13] locations shown in Figure 2.7.

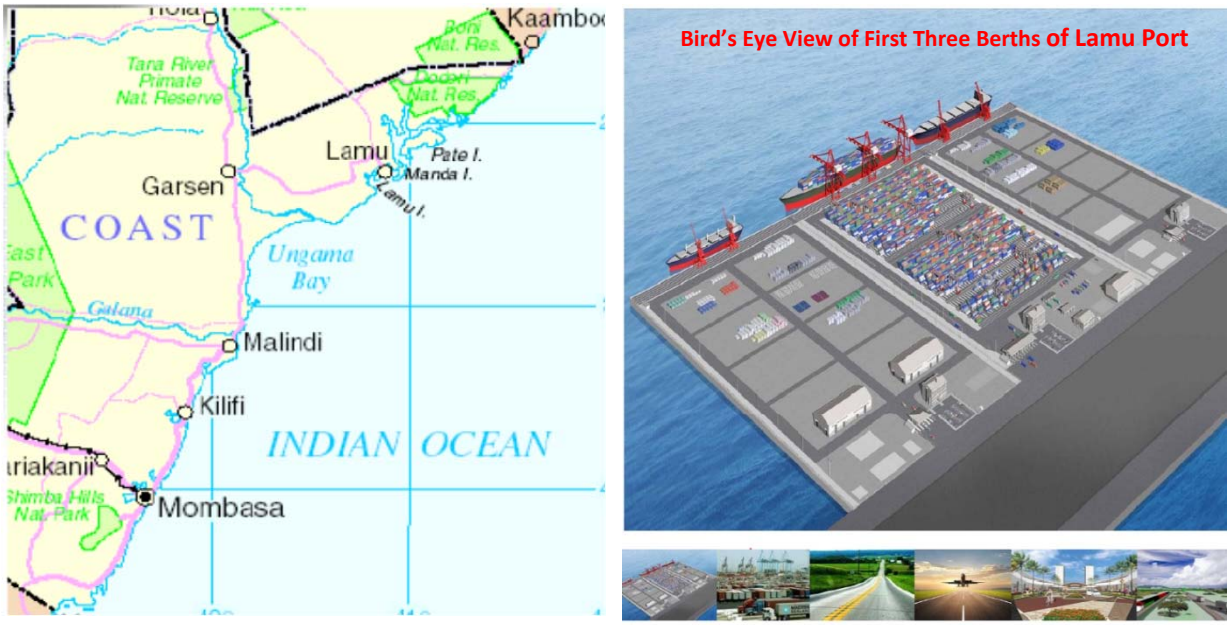


Figure 2.7 Kenyan Coast showing positions of Mombasa and Lamu Ports

Source: Kasuku (2012)

Of course, further development of the wider maritime sector in Kenya will expand the options of Kenyan seafarers with respect to alternative shore employment. In the short to medium term however, the situation implies that Kenyan seafarers will have higher retention rates on ships than comparative nationalities.

[13] See Kenya Vision 2030 "http://www.vision2030.go.ke/index.php/pillars/project/macro_enablers/181"

2.4.3 Significance of Human resources in MET and the shipping Industry

The labour scenario in the maritime industry currently and in the future is an issue that draws global attention. There are fears that shortage of qualified personnel can pose a possible threat in standards of safety (Toz & Koseoglu, 2012). The prime task for MET institutions is to educate and train seafarers with integrative knowledge and skills to fulfill the industry demands (Yongxing, 2006). The deficit in officer supply in the shipping industry drives the Kenyan strategy to train Kenyan seafarers for the international job market as stated by the KMA flagship project (KMA, 2012a).

Fisher & Muirhead (2005) recognize the challenge of recruiting sufficiently qualified and experienced staff in MET institutions. They explain that this challenge becomes more evident during review of programs that have been poorly documented as a result of inadequate knowledge in curriculum development and design. The task is therefore to find means of attracting and motivating appropriately qualified teachers and instructors and avail career progression to existing instructors to ensure that qualitative MET will be available in the years to come (Cross, 2011).

Cox (2012) decries the existence of incompetency of MET teachers and assessors. He explains that there are instances when MET institutions employ practitioners who are incapable of teaching and in worse scenarios, poor practitioners are assigned teaching roles. In his paper presented at the International Maritime Lecturers Association (IMLA) 20th Conference, he attempts to establish which cadre makes better teachers between practitioners, academics and researchers. He concludes that instructors should be given an opportunity to be "guided to practice" the craft of teaching and training. As Wilson points out:

> Much of the current training around the world, whether done at sea or ashore, already fails to deliver genuinely competent seafarers that can consistently

> perform at best industry practice standards. Part of the problem is that there are too many trainers with good technical expertise who are incompetent teachers and others who lack the technical expertise to teach. (Wilson 2005)

Moreover, rapid evolution of the maritime industry certainly amplifies the need for qualified human resources. Additionally, educational paradigms are rapidly changing with increasing application of web-based, computer based, distance and blended learning which have proven to be very effective for attainment of knowledge and competence as endorsed by Goldberg, (2012). Therefore, it is essential for growth and development of MET that changes are entirely understood by trainers. This will enable them establish the most effective methods of education and training to meet the required industry standards (Lewarn 2002, pp. 19-24; Nas & Zorba, 2012, p.2).

In addition, ship designs have continued to be highly modernized and operated with highly sophisticated technology. Consequently, they require personnel with advanced and top notch training both at sea and onshore. To this end, quality MET cannot be overemphasized if the maritime industry aims at acquiring competent personnel with the skills needed for safe and efficient ship and port operation as well as maritime administration, education and training.

Furthermore, approximately 80% of accidents at sea are as a result of human error. Mistakes are viewed not to occur due to inadequate or failed regulations but because "standards do not exist or have been ignored" (Ziarati, 2006, p. 2). Further, according to Ziarati and Ziarati (2007) accident analysis reports indicate that the causes of many maritime accidents are a result of inefficiencies in maritime education and training of seafarers or poor conveyance of existing standards.

Maritime education and development of competencies of seafarers are important elements of human resource development strategies both in MET institutions and the industry. It is imperative that institutions work closely with the industry to enhance competitiveness and capability to meet industrial demands hence realise the positive value of human capital (Froholdt & Hansen, 2011).

2.4.4 Knowledge gap in Maritime Kenya

The collapse of the training programme for mariners aided by the British Government in 1977 and the need for Kenyan mariners to privately seek training abroad resulted in a breakdown in the knowledge spiral, hence creating a knowledge gap for maritime experts (Nonaka, 1994). The Government of Kenya seeks to seal this gap by creating a suitable environment to promote MET in national institutions (KMA, 2012c).

The knowledge spiral requires to be restarted as lack of seafarer training nationally resulted in a lack of qualified officers and consequently a shortage of seafarers culminated to a shortage of instructors, assessors and subsequently a shortage of experienced maritime experts as illustrated in Figure 2.8 (Cross, 2011).

One of the strategies Kenya can employ in implementation of MET is filling the knowledge gap and developing new knowledge though motivating and training young cadets. Similarly, to facilitate smooth transition between the maritime experts trained in the 1970s and the new generation, there is need to harness the existing knowledge pool (tacit knowledge from the experienced mariners) to augment implementation and development of MET in Kenya (Nonaka, 1994).

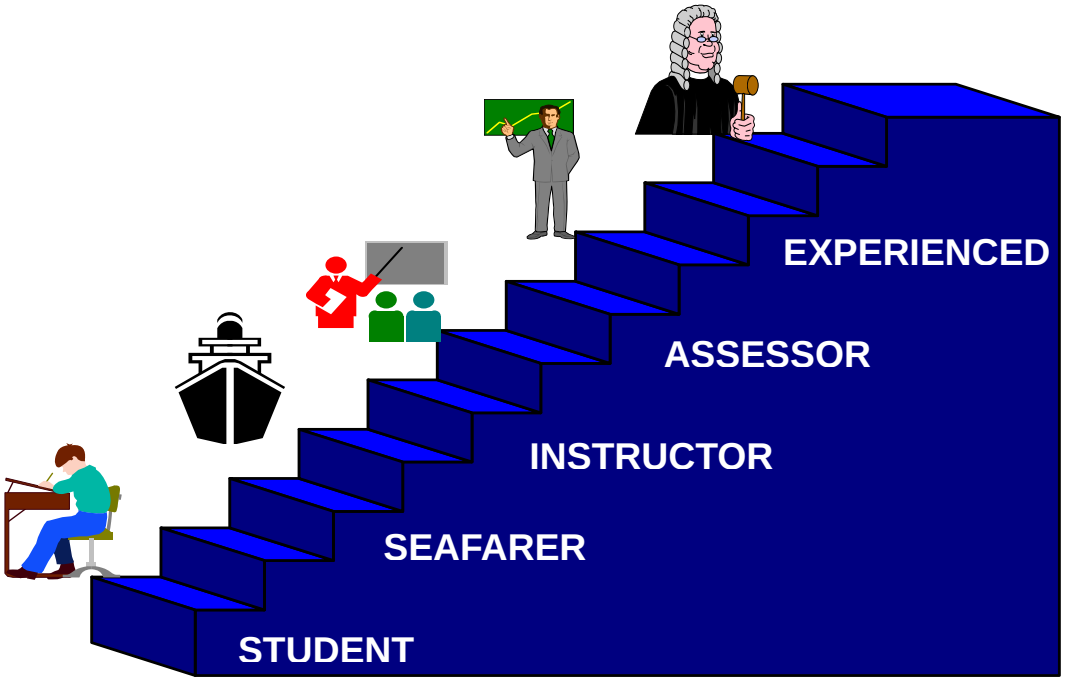


Figure 2.8 Sequence of Acquiring Qualified and Experienced Instructors and Assessors

Source: Cross (2011)

As knowledge is created by individuals, the ontological dimension[14] can be utilized to facilitate knowledge transfer from the experienced seafarers (Nonaka & Takeuchi, 2007; Berger & Luckmann, 1966). The Government of Kenya and MET institutions should motivate such knowledgeable maritime experts to facilitate conversion of their tacit knowledge into explicit knowledge and subsequently build a knowledge base for Kenyan MET institutions.

2.4.5 Sustainable MET

Kenya aims at establishing a sustainable MET system founded on research and based on academic rigor. For instance, the BSc Marine Engineering entry requirements and quality are harmonized with other engineering specialities as proposed by Butman

[14] Ontological dimension "…an organization cannot create knowledge without individuals hence it supports creative individuals and provides contexts for them to create knowledge..."

(2006, p. 29). In addition, the content of the foundation courses offered during the 1st and the 2nd years is similar for engineering specializations, hence affording some Kenyan institutions time to 'marinate'[15] some Mechanical Engineering lecturers in preparation for the specialization training of marine engineering students during their third year of study (JKUAT, 2012).

Developing countries have over the years grappled with shortage of adequately trained and qualified maritime teaching staff (Menon, 1986). Some countries have attempted to deal with this problem by recruiting expatriates but this was not sustainable due to excessive expenditure on salaries and other allowances among other complexities. Kenya may consider utilization of expatriates as a short-term measure especially for the specialized training, while it develops its human resource and knowledge base in MET.

In addition, the option of cooperation and coordination among MET institutions nationally to share human and other resources, in addition to their international counterparts can provide a suitable environment to reap mutual benefits for all parties involved. Past successful cooperative initiatives include the Northern Maritime University (NMU) Project[16] established to build a strong trans-national network of universities and "Train for Sea" a European Union Leonardo Mobility project which facilitates transfer of cadets between MET institutions (IMLA, 2009). Additionally, Jieying & Yingming (2012) support student exchange programmes such as between Shanghai Maritime University and Massachusetts Maritime Academy aimed at cultivating diverse competencies and problem solving capabilities in students.

[15] "Provide training in Marine Engineering for lecturers previously trained in Mechanical Engineering"
[16] NMU Project – "aims to build a strong trans-national network of universities and integrate the relevant stakeholders from the maritime business sector in order to provide multi-disciplinary and internationally oriented qualification offerings for maritime industry".

In his dissertation, Wainaina (1989) mentioned the need for continuous training for MET experts but decried the high costs that accompany such training[17]. He suggested that the Government of Kenya could seek financial aid from international aid agencies to support such training. On the other hand, Olango (1996) recommended establishment of a training programme in Kenya for lecturers and instructors. While this recommendation was well intended, it could not materialize since Kenya did not have an MET system for training seafarers' let alone instructors. The phenomenon of training of seafarers is cyclical in nature as instructors emanate from experienced seafarers hence seafarers' training should be emphasized at the implementation stage (Cross, 2006).

From the foregoing discussion, it is established that there is a notable deficit in supply of seafarers. However, quality[18] of the human resources (seafarers) is critical as it means safer shipping, cleaner oceans and reduced economic risks as human errors are key factors leading to loss of lives and marine pollution (Yongxing, 2006, p.79).

Finally, many ship owners are nurturing sources of labour supply which are reasonably priced, preferably English speaking, highly motivated and at times go a notch higher to provide funding for such sources in an effort to promote growth of skilled seafarers (Precious, 1997).

2.5 Technological Challenges in MET

This section examines the technological challenges in MET that Kenya faces according to the dissertation objectives.

[17] Training for mariners in the 1980s was undertaken abroad.
[18] …rich experience on board as well as abilities and efficiency in various aspects such as seamanship, computer skills, English, shipping management, communication, leadership, professional ethics and motivation… (Yongxing, 2006, p. 81).

2.5.1 Maritime Technology defined

Maritime technology is broadly described by Graff (2009) as the "engineering and maritime transport oriented activities, including equipment manufacture and associated infrastructure spanning the maritime sector…" MET institutions in Kenya are facing infrastructural challenges in addition to equipment for practical training in maritime technology such as simulators, laboratories and training ship (Fuazudeen, 2011). Technological resources require high capital outlay to install and maintain but are essential for development of competency (Cross, 2013; Demirel & Ziarati, 2012; Muirhead, 2004, p.140).

2.5.2 Significance of Technological Resources to Competence

Competence in this context is the ability of an individual to perform certain tasks onboard ship in a safe and efficient manner (Cross, 2011). Ideally, evaluation for competency should be carried out onboard ship. However, it is limited by ship safety requirements, reduced manning and shortage of cadet berths. While it is expensive for an MET institution to deploy a training ship purely for training purposes, there exists an ongoing debate on effectiveness of training onboard training ships.

Some maritime professionals argue that training ships often cannot simulate real merchant ships, while others claim that even a small training ship may provide a better training scenario than land based bridge and engine-room simulators (Demirel & Ziarati, 2012. p.8). The above arguments notwithstanding, the responsibility to safeguard competence rests on the MET institutions to ensure relevant performance standards are followed and training and assessment processes validated (Fisher & Muirhead, 2005).

2.5.3 Use of simulators and its impact on MET

According to the STCW Convention 78, as amended "… any simulator used for mandatory simulator based training shall be capable of simulating the operating capabilities of shipboard equipment to a level of physical realism appropriate to training objectives…" (STCW Code, Section A-I/12, p. 93). This is of particular importance as the industry continues to accept remission of sea time with simulator time, most likely in an effort to reduce training time in response to shortage of officers (Cross, 2011).

Nevertheless, maritime scholars caution that remission of sea time should be approached cautiously as practical learning requires time for reflection and repetition. Remission of sea-time remission should therefore, be considered on the basis of an approved training program with well-defined objectives, scenarios and appropriately qualified instructors (Cross, 2011; Barnet, 1997; Reeve, 1987).

Simulation, as defined by IMO Inter-sessional Simulator Working Group (ISWG) 1994 is:

> a realistic imitation in real time, of any ship handling, radar and navigation, propulsion, cargo/ballast or other ship-system incorporating an interface suitable for interactive use by the trainee or candidate either within or outside of the operating environment and complying with the performance standards prescribed in the relevant part of the STCW Code (IMO, 1994).

MET institutions utilize different types of simulators to build various competencies in MET as illustrated in Figure 2.9 reflecting simulator applications at the Maritime Institute Willem Barentsz (MIWB) in Terschelling, Netherlands.

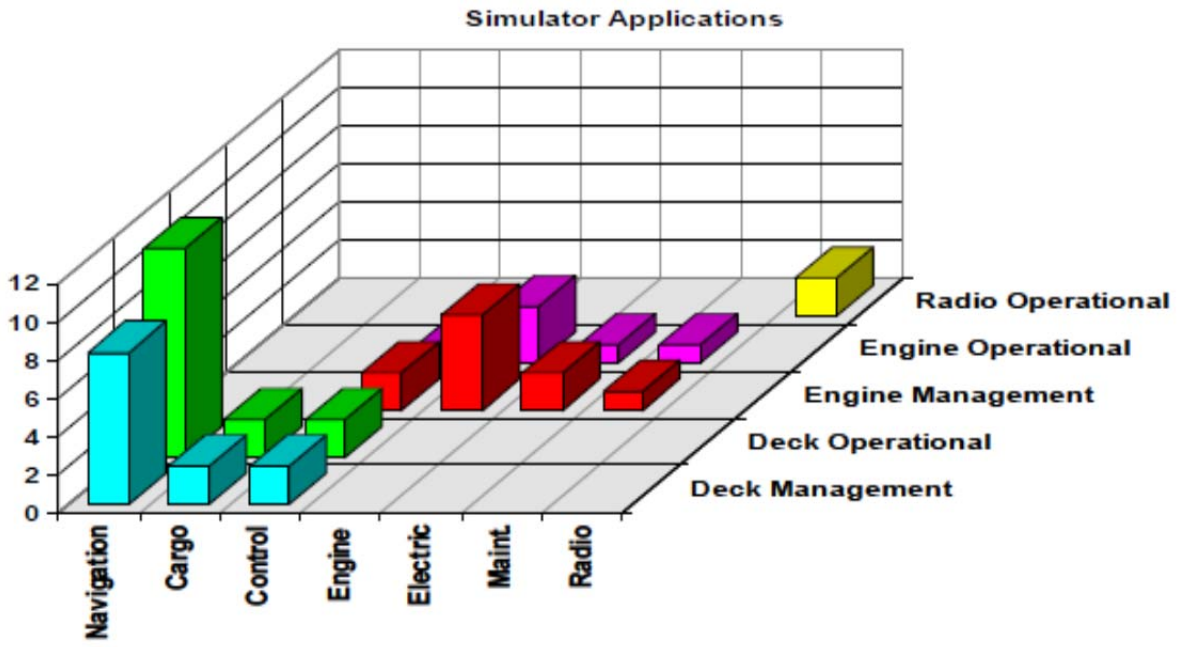


Figure 2.9 Simulator Applications at MIWB

Source: Cross (2006)

Safety of vessels operating in the marine environment both cargo and passenger is a matter of global concern. Moreover, MET is in the throes of rapid evolutionary change in the face of emerging trends in the shipping industry (Demirel & Ziarati, 2012, p.1). These events, catalyzed by the radical revision of the STCW Convention in 2010, intensify the complexity of technological challenges facing implementation of MET in Kenya. However, Section A-I/12 of the STCW Code outlines requirements for mandatory simulation equipment which are Radar and ARPA simulators[19]. The IMO model courses can be used as a guide to gauge the suitability of a proposed simulator to meet learning objectives.

2.5.4 Can simulators reduce human error related incidents?

Mende and Ziegler (2012) assert that human error related accidents claim an average of between 60% – 94% in the maritime industry and the related costs are estimated to one billion dollars each year. The STCW Convention and Code requires officers in operation

[19] Section B-I/12 of the STCW Code gives recommendation on performance standard for navigation and watchkeeping, ship handling and maneuvering, cargo handling and stowage, reporting and radio communication, main and auxiliary machinery operation all which are non-mandatory.

and management levels to undertake the Maritime Resource Management (MRM), Bridge Resource Management (BRM) or Engine-room Resource Management (ERM) training.

The aim of MRM training is to introduce non-technical skills, lack of which, is seen to aggravate human error. Simulation therefore, provides an opportunity to gain competence with the objective of preventing mistakes, as stipulated in the STCW Tables of Competence for deck and engine room officers also emphasized by ISF (2010).

Furthermore, environmental impacts like global warming have influenced shipping activities, providing novel challenges in navigation. For instance, the Baltic Sea has in recent years experienced increased volumes of commercial shipping as shippers strategize ton/mile reduction as illustrated in Figure 2.10. However, most crews venturing in voyages in the North Sea currently have little or no experience in ice navigation (Toz & Koseoglu, 2012).

With the emergence of new trade routes, hazardous and risky conditions, simulation with the appropriate level of realism provides a safer and more cost effective alternative training than sea training and it has proven its effectiveness through provision of high levels of competence. This can be achieved through simulation exercises where one can freeze each subsystem to enable students understand and gain knowledge when they perform critical operations in addition to developing attitudes and problem solving skills (Toz & Koseoglu, 2012; Kongsberg, 2013).

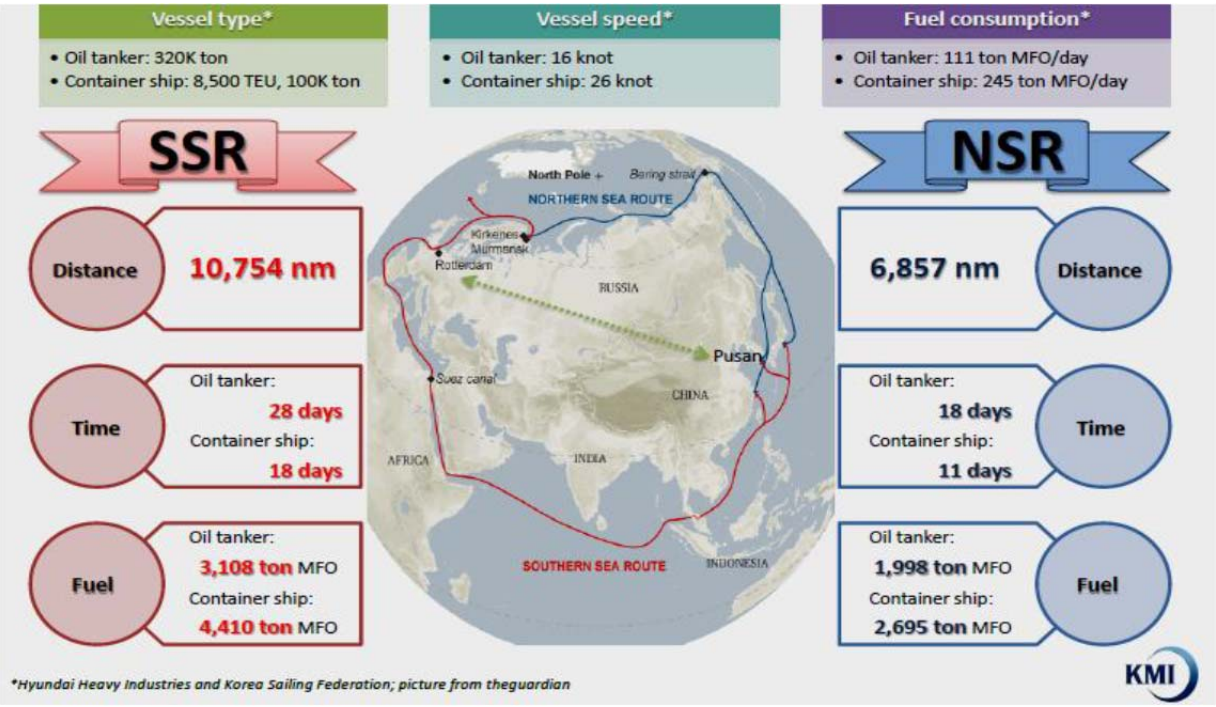


Figure 2.10 Comparison of Northern Shipping Route with Southern Shipping Route
Source: Cho (2011)

2.5.5 How can MET Institutions cope with technological challenges?

It is no doubt that top notch laboratory and simulation equipment require a high capital outlay as discussed by Muirhead (2004, p.141). This cost factor may currently be beyond the reach of MET institutions in Kenya. The KNBS (2012) report on the Ministry of Education indicates that the education budget dropped by 3% between 2008 and 2011 (Figure 2.11). Generally, governments implement budget cuts for a variety of reasons. Therefore, this reduction should not discourage the maritime administration in liaison with the MET institutions from drafting a justifiable proposal to the Government of Kenya, including a cost-benefit analysis, for establishment of a national simulation centre.

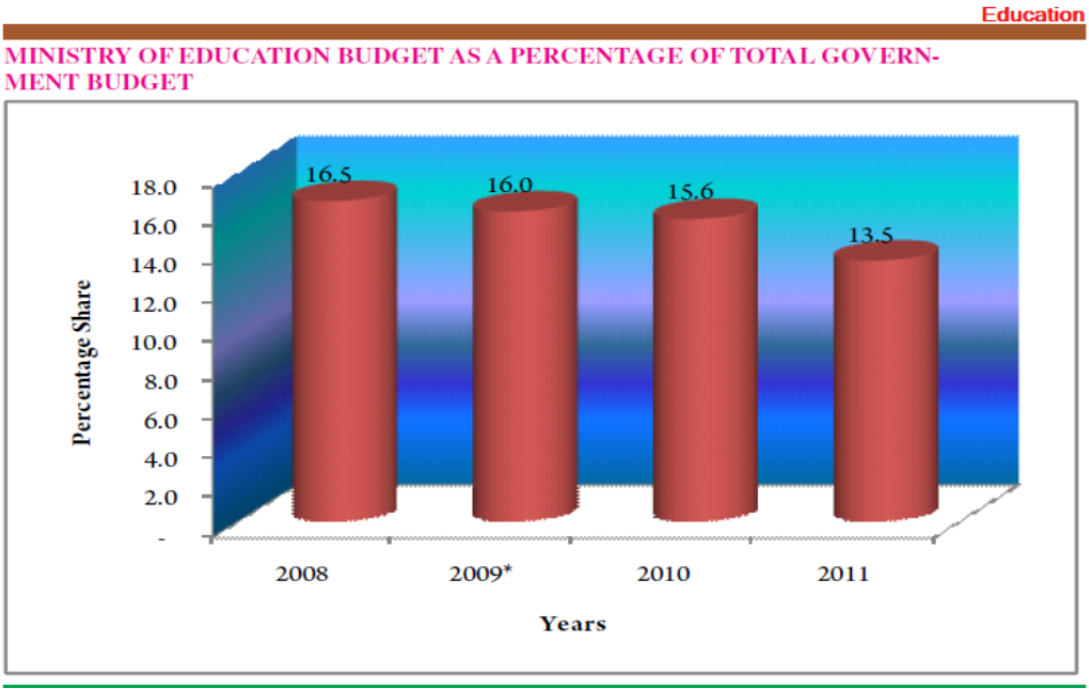


Figure 2.11 Ministry of Education Budget

Source: KNBS (2012)

Furthermore, Muirhead (2004, p. 140) and Zade, (2000, p. 47) suggest utilization of national and regional collaboration to optimize technological investments in MET and in turn enhance global maritime standards. Other suggestions which can assist MET institutions to cope with technological challenges are discussed as follows:

(a) Web based simulation

Muirhead (2003a; 2003b) proposes web based simulation centres with which students have access to simulation exercises from colleges, home or on-board ship. This simulation technology provides a cheaper alternative to small and upcoming MET institutions which do not have adequate resources to procure and maintain independent simulation systems. The systems are managed through learning management systems

(LMS) administrator. The training is recorded and once the progress record is confirmed by the LMS, the student can be certified for eligibility for assessment and/or proceed to full mission simulator training course. However, this kind of system should be capable of verification and management of courses and training records. In addition, it should be capable of enabling data security using coded formats for quality assurance (CBT@Sea, 2001).

Furthermore, the concept of e-learning and its effectiveness in comparison to traditional learning systems is widely discussed (IMO, 2002, p.1). The fact that e-learning is used to address the handicaps of conventional education and training is often forgotten during these discussions. Of particular relevance to this discussion is that e-learning may not be suitable for all situations and hence careful evaluation of the learning objectives should be done in order to achieve the required learning outcomes.

(b) Distance learning

Fisher & Muirhead (2005, p.153) define the aspects of distance learning as the physical separation of the student and teacher and the use of technology to bridge the physical gap. With upward advancement in multimedia and communication technologies, distance learning has benefited from the various delivery modes presented by technology. It is now increasingly being adopted by shipping companies as well as MET institutions world-wide to provide courses and programmes to learners outside their local boundaries (Fisher & Muirhead, 2005.p, 154). Computer applications, compact discs (CD) and e-mail have become important modes of delivery and they provide a great potential for development in MET.

Furthermore, key features of important pedagogic models influenced by distance learning are endorsed by Coldwell (2003) and Wang (2003) among other researchers. They note however, that distance learning does not support an interactive learning

experience. Besides, it is now faced with the threat of reduced manning which has resulted in increased workloads onboard leaving seafarers with less time to study.

Nevertheless, Fisher & Muirhead (2005, p.155) observe that despite the disadvantages of the "distance" and lack of direct supervision, when used in combination with communication technology, it has the potential of venturing into new avenues of knowledge and skills.

(c) Computer based training (CBT)

Considerable onboard training is carried out by CBT including, cargo stowage and stability, the process of loading and discharging procedures to ensure that sheer and bending moments are not exceeded. CBT is viewed as a useful tool since graphical representations enhance learning especially for students who are inexperienced with ship profiles (Batrinca, 2006). He proposes computer based learning as a cheaper training alternative. However, he remarks that its effectiveness will depend on the trainers and seafarers ability to choose the right training material.

This notion is supported by Muirhead, (2004, p. 141) although he asserts that new technology should be viewed as a complementary methodology to enhance learning in a cost effective manner. To this end, MET institutions should ensure that the teachers are equipped with the didactics required to use computer technology confidently and effectively both in classrooms or laboratories (Zade, 2000).

2.5.6 Summary of the literature review

The literature reviewed acknowledges that sea training is mandatory for certification of competence for seafarers. It is apparent that the shipping industry continues to appreciate the benefits of using simulators for training competent seafarers. In this regard, MET

institutions may consider the suggestions proposed in the discussion during the procurement of equipment for practical training.

Furthermore, cooperation between MET institutions for both human and technological resources can yield mutual benefits for the institutions involved. This may in addition, reduce the cost of training and therefore attract more students into the maritime studies and therefore enhance knowledge spiral and in turn, MET knowledge base.

CBT, web-based simulation and distance learning are proposals that MET in Kenya can explore to address both human and technological resource challenges. However, the discussion highlights various considerations that MET institutions need to carefully assess before adopting any proposed training system. For example, student instructor interaction, quality of material, suitability of training material to training objectives, delivery infrastructure like the internet broadband among others (Fisher & Muirhead, 2005).

Finally, more reviews to the STCW Convention are expected in response to rapid ship technology, dynamic shipping trends, bigger, more complex ship designs and new shipping routes which pose unfamiliar safety challenges. Besides, 'human factor' elements such as training, fatigue and working conditions require careful consideration as they attribute to safety of ships and protection of marine environment and more importantly, safety of crew and passengers (Nautilus, 2013 Vol. 46; IMO, 2013a, p.4).

3.0 Methodology

The broad aim of this chapter is to discuss how the study was carried out from sample selection to data analysis. Four methods of research techniques including literature review[20], electronic questionnaires, unstructured interviews and observation were utilized to collect data. This method of utilizing multiple research techniques is referred to as triangulation. It is used by researchers where there is need for the different techniques to complement and reinforce each other (Denzin 1978, pp. 339-342). Kane (1990) asserts that using several techniques (triangulation) enables the researcher to analyze the same data using different strategies in order to verify and strengthen the validity of the research results.

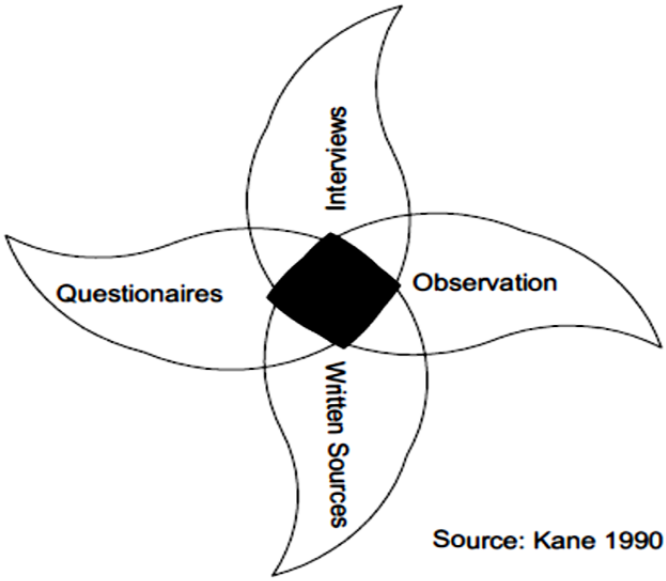


Figure 3.1 Triangulation methodology

[20] Literature review is discussed in chapter 2

3.1 Source of Data

The Source of data for the research included primary and secondary sources.

3.2 Primary Source of data

Primary data was collected through electronic questionnaires[21] which were dispatched to the Kenya Maritime Authority, MET Institutions in Kenya, Africa, China, the Fiji Islands, the Caribbean and Europe. Additional data from unstructured interviews[22] obtained from respondents at the International Maritime Organization (IMO), Kenya Maritime Authority (KMA), The Nautical Institute and European Maritime Safety Agency (EMSA) was considered in this dissertation. The researcher visited five MET institutions within the EU during field studies and collected data as an observer participant in MET delivery[23] and simulation sessions[24]. A list of the research subjects (institutions) is indicated in Table 3.1.

[21] See appendix A – Electronic questionnaire
[22] See appendix B – Interview guide
[23] In MET delivery, the focus of observation was the teachers (human resources)
[24] In simulation sessions, observation was on both human and technological resources

Table 3.1 List of research subjects

	Name	Location	Abbreviation
1	Arab Academy of Science and Technology	Egypt	AAST
2	Bandari College	Kenya	BC
3	Caribbean Maritime Institute	Jamaica	CMI
4	Dar es Salaam Maritime Institute	Tanzania	DMI
5	Dalian Maritime University	China	DMU
6	Jomo Kenyatta University of Agriculture and Technology	Kenya	JKUAT
7	Lycée Maritime Anita Conti, Fécamp	France	LMAC
8	Maritime Institute Willem Barentsz	The Netherlands	MIWB
9	Mombasa Technical Training Institute	Kenya	MTTI
10	Escola Superior Nautica Infante D. Henrique	Portugal	ESNI
11	École Nationale Supérieure Maritime, Le Havre	France	ENSM
12	Regional Maritime University	Ghana	RMU
13	Warsash Maritime Academy	United Kingdom	WMA
14	Technical University of Mombasa	Kenya	TUM
15	University Fiji National	Fiji	UFN
16	European Maritime Safety Agency	Portugal	EMSA
17	International Maritime Organization	London	IMO
18	Kenya Maritime Authority	Kenya	KMA
19	The Nautical Institute	London	TNI

Source: Author

The following is a detailed discussion of the data collection instruments.

3.2.1 Reasons for the choice of the data collection instruments

(a) Electronic Questionnaire

The electronic questionnaire was aimed at assessing the contemporary situation of the implementation of maritime education and training in Kenya, challenges facing the implementation process and exploring possible lessons that can be learnt from established MET institutions. It was structured to elucidate how the challenges of human and technological resources impact on the MET implementation process with reference

to STCW 78 as amended. The electronic questionnaire was used as a data collection instrument for its convenience and cost effectiveness (Philbrick, Smith & Bart, 2010) considering the geographical dispersion of MET institutions in Kenya and other parts of the world.

In addition, Gillham (2008, p. 6) outlines advantages of using questionnaires for data collection in research which were considered in the selection of the questionnaire including:

- Cost effective in terms of time and money
- Convenience as respondents had complete the questionnaire at their most suitable time
- It is a good method to get information from many respondents
- It gives the respondent less pressure for immediate response
- It provides respondent's anonymity
- It reduces interviewer bias

(b) Interview guide

An interview guide was developed to conduct interviews with representatives from KMA, IMO, EMSA and the TNI for the purpose of identifying good practices which can be proposed for development of MET in Kenya. It was designed with the objective to "contribute thematically to production of knowledge and dynamically to promote a good interview interaction" (Kvale, 1996, p.129).

In addition, this data collection instrument was preferred for its ability to provide opportunity for clarification as well as encouraging respondents to provide deeper responses to open questions (Brace, 2004, p. 24). This was in consideration that the respondents in these institutions have a vast knowledge in MET and the challenges that

face its implementation in various countries. Further, the interviews provided immediate feedback during discussions which was both convenient for the busy respondents as well as the researcher.

(c) Observation

Observation was selected as a data collection method in this dissertation for its capability to produce detailed, qualitative descriptions of human behavior that illuminate social meanings (Sapsford & Jupp, 1998). This method of data collection is endorsed by (Kane, 1990) for collection of primary data especially when a researcher does not want to rely on secondary sources. The observation was undertaken with a focus on human resources (teachers and instructors) and technology (equipment) used for practical training in MET institutions.

3.2.2 Reasons for selection of the sample

The selection of the sample was based on the following reasons. At the time of writing of this dissertation, only four institutions in Kenya offered MET and data from these institutions was considered in the study. MET institutions from Africa were selected to provide a regional comparison for MET in Kenya. Similarly, institutions from China, Fiji and the Caribbean were selected since these are developing economies just like Kenya as classified by UNCTAD (2013). Therefore, they provide an economic benchmark with regard to their capabilities to cope with human and technological resources.

Other institutions considered in this study are members of the EU in recognition of its efforts to develop MET and maintain standards of training through the Bologna Process (1999 – 2010)[25] and the Lisbon strategy[26] among other projects. Britain is of particular

25 "Set out a vision for the European Union to become an internationally competitive and attractive European Higher Education Area…"

26 "…action and development plan with the objective to improve the quality of national and European reforms…"

interest as Kenya adopted its education policies after independence and therefore implementation of MET programs may have aspects of similarity (Chase, 2006; Buchman, 1999). Maritime organizations like IMO, EMSA, KMA and the TNI were selected to provide an expert opinion on the challenges of human and technological resources and their impact in the implementation of MET.

3.3 Secondary Sources of Data

The secondary sources of data included the STCW Convention 78 as amended and Code, IMO Conventions, Circulars, papers from various IMO committees and sub-committees, MET books, IMLA publications, reports from the Government of Kenya, and KMA, EMSA reports and dissertations written by World Maritime University graduates.

3.4 Method of Data Analysis

This dissertation adopted qualitative method of data analysis which mainly refers to a non-numerical data collection. However, when using qualitative methods, there may be need for some quantitative analysis such as the use of descriptive statistics and graphs. This method of enquiry has been adopted in different disciplines commonly in social sciences, ethnographic studies and market research (Sapsford & Jupp, 1998). It aims at "gathering in-depth understanding of human behavior and the motives that govern such behavior" (Moon, 2012, p. 11). It is therefore useful for making inference from the questionnaires, unstructured interviews and observation (Swetnam, 2007).

While some researchers argue that quantitative methods of data analysis provide more validity and reliability, a pragmatic choice of the data analysis depends on the nature of the problem statement and in this dissertation the most logical method of data analysis was found to be qualitative (Swetnam, 2007, p. 56).

3.5 Method of Data Presentation

The analysis is presented in a descriptive statistical method, employed to describe what has been established and depict the characteristics of variables. The data was collected, organized and presented by means of tables, figures and photographs to describe the data (Singh & Bajpai, 2009).

3.6 Limitation of Data Collection

The data collection was limited by geographical dispersion of MET institutions globally. This was one of the reasons for using electronic questionnaires as a data collection tool in this study. Another limitation is the number of MET institutions particularly in Kenya and Africa which are considerably few and therefore hindering acquisition of a large sample.

In addition, a large number of the respondents approached were not willing or perceived to be uncomfortable to provide the required information. Others required anonymity which was resolved through the use of electronic questionnaires where anonymity was promised.

Delayed response to questionnaires was experienced in Kenya, but it was overcome through follow up telephone calls and/or intervention by an assistant after several email reminders. However, when no response was received, a research assistant (based in Kenya) was requested to make a physical follow up. This was important as people have less incentive to respond when there is no face to face encouragement or they might not have clearly understood the questionnaire (Kane, 1990). To this end, consistent follow-up on the questionnaire responses was crucial as the time allocated for the dissertation is limited and therefore need for speedy responses.

4.0 Data Presentation and Analysis

4.1 Introduction

This chapter presents data collected in an effort to explore the contemporary situation of MET in Kenya and the human and technological resource challenges facing the MET implementation process. This follows an IMO needs assessment report on two Kenyan institutions which had shown intentions to commence seafarer training in 2010. The report recommended investment in appropriately qualified MET human resources and training equipment, namely marine simulators and well equipped laboratories[27]. Four institutions have commenced training seafarers at different levels including support, operation and management levels. This chapter therefore endeavors to present the data collected through questionnaires, interview guides and observation.

4.2 Outline of the questionnaire and interview guide structure

The questionnaires and interview guides were structured in line with the objectives of the research in an attempt to answer the research questions while exploring the challenges of human and technological resources in Kenyan MET Institutions as outlined as follows:

Questions focusing on human resources challenges included:

1. Which classification of institutions does your MET institution fall under?
2. How long has your institution offered MET?

[27] Marine simulators and well equipped laboratories herein referred to as technology.

3. Which levels of responsibility are offered by your institution?
4. Which specializations of Maritime Education and Training (MET) do you offer?
5. How many MET specialist teachers do you have?
6. Have you had any difficulties in recruiting appropriately qualified teachers and assessors as per the STCW 78 Convention as amended? If yes how do you mitigate shortage of MET specialist teachers?

Questions focusing on Technological resources challenges

1. How is practical training and assessment undertaken in your institution?
2. What challenges are you facing in practical training?
3. How do you obtain equipment for practical training?
4. Which institution/s conducts the academic and competency assessment?
5. What strategies do you have for sea training?
6. Who carries out audit on your institutions quality standards?

4.3 The analysis

The dissertation will now proceed with the analysis of the questions.

4.3.1 Which classification of institutions does your MET institution fall under?

This question was supported by multiple choices to enhance the understanding of the respondents. The choices for classification of institutions included, college, technical training institute, university college, university, academy and others in case of a different category of institution. The question was aimed at providing the basis to the exploration of the contemporary situation of MET as the researcher sought to know the classification of institutions offering MET. The data collected indicates that out of the four institutions offering MET in Kenya, one is an Institutional College owned and run by the Kenya Ports Authority, one Technical Training Institute, one Technical University College and

one University. None of the Kenyan institutions is a maritime academy and they are currently running other academic programs besides MET.

The same question was asked to institutions outside Kenya and all institutions in this category are maritime academies. This disparity can be attributed to the fact that maritime Kenya is still at its foundation stage. It is therefore necessary for the institutions to invest on infrastructure, human resources and technology which require a large capital outlay. It may take a number of years to build the required capital outlay and embark on long term MET projects such as establishing a maritime academy.

4.3.2 How long has your institution offered MET?

Data collected shows that all Kenyan institutions commenced MET programmes from 2011. In comparison with other MET institutions in Africa, the data shows that RMU in Ghana has been offering MET for about 55 years, AAST in Egypt 41 years, while DMI in Tanzania above 10 years. Institutions in Europe and China show a long experience in MET except LNAC in France which was established 16 years ago. CMI in Jamaica and UFN in Fiji have 23 and 38 years of experience in MET of respectively. Figure 4.1 below shows that the Kenyan MET institutions are still in their formative stage having the minimum experience in years of operation as MET institutions.

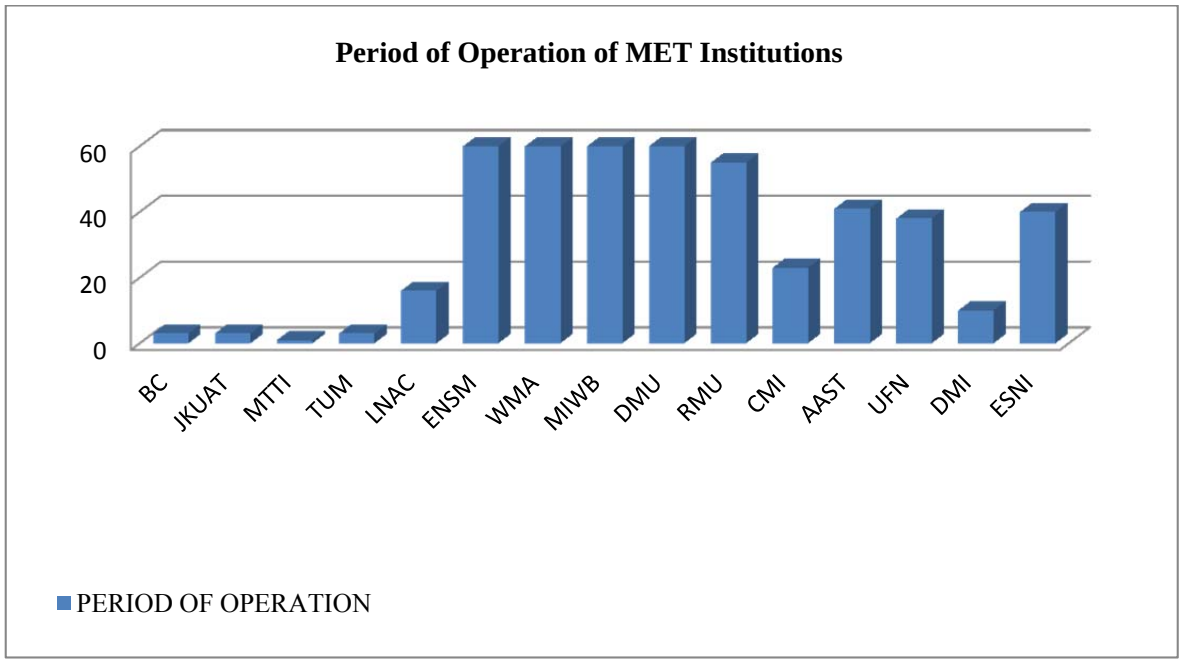


Figure 4.1 Period of Operation of MET Institutions

4.3.3 Levels of Training offered in the MET institutions

Availability of human resources (teaching staff) is an important factor in determining the level and number of specializations an MET institution can competently offer. As shown in the Figure 4.2, Kenyan institutions are offering training in only one level of responsibility[28] respectively, in addition to the basic safety training, depending on the classification of the institution. For example, BC offers basic safety training referred to as support level. JKUAT which is a university offers training for marine engineers in the management level, TUM and MTTI offer training for operation level. None of the Kenyan MET institutions is currently offering both operational and management level of training.

[28] Levels of responsibility – Management, operation and support. Support is offered by all MET institutions since it is basic safety training

This status was ascribed to respective institution's ability to diversify from its core training programs to MET. For example, the university which specializes in training graduate engineers finds flexibility in training marine engineers. This strategy is supported by the similarity in the basic concept of engineering pedagogy for engineering specializations during the foundation years of training as reinforced by (Surpass 3, 2012). Another reason for lack of diversification was attributed to shortage of teachers in the various specializations.

Conversely, in the other MET institutions the situation is different and the data illustrates capability to offer at least operational and management levels while others offer all the three levels from support, operational and management levels. This data amplifies data collected in Figure 4.1 which indicates that MET in Kenya is still at the foundational stage compared to the established institutions under study.

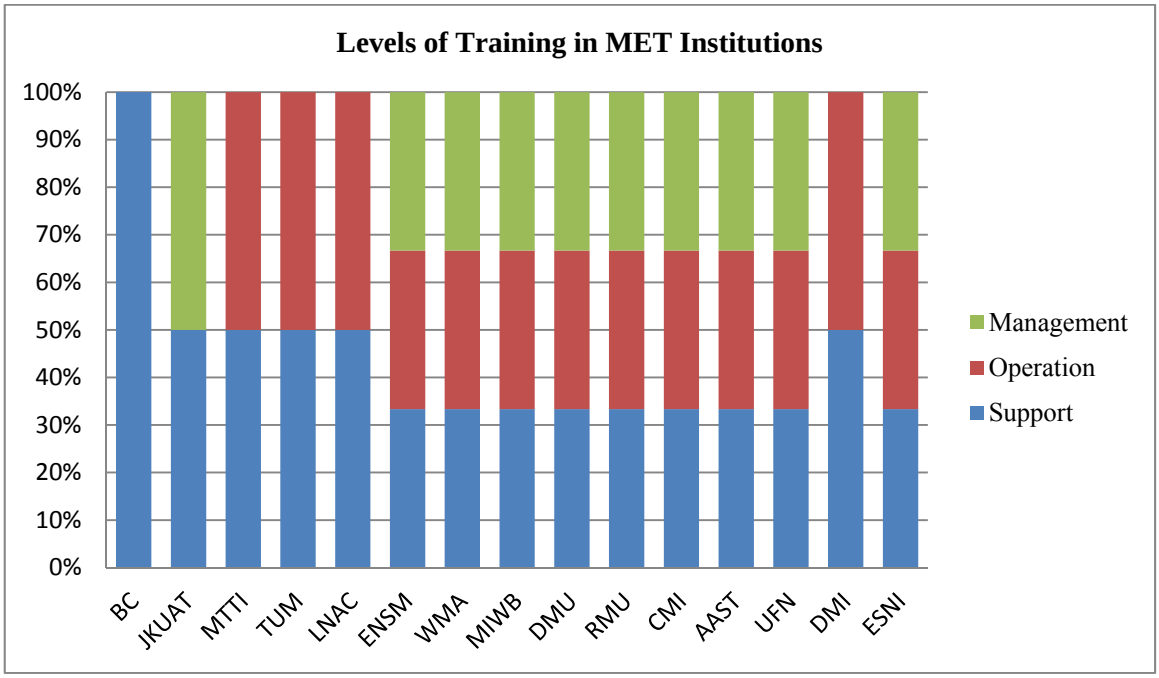


Figure 4.2 Levels of Training in MET Institutions

4.3.4 Qualification of MET Teachers

The question on qualification of MET teachers was asked to assess the qualification of MET teachers or lack of, with reference to the STCW Convention 78 as amended under Section A-1/6. A comparison of the data was undertaken between the Kenyan MET institutions and other institutions in the African continent and globally.

Figure 4.3 shows a trifling number of graduate teachers in Kenyan MET institutions with a maritime background. The MET institutions explained that they are running other non-maritime programmes; therefore, the non-maritime teachers use their existing knowledge for the foundation levels of the degree and diploma studies which are similar with other engineering specializations. However, TUM and JKUAT respectively have two teachers with maritime background, other institutions are currently contracting retired mariners to offer training in MET specialist courses.

On the other hand, it is evident that other MET institutions especially in Europe have higher levels of graduate MET teachers in addition to utilizing the services of retired mariners especially in practical and simulation training and assessment. This scenario is duplicated in other institutions in Africa, the Caribbean and the Fiji. It is noteworthy that China has an exceptionally high number of MET teachers both retired mariners as well as graduates from MET institutions. This can be attributed to the high supply of seafarers from China as illustrated in the Drewry (2012, p.7). The data shows a general trend of utilizing retired mariners especially in practical training in MET institutions.

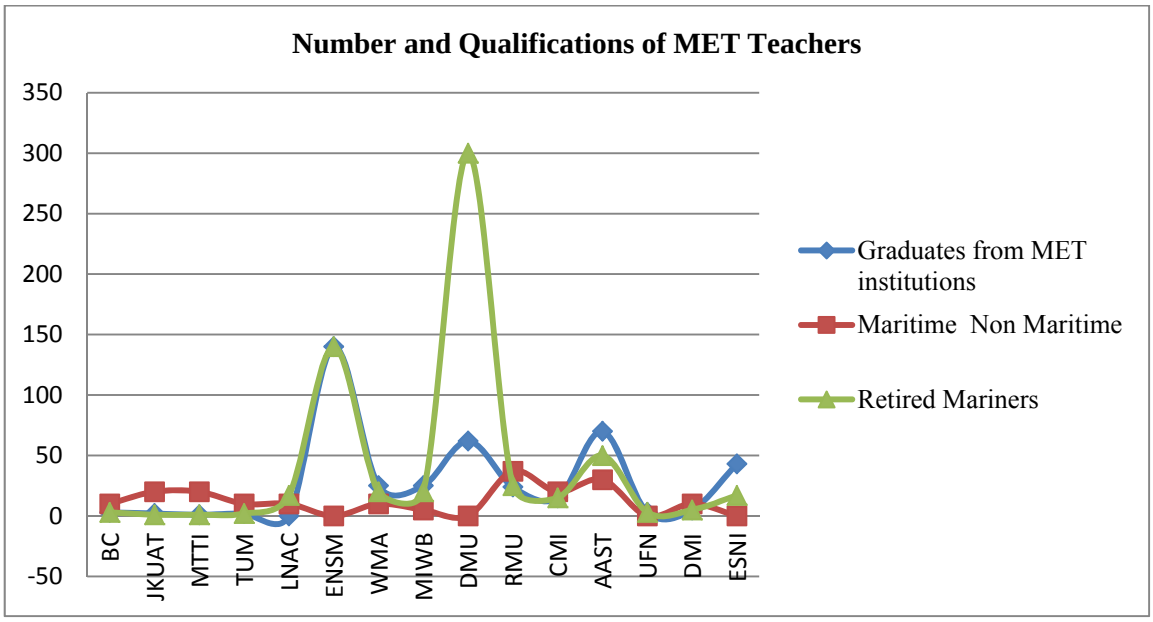


Figure 4.3 Qualifications of MET Teachers

4.3.5 Mitigation of MET Teacher Shortage

Having noted a significant shortage of MET teachers especially in developing countries (except China) as illustrated in Figure 4.3 the researcher sought to find out how the MET institutions are coping and mitigating the teacher shortage. Three Kenyan institutions indicated that they are currently contracting retired mariners to offer training for the seafarers. However, TUM and JKUAT have undertaken a higher level of mitigation by "marinating"[29] their Mechanical Engineering lecturers by sponsoring them to train in Marine Engineering overseas. In addition, TUM is considering collaboration with established MET institutions overseas to support them with teaching resources. They are also contracting the services of retired mariners on a part-time basis.

Figure 4.4 shows no mitigation actions in all European institutions as well as China. This trend is construed to indicate no shortage of qualified MET teachers in these

[29] "Marinating" - sponsoring their Mechanical Engineering lecturers to train in Marine Engineering and consequently become mariners.

regions. On the other hand, RMA employs mariners; CMI has an MOU agreement with other MET institutions on teaching services. AAST is currently harmonizing the teacher student ratio to reduce teacher shortage while DMI reported that it has withdrawn some courses (navigation) due to teacher shortage. The data indicates that mitigation varies from institution to institution. However, it is evident that most institutions engage the services of retired mariners. The decision by DMI to withdraw navigation courses could have far reaching consequences and perhaps exploring other avenues to address MET teacher shortage, for example, collaboration with other institutions could be a worthy consideration.

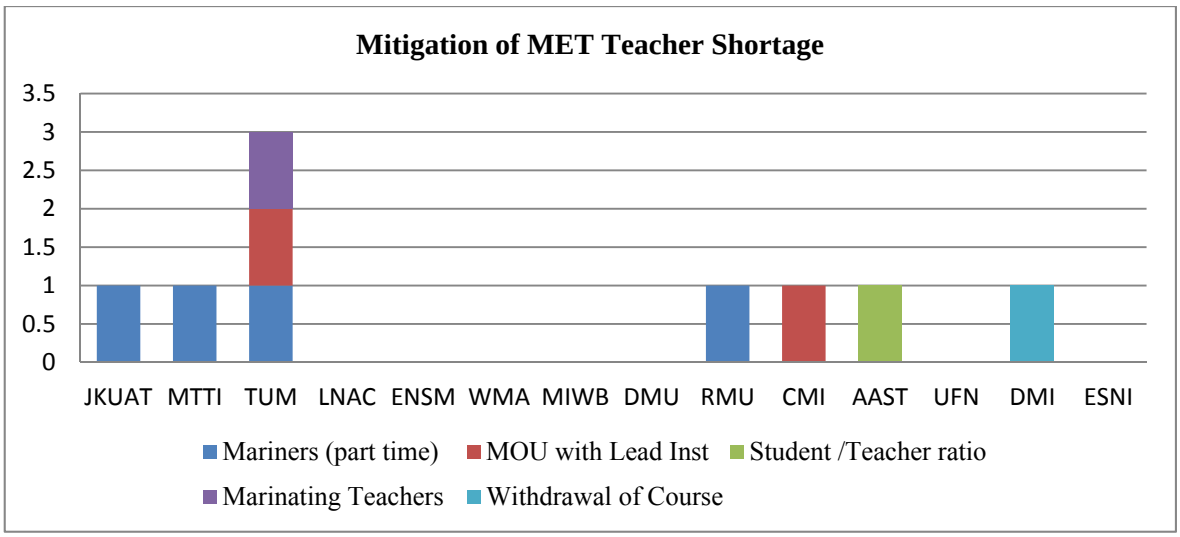


Figure 4.4 Mitigation of MET Teacher Shortage

4.3.6 Institutions responsible for Assessment of Seafarers in MET Institutions

The question on institutions responsible for assessment of seafarers during their training was asked in an effort to find out if the institutions had the capacity for assessment including qualified assessors and requisite equipment.

Figure 4.5 indicates that currently, Kenyan seafarers in training are assessed by assessors from MET institutions, the Kenya National Examination Council for academic qualifications, and the Kenya Maritime Authority is currently carrying out assessment for competency of the seafarers. This scenario is replicated in most institutions except Warsash, LNAC, UFN and AAST where assessment is conducted entirely by the MET institution. In DMI assessment is done by both the MET institution and the Maritime Authority. This inconsistency is partly attributed to individual nation's education systems and regulations as well as availability of qualified assessors and assessment tools and equipment.

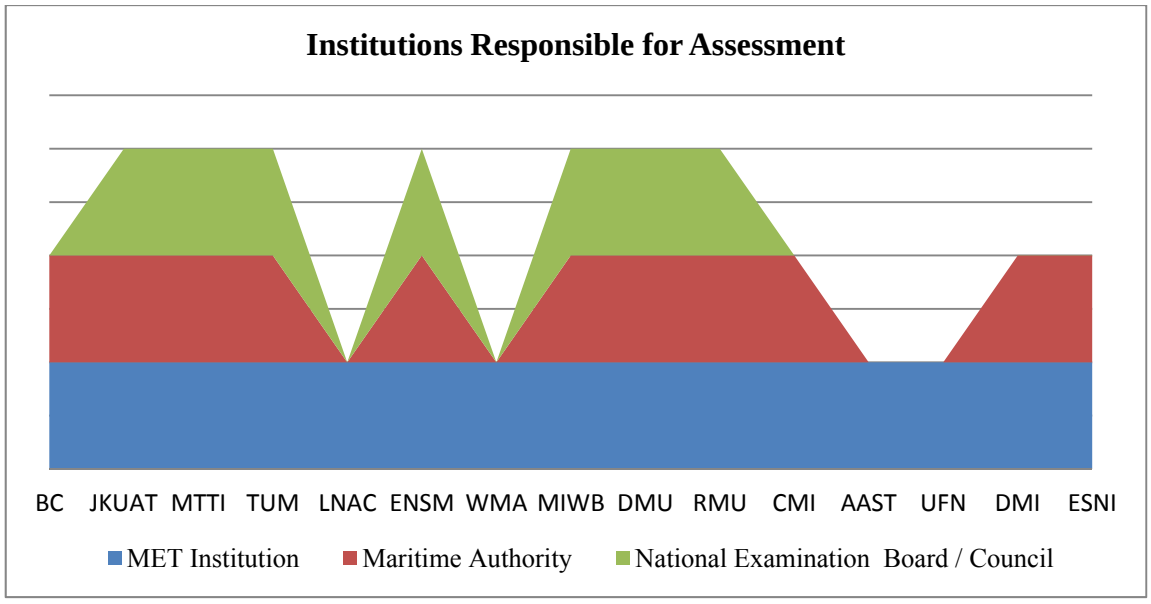


Figure 4.5 Institutions responsible for Assessment of Seafarers

4.3.7 Assessment of Technological challenges in MET Institutions

This analysis attempts to find out how the MET institutions conduct practical training and what technological resources they possess for effective training and assessment in MET. Three institutions in Kenya out of the fifteen institutions representing 20% have only laboratories and workshops for the practical training and these are complemented with role play. TUM has gone a notch higher and recently procured an engine room simulator. Eleven

MET institutions approximately 73% of MET institutions in the study have technological installations for practical training including computer based training, laboratories and workshops, as well as bridge and engine room simulators. Radar and Electronic Chart Display and information System (ECDIS) simulators have also been installed in most institutions.

However, DMI representing 7% of MET institutions uses computer based training in addition to role play. This data shows that there is a general recognition of the significance of technological resources for practical training in MET institutions except Kenya and Tanzania which currently have minimum equipment.

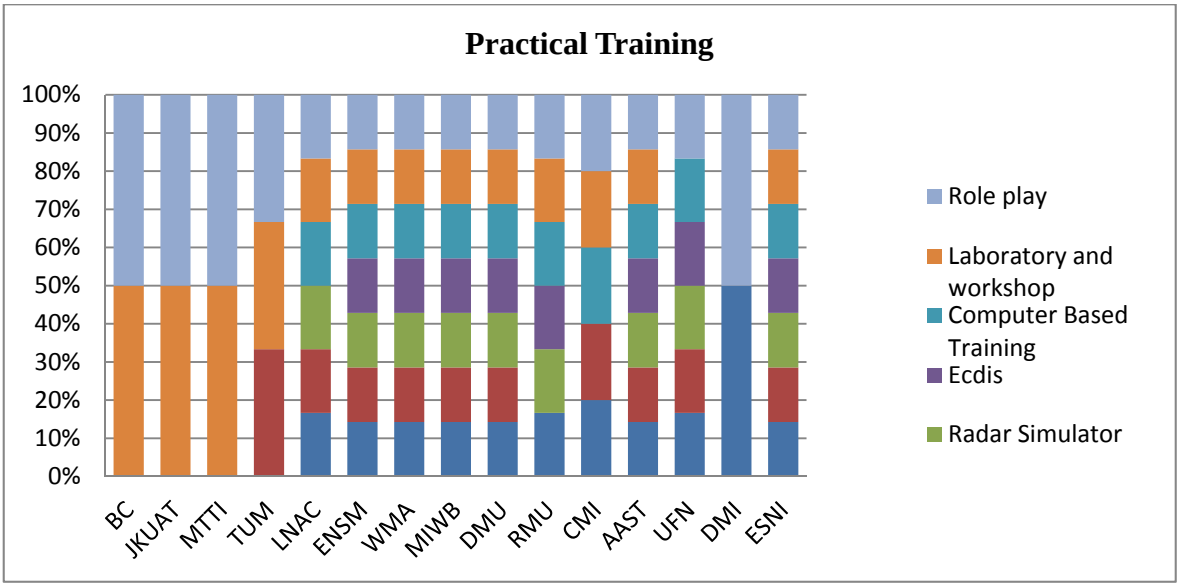


Figure 4.6 Practical Training

4.3.8 Challenges of Practical Training

Figure 4.6 shows MET institutions and particularly those from developing countries have challenges in equipment required for practical training of seafarers. Therefore, the researcher sought to gain an in-depth understanding of the challenges the MET institutions in Kenya are facing in comparison to other institutions in providing practical training.

Kenyan institutions generally indicated lack of simulation equipment except TUM; the laboratories require upgrading and equipping to provide required practical training effectively.

Moreover, acquiring cadet berths for sea going training is a challenge to all institutions as well as a shortage of qualified instructors and assessors in practical training in varying degrees. European institutions did not indicate significant challenges in practical training. DMU, RMU, and CMI faced the challenges of some specific simulators, although they have already installed most of the required equipment. However, they felt their laboratories and workshops need to be upgraded and they also faced the challenge of cadet berths. AAST recorded a challenge of cadet berths despite the fact that the institution owns a training vessel. DMI recorded similar challenges like those experienced by Kenyan MET institutions.

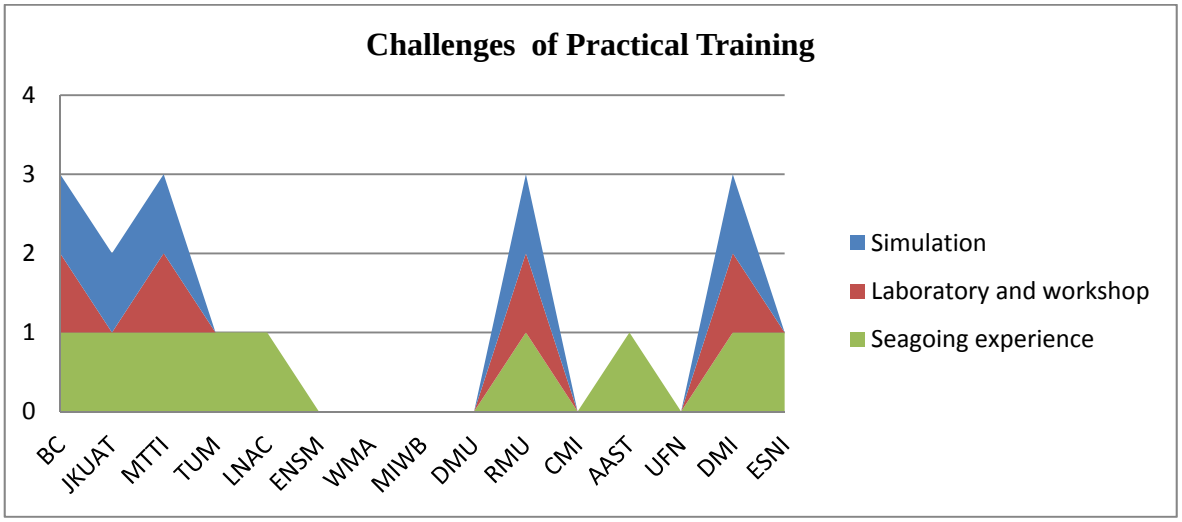


Figure 4.7 Challenges of Practical Training

4.3.9 How do you obtain equipment for Practical Training?

Having noted the various methods of practical training in Figure 4.6 and varied levels of challenges facing MET institutions shown in Figure 4.7, the researcher sought to understand how the various institutions acquire simulation equipment for practical training. As indicated in Figure 4.8, all Kenyan institutions, RMU, Warsash, Lisbon, and Shanghai purchase simulation equipment through the institutional budgets. Further, the data shows that MET institutions in France, the Netherlands and the Fiji receive government grants to purchase simulation equipment. The simulation equipment is shared by MET institutions in the country from a designated simulation centre, such as the MIWB simulation centre in Terschelling, the Netherlands.

The other institutions under study engage in partnership and cooperation with other institutions in addition to institutional financing as well as partial government funding for purchasing equipment for practical training.

The shortage of simulation equipment in Kenyan institutions can therefore be ascribed to inadequate funding and the novice condition of the institutions to MET programs. It is therefore necessary to accumulate resources to facilitate investment in practical training or partner with other institutions to pull resources. This is a contrast in comparison with WMA which is self-funded but has adequate simulation equipment for all types of training. The scenario at WMA was attributed to heavy investment by its shareholders.

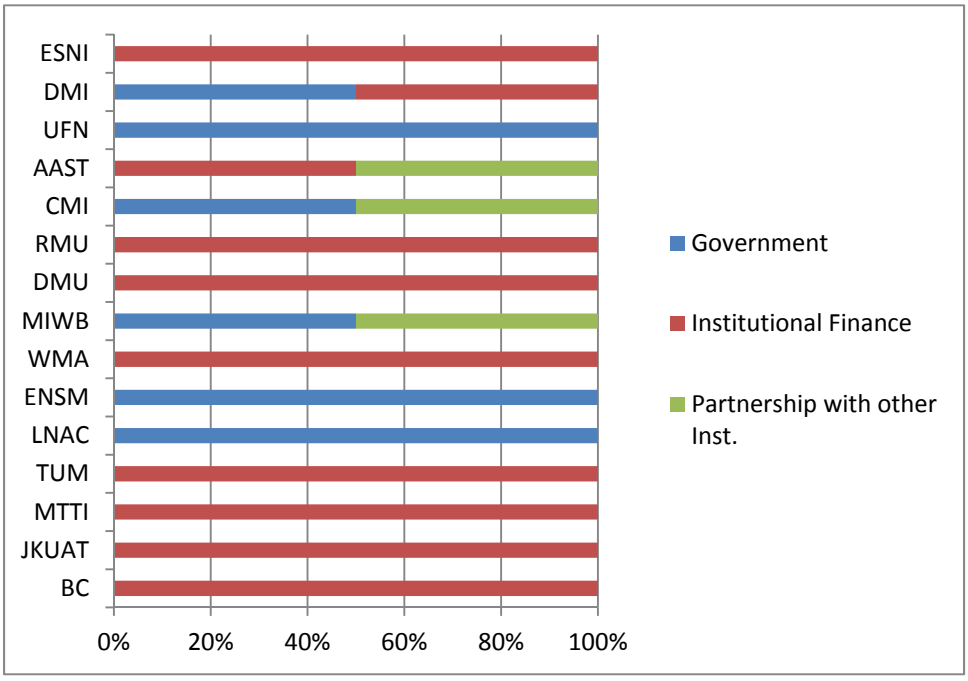


Figure 4.8 How institutions obtain Equipment of Practical Training

4.3.10 Sea Training

Qualified seafarers, trained by qualified instructors, using appropriate technology and equipment are over and above required to undertake mandatory sea training to achieve the required competency. The analysis illustrates that Kenyan institutions and LNAC students currently find cadet berths independently to achieve on-board training. Conversely, in ENSM, CMI and UFN with the support of their respective governments have Memorandum of Understanding (MOU) agreements with shipping companies to provide cadet berths for MET students. Other institutions employ multiple approaches to provide sea training, for example, an institution has a training vessel as in the case of (AAST, WMA and MIWM), the students can find a training ship individually or a cadet berth is facilitated through an MOU agreement between the government and shipping companies.

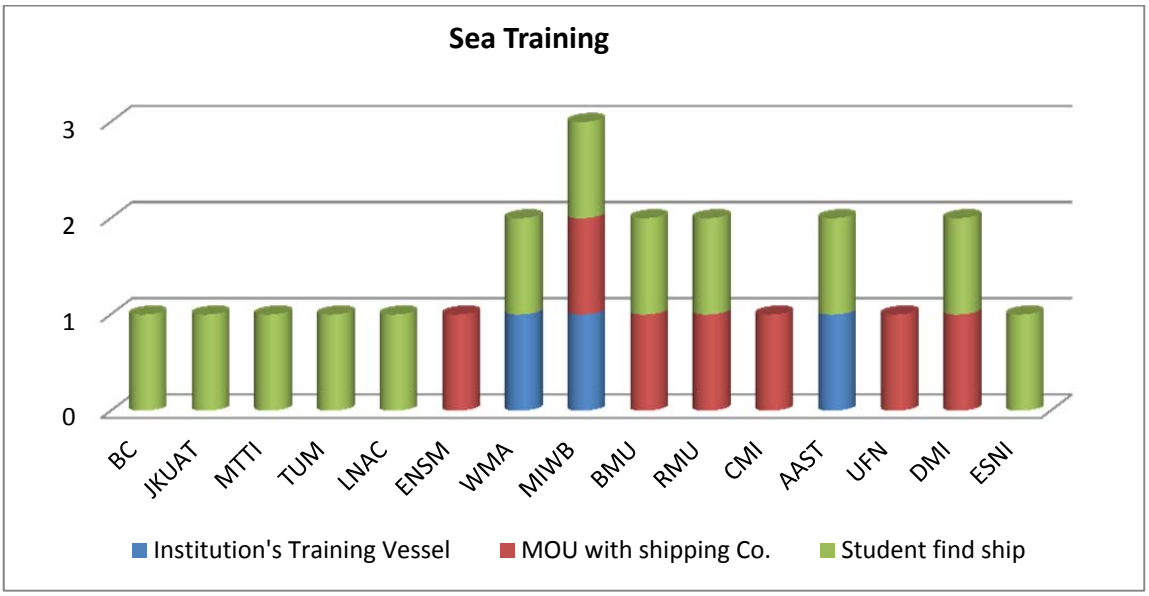


Figure 4.9 Sea Training

4.3.11 Who audits your institution's quality standards?

The requirement of STCW Convention 78 as amended Section A-1/8 on quality standards drew the researcher's attention to explore how quality audits are undertaken in MET institutions. From the data collected, it is observed that all institutions undertake internal audits but most are audited by the respective Maritime Authorities.

However, it was noted that institutions governed by the Ministry of Education receive audits from the Ministry of Education. Other institutions take additional quality audits and more so, on simulation equipment by Det Norske Veritas. Institutions in the EU are audited by EMSA as well as some non-European Union members for recognition of certificates. This analysis confirms the importance of quality standards in MET institutions, more so the particular attention paid by the European Union.

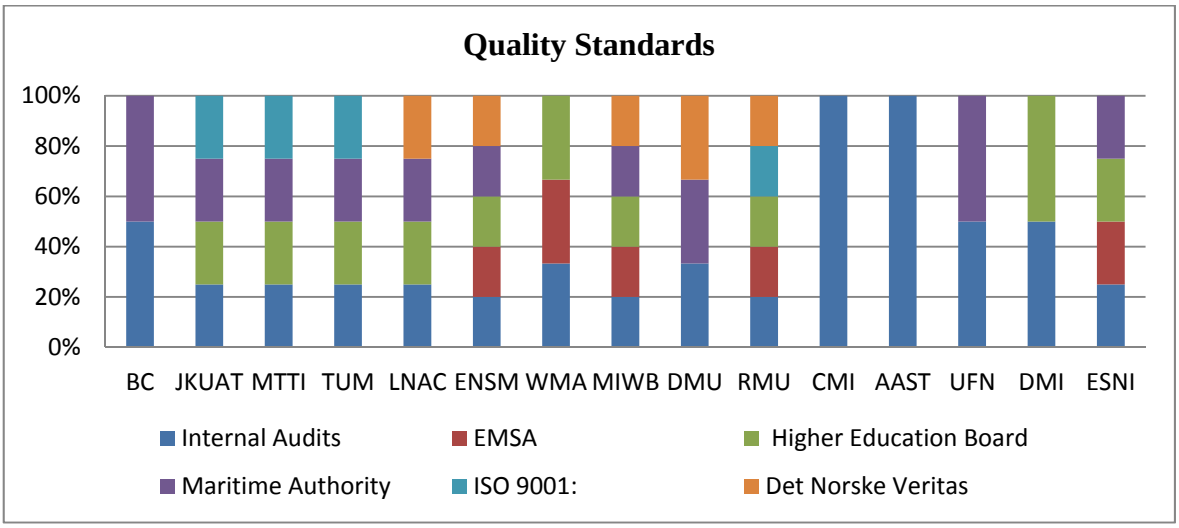


Figure 4.10 Quality Standards

4.4 Analysis of data collected through Observation

The researcher visited five institutions under study as an observer participant and spent at least two days at each of the institutions. These institutions include: LNAC, ENSM, WMA, MIWB and ESNI. The analysis on observation was focused on teaching staff (delivery) and equipment for practical training (technology).

4.4.1 Teaching staff

In all the five institutions visited there was no notable shortage of MET teachers. The teacher-student-ratio in the simulator rooms and laboratories was at an average of 1:4 and only once was it 1:5. However, the ratio was higher for non-practical lessons. The teachers seemed to have full attention of the student's activities. They held briefing sessions before simulation exercises and a debriefing after a simulation exercise with considerable teacher-student interaction taking place throughout the sessions. The teachers confirmed that the teacher-student ratio is particularly important during

practical exercises which require careful observation and assessment especially where maneuvers as well as leadership and teamwork training and assessment are concerned.

Figure 4.11 Teaching sessions observed

Source: Author (2013)

4.4.2 Equipment

The institutions visited had well equipped laboratories for practical training; they had engine room simulators, bridge simulators, Radar and ECDIS simulators. WMA and MIWB however, seemed to have remarkably modern laboratories, well equipped with simulation equipment. However, it was noteworthy that the equipment varied from

institution to institution according to their course objectives. For example, WMA and MIWB had both physical simulators and 360 degrees virtual engine room simulators, which provide realism of a real ship's engine. Besides possessing simulation equipment required for mandatory courses as per the STCW Convention, the two MET Institutions have already procured equipment to train new upcoming courses like Electro-Technical Officer (High Voltage simulator) and the Dynamic Positioning simulators.

Figure 4.12 A sample of Simulation Equipment observed during the study

Source: Author (2013)

4.5 Analysis of the Interview Guide

The interview guide was utilized to explore the challenges on human and technological resources in MET institutions, in addition to impacts of STCW Convention to MET. Respondents from maritime institutions including IMO, EMSA, KMA and TNI

participated in the interviews (Kvale, 1996, p.129). Six cross cutting questions were asked and responses are summarized as follows:

4.5.1 What is the minimum qualification expected of teaching staff in an MET Institution?

Responses received from the interviews indicated that teachers and assessors in MET institutions should be trained appropriately and possess minimum standards as stipulated under Section A-1/6 of the STCW Convention 78 as amended. However, the respondents were keen to mention that the Party States through respective maritime administrations have the responsibility to ensure that instructors, supervisors and assessors are appropriately qualified for the particular types of training and competencies and levels of the seafarers as required by the STCW Convention as amended. The respondents acknowledged there was shortage of appropriately qualified human resources in MET institutions. This response is reinforced by figure 4.13 from EMSA which shows the highest shortcoming in compliance with the STCW Convention is in Regulation A-I/6 on teaching and assessment.

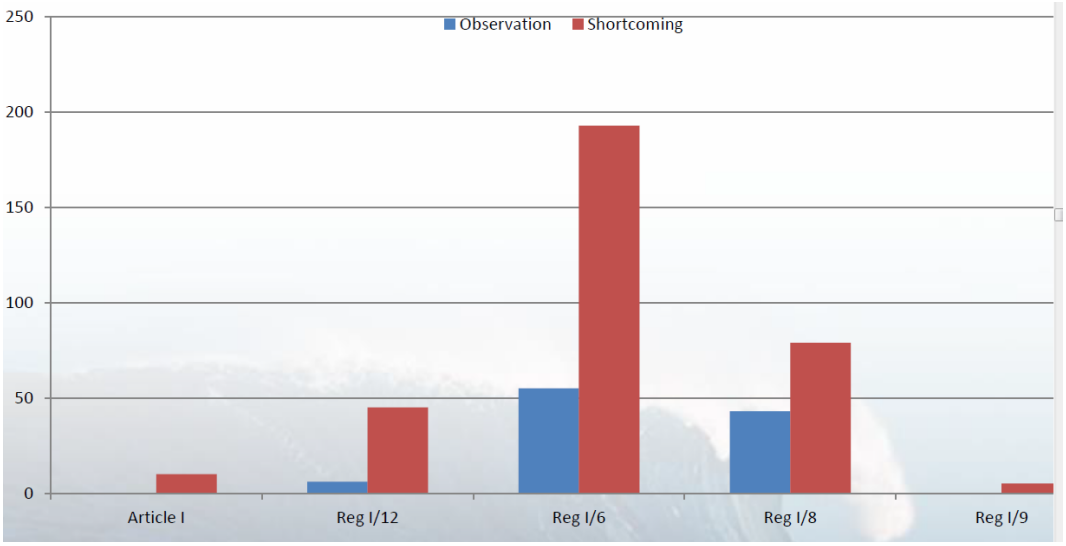


Figure 4.13 Levels of compliance in MET with reference to STCW Convention 78, as amended

Source: EMSA (2013)

4.5.2 Which equipment would you recommended for simulation and practical training of seafarers?

While the respondents offered varied responses there was a general consensus that an MET institution should have at least a bridge simulator, engine room simulator, RADAR and ARPA in addition to computer based training. The interview revealed that although some institutions have very sophisticated simulation equipment, simulators for mandatory courses as stipulated in the STCW Convention Section A-I/12 are Radar and ARPA. In addition, respondents indicated that simulation based training should meet the specific objectives and tasks selected should relate as closely as possible to shipboard tasks and practices.

4.5.3 Can simulation be alternative to sea training?

All respondents opined that simulation cannot be an alternative to sea training. They conceded that it is expensive to install and maintain simulators but they provide valuable training tools that allow students to train in a safe environment without the real dangers presented at sea. In addition, respondents were of the view that simulation affords the opportunity for training seafarers in a realistic environment through scenario based training which supports augmentation of skills, at the same time allowing safe environment for assessment. These responses further endorse the importance of technological capacity for MET institutions in the form of equipment for practical training and simulators.

4.5.4 What duration of sea training can be substituted with simulator training?

Respondents noted that some institutions in the EU have substituted a two-week simulator training with 30 days of sea training. However, majority of respondents felt that sea training should not be reduced further or substituted with simulator training as

the practical aspect of sea training is essential in preparing the students for their real work situations at sea.

4.5.5 Which challenges are MET institutions facing in the implementation of the STCW Manila amendments?

Responses received indicated that institutions are faced with different challenges as they implement the Manila amendments. It was clear that the developing countries faced challenges in recruiting appropriately qualified MET teachers. The responses further indicated that practicing mariners were not ready to leave their sea going careers to take up teaching jobs onshore mainly due to remuneration differentials. It was appreciated, however, that utilization of retired mariners was common in most MET institutions in all regions under study. Even through use of mariners was appreciated, respondents pointed out the need equip the retired mariners with pedagogical skills to augment effective teaching and learning in MET.

In addition, responses from IMO and KMA concurred that practical training provides the competence required of seafarers by the STCW Convention, notwithstanding the technological challenges. It was noted however, that this challenge was not common in the developed countries as much as developing countries. Lack of cadet berths was mentioned as a deterrent to achieving the required competencies especially in developing countries. This analysis can be confirmed by the following data from EMSA which shows shortcomings of MET institutions including simulation, training and supervision, staff qualification and training among other variables.

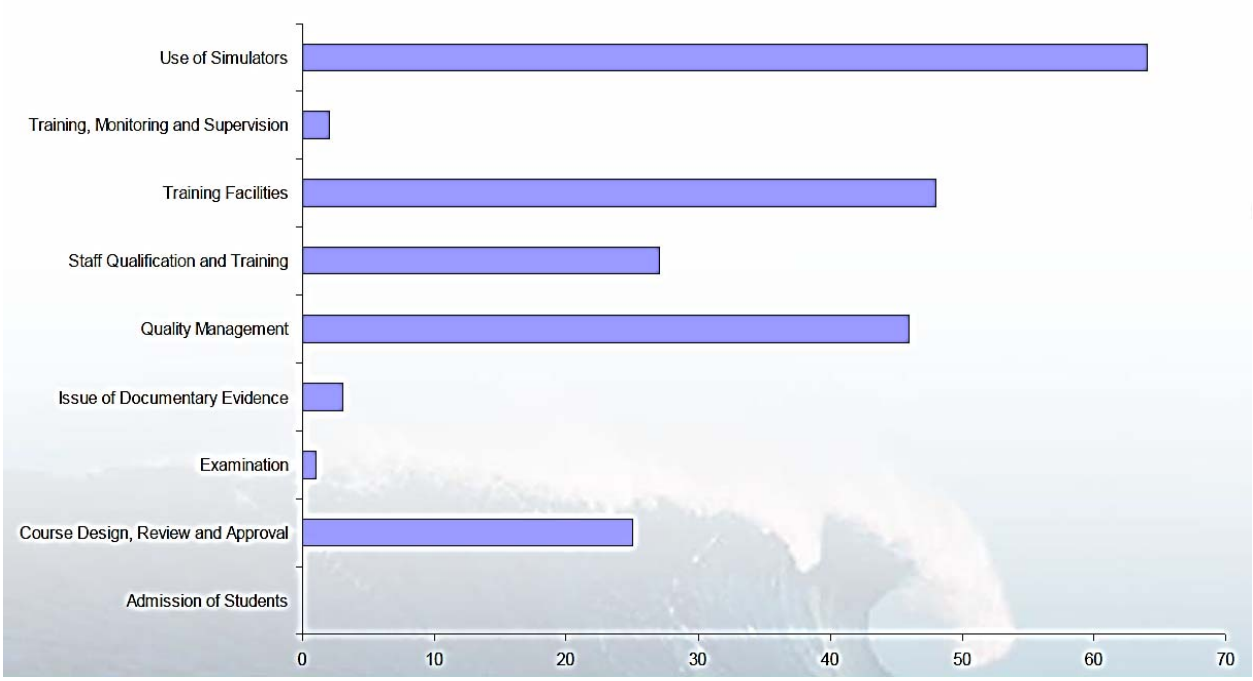


Figure 4.14 Findings from Non-EU and Non EFTA MET institutions
Source: EMSA (2013)

EMSA in its activities studied the shortcomings of MET institutions from non-EU and non-European Free Trade Association (EFTA) MET institutions with reference to compliance to the STCW Convention as illustrated in Figure 4.14.

The highest shortcoming is the use of simulators, in this dissertation referred to as technology. This is an indication that the technological challenge is not localized in Kenyan institutions but extends to other countries mainly non-EU. This is a principal area of concern as simulation enhances competency and consequently reducing chances of human error. Simulation provides an opportunity for trainees to practice various scenarios and build confidence and competence on how to respond especially in emergency situations (Barnett, 1997, p. 81; Fisher & Muirhead, 2005, p. 103; Cross, 2011, p. 139).

Training facilities classified as technology (infrastructure) in this dissertation include classrooms, laboratories and workshops among others lies at the range of 50% indicating that many institutions are grappling with this challenge. This shortfall is closely followed by quality management which generally includes teaching methods, assessment, policies, and equipment among other quality issues.

Although qualification and training of teachers takes the fourth position at approximately 30%, it is a major determinant to the quality of seafarers trained. These statistics therefore show that there is need for capacity building for teachers and instructors in MET. To achieve this objective, there is need for cooperation at both national and international levels of training institutions, ship owners and other international organizations.

4.5.6 How are the MET Institutions addressing the challenges of Human resources and equipment for practical training?

Responses received indicated that Governments have supported MET institutions through financial grants to procure expensive equipment for practical training as well as simulators. Other institutions cooperate and share simulation equipment for different exercises and training needs. Respondents from the EU indicated that the EU is addressing the human resource challenge by intensifying and developing advanced skills and qualifications of EU officers to enhance their employment possibilities. This is in addition to facilitation of life-long career paths and mobility of seafarers among other strategies.

In summary, this chapter examines data collected using questionnaires, observation and interview guides using the triangulation methodology. The analysis reveals the contemporary situation of MET in Kenya in comparison with other MET institutions. In addition, it analyses the challenges of human and technological resources facing MET

institutions in Kenya and abroad. Further, it examines how the STCW Convention 78, as amended impacts on MET and how the institutions maintain compliance with the standards outlined by the Convention. The results of the data analysis are discussed in detail in chapter 5 of this dissertation.

5.0 Discussion

5.1 Introduction

This chapter, attempts to answer the research questions through an in-depth discussion which synthesizes the literature review and data analysis findings, guided by the research questions. The discussion will finally conclude with suggestions on how the challenges established in chapter 4 can be mitigated as directed by the dissertation analysis.

5.2 What is the current situation of MET implementation process in Kenya?

Based on literature reviewed, the roadmap towards implementation of MET in Kenya was charted since 1963 after Kenya's independence. Apparently, it took five decades of concerted efforts to finally acquire IMO "white list" status and commence MET programs in Kenya. This would not have been possible without the legal framework established through KMA and enactment of the Merchant Shipping Act of 2010.

Literature further suggests that the Government of Kenya continues to support the maritime Kenya, evidenced by embedding of "maritime navigation" in the Constitution of Kenya, 2010 and the Kenya Vision 2030 within which, one of the flagship projects of interest to this dissertation is the "training of the Kenyan seafarers for the international job market". Despite the above efforts to promote maritime Kenya and more so the newly established MET programs, the data analysis confirms that MET in Kenya is still

at its foundation stage. This interpretation is based on the data analysis which shows that there is no maritime academy in Kenya.

Furthermore, MET institutions in Kenya currently offer only one level of responsibility (management or operational) as a strategy to harmonize the MET programme with other programmes previously running in the institutions. The data indicates that the university offers management level of responsibility, the polytechnic and university college offer operational level, while the college offers support level of responsibility.

This interpretation is further supported by responses from institutions offering Marine Engineering courses in Kenya. They explained that "due to the similarity in engineering pedagogy in the foundation years of study, they experienced little difficulty diversifying from Mechanical to Marine Engineering".

5.3 What are the challenges facing the MET Implementation process?

Besides the human and technological challenges, the study exposes other minor obstacles to the implementation of MET in Kenya. These include the societal perception about the seafaring profession that "seafaring can be learnt through apprenticeship and that there is no need for academic qualifications" and weak public awareness of the opportunities in maritime Kenya.

These minor misconceptions if not addressed, may further compound the human resources challenges since they affect enrollment levels of students in MET institutions. The cyclic effect of this scenario would be lack of seafarers and consequently lack of instructors for MET institutions. The literature and data analysis inform that KMA has developed mechanisms to create awareness and educate the public on opportunities in maritime Kenya especially students in high schools and the youth to consider maritime education as a career of choice.

5.4 How the human and technological resources challenges influence the MET implementation and development process?

To begin with, the analysis indicates that the human and technological resources challenges in MET cannot be addressed without reference to the STCW Convention 78 as amended. This was exhibited by both the literature review and data analysis which focused on the training "T" in the STCW thus exploring Section A-I/6, A-I/8 and A-I/12 of the Convention. The analysis confirms that the shortage of MET teachers is heightened since seafarers cannot be trained by a general teacher (ISF, 2010)[30]. Section A-I/6 clearly outlines the competencies required of instructors and assessors, affirmed by Section A-I/8 on quality standards and Section A-I/12 on qualification of simulator instructors. The following sub-section will discuss the human resources challenge (shortage) and its implication on the MET implementation process.

5.4.1 MET Human resource (Teacher / Instructor) shortage

The literature took cognizance of the global shortage of officers and the initiatives including research projects being undertaken to encourage young people to join seafaring career particularly in Europe, from the viewpoint of various scholars including (Cahoon & Haugstetter, 2008; Froholdt & Hansen, 2011; Danish Ship-owners Association, 2013) among others. This assertion is confirmed by the Drewry Report (2012) which registers a slight improvement in officer supplies but shows officer shortage in Europe although the Eastern Europe displayed a slight improvement. This is in contrast to an increase in officer supply in the Indian subcontinent.

[30] See Appendix C - ISF guidelines on mandatory requirements concerning qualifications of instructors, supervisors and assessors, retrieved from ISF (2010).

The human resources situation in the maritime sector at the present and future is an issue that attracts international attention. This is confirmed by Toz and Koseoglu (2012) who are of the viewpoint that shortage of qualified personnel might pose a threat in safety standards. The deficiency in global officer supply in the shipping industry drives the Kenyan strategy to train seafarers for the global labour market. While this is a timely strategy, headed in the right direction, it is faced with the drawback of shortage of qualified instructors. As the literature review depicts, the shortage of instructors in Kenya can partly be attributed to a knowledge gap in the seafaring profession in Kenya since 1977 when the programme of training Kenyan seafarers in Britain ceased.

The analysis acknowledges the need to acquire appropriately qualified instructors for Kenyan MET institutions. TUM and JKUAT have taken a leading and proactive initiative of "marinating[31]" Mechanical Engineering teachers to Marine Engineering in readiness to train students in their third year when they commence their specialized marine engineering courses.

In addition, the data analysis notes a marked utilization of retired mariners, a scenario not localized in Kenya but replicated across the global MET institutions under study. However, maritime scholars such as Cross (2013) and Cox (2012) maintain that the mariners should be equipped with pedagogic and didactic skills to augment teaching and learning effectiveness.

Further, the analysis results showed sufficient numbers of MET teachers particularly in China and the European Union. This evidence suggests the possibility of Kenyan institutions seeking cooperative alliances with the institutions having sufficient instructors to build and enhance the human resource capacity and uphold the requirements of STCW Convention 78, as amended.

[31] "Marinating" – Re-training mechanical engineering lecturers to marine engineering lecturers

The data analysis featured three main bodies which conduct assessments of seafarers including MET institutions, the maritime administrations and national examination bodies under the Ministry of Education. The analysis established that all institutions have internal assessment of seafarers training, although in some institutions further assessment is undertaken by the maritime administrations and where academics are involved, the national examination bodies take charge of examinations and assessment.

Another observation from the analysis is that, in addition to its functions as a maritime administration, KMA is currently conducting competency assessment to mitigate the shortage of competent assessors in MET institutions. This is in contrast to institutions like WMA, AAST and UFN who have the entire assessment process undertaken by the MET institution. This disparity in assessment bodies is further attributed to lack of qualified assessors who form part of the human resources.

The literature evaluated the option of contracting expatriate MET teachers. It was established that this option has been explored by developing countries in the past, but it was found unsustainable due to high financial implications including, demand for high salaries and allowances as explained by Menon (1986). In an extreme shortage scenario, this is a possible alternative which Kenyan MET can consider as a short term measure. Attractive offers can be extended to expatriate MET teachers for short periods for example; three months, during which a newly trained MET teacher in Kenya can understudy the experienced teacher to facilitate knowledge transfer.

Another option that could be considered to develop human resources in Kenya is cooperation and collaboration among MET institutions in Kenya to share human resources especially in the specialized courses to reap mutual benefits. Cooperative alliances in the maritime sector have been embraced in the EU, which has realized the launch and development of various educational research projects. These projects

include; the Leonardo mobility project, the Bologna process, Lisbon strategy, the Northern Maritime University Project among other MET projects. Collaboration can be inter-institutional to build institutional capacities; national to develop maritime Kenya. Cooperation can further be developed across borders or regionally to build a regional maritime knowledge base.

5.4.2 Technological challenges

The analysis on technological challenges was addressed with reference to STCW Convention 78, as amended and its emphasis on competence of seafarers[32]. The STCW Tables of Competence provide guidelines for competency, knowledge and understanding, methods for demonstrating competence and criteria for evaluating competence.

In addition to requirements of the STCW Convention 78, as amended, environmental effects like melting sea ice in the North Sea has resulted in increased volumes of commercial shipping as Toz and Koseoglu (2012) enlighten. However, most crews venturing these new routes have little or no experience in ice navigation. Development of competences which includes simulation, practical training in workshops and laboratories and sea training cannot be overstated where safety of life at sea, environmental protection and efficient shipping is involved.

Apart from providing safe environment for training and assessment, simulators have been recommended as tools capable of reducing human error (ISF, 2010; Hernqvist, 2012). ISF guidelines endorse the use of simulators in MRM for training deck and engine room officers to enhance non-technical skills with the objective of mitigating human element related accidents. The recent renaming of STW Sub-Committee to Human Element, Training and Watchkeeping sub-committee confirms the increased

[32] Competence - Ability to perform what they are trained to do.

importance placed on matters relating to the role of human element in the maritime industry (IMO, 2013a).

In this regard, the study noted efforts to build capacity in technological resources demonstrated by TUM being the first MET institution in Kenya to procure and install an engine room simulator.

Figure 5.1 Engine-room Simulator at TUM
Source: Author (2013)

In recognition of the need to build capacity in practical training, data obtained from KMA shows that there is an on-going proposal to the Government of Kenya to establish a national simulation centre. If the Government of Kenya approves the construction and equipping of a national simulation centre, then the MET institutions in Kenya can share the technological resources and provide practical training to MET students in a cost effective manner. This development can be comparable to the Netherlands where MET institutions send their students for simulation training at MIWB simulation centre in Terschelling, hence pool human and technological resources.

These are positive initiatives which evidence efforts to comply with Section A-I/12 of the STCW Code which underlines the requirements for mandatory simulation equipment namely, Radar and ARPA simulators[33]. Further guidance can be obtained from the IMO model courses[34] on simulator capabilities.

Moreover, data analysis established from MET institutions in Africa revealed the need to upgrade equipment for practical training. The situation is a contrast to institutions in the EU who are currently investing in the latest technology including virtual engine-room simulators and 360 degrees bridge simulators for example WMA and MIWB. An illustration of a virtual engine room is shown in Figure 5.2.

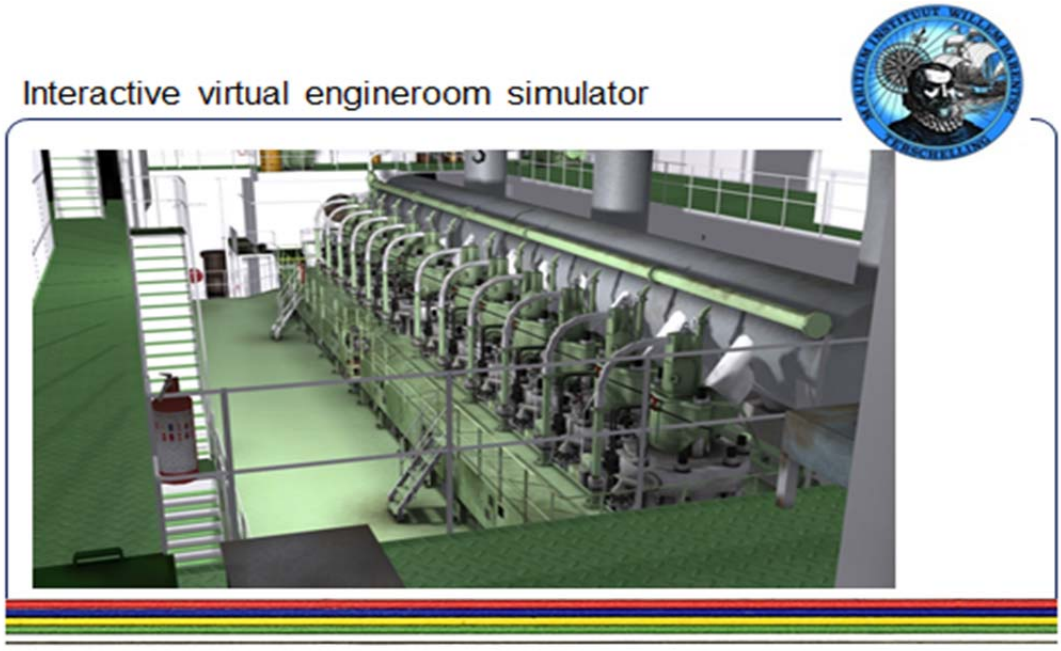


Figure 5.2: Illustration of an interactive Virtual Engine room simulator

Source: Cross (2013)

[33] Section B-I/12 of the STCW Code gives recommendation on performance standard for navigation and watchkeeping, ship handling and maneuvering, cargo handling and stowage, reporting and radio communication, main and auxiliary machinery operation all which are non-mandatory.
[34] IMO Model Courses on simulators (1.07, 1.08, 1.22, 2.06 and 2.07).

Maritime scholars like Muirhead (2000; 2004) in recognition that not every MET institution can afford to install and maintain institution's owned simulation systems[35] proposed web based simulation programs also reinforced by (Kongsberg, 2013). Students can access simulation training from remote locations. However, to ensure effectiveness of web-based simulation and e-learning systems, they should be managed by a LMS administrator, be capable of verification, course management and security of training records as proposed by CBT@Sea (2001).

With the advancement of multi-media and communication technologies, the concept of e-learning can be utilized to alleviate the technological challenges in training of seafarers in Kenya. Use of computer applications and compact discs mode of delivery provides a great potential in development of MET. These materials can be obtained from recognized institutions or online to augment computer based learning. This interpretation is based on literature review, which indicates that computer based training is a cost effective alternative to provide practical training, a learning tool also applied by shipping companies for seafarers on-board ship (Fisher & Muirhead, 2005, pp.151-159).

The analysis illustrates appreciation of simulation training and a growing trend towards remission of sea time for simulator time, perhaps to reduce training time in view of a shortage of qualified officers. However, the STCW Convention 78, as amended places great emphasis on outcomes of training and stipulates an irreducible minimum length of seagoing service[36].

Maritime scholars assert that evaluation for competency should be carried out onboard. Yet, this process is challenged by ship safety requirements, reduced manning and shortage of cadet berths. The impact is greater in countries with small or no fleets like

[35] See appendix D retrieved from Muirhead (2004) which illustrates a continuum of simulation technology development.
[36] Seagoing service - "for the certification of officers taking charge of a navigational watch 12 months seagoing service; 6 months for officers taking charge of an engine room watch".

Kenya. However, the data analysis illustrates that shortage of cadet berths is a problem that cuts across MET institutions globally except a few such as WMA where most of the students are seconded from shipping companies, hence they train on-board their employers' ships. In France and the Netherlands for instance, maritime students benefit from Government initiatives which facilitate cadet berths through national agreements with ship owners.

It is important to note however, that some MET institutions studied own training ships, but still seek cadet berths on-board merchant ships. Apart from the high cost of deploying a training ship, some maritime scholars argue that the experience on-board a training ship does not provide a similar experience as in a merchant ship. However, other scholars maintain that it provides better training than land-based bridge and engine-room simulation (Demirel & Ziarati, 2012).

From the foregoing, Kenya requires to secure cadet berths for its seafarers undergoing training. The analysis indicates that currently, KMA cadets studying abroad have secured cadet berths with Pacific International Lines (Singapore flag). Nevertheless, as the projected number of MET students studying in Kenya is expected to rise, a single shipping company cannot accommodate all the cadets from Kenyan MET institutions.

Therefore, other strategies to provide cadet berths for Kenyan students should be explored. For example, provision of tax benefits to shipping companies who avail cadet berths as in the case of France and the Netherlands. However, since Kenya does not have a national fleet, the France and Netherlands scenario may currently not be effective. Nevertheless, the Government of Kenya can provide other incentives to shipping companies, especially liner shipping companies and perhaps allow them to market and advertise their shipping services in Kenya.

Moreover, as maritime Kenya continues to develop, the Government might consider possibilities of having an open register like the Liberia Registry; hence create opportunities for cadet berths for Kenyan MET students. Since this is a major legal and economic decision, in the meantime, securing of cadet berths should be anchored on cooperation and collaboration with international shipping companies. The literature suggests that there are certain shipping companies willing to invest in developing skilled seafarers; the snag is for MET institutions to research and identify these companies and engage them to support MET in Kenya. Additionally, Kenyan seafarers have an advantage of speaking the English language hence can learn maritime English with ease. Thus, if well trained and motivated, they can participate in the global labour market.

The following matrix is a summarized view of the relationship between the size of MET institutions, technology and development continuum to which Kenyan MET institutions can make reference to gauge the type of equipment and technologies suitable for each type of institution.

Table 5.1 Development matrix for MET institutions

Continuums MET Institution	**Computer Technology**	**Multimedia Technology**	**Simulation Technology**	**Delivery Methods**	**Communications**
Training Centre	Computers	Audio-visual library	PC desktop	Traditional Classroom	Basic
Vocational Training Centre	Added accessories	CDR-CD-I Advanced	Single task	Classroom plus limited technology	Low speed links
Small MET academy	Special workstations	Digital technology	Part task	Computer laboratories	Medium speed links
Medium sized MET college	Networks LAN	Web page site	Full mission	Internet links	High speed links
Polytechnics Large institute	IT equipped classrooms	Authoring tools	Full mission internet interactive	Distance learning	High speed links
Maritime university	Interactive PC laboratories	Multimedia studio production	Internet interactive	Web education management system	Satellite links fibre optics

Source: Muirhead (2004, p.157)

5.4.3 Quality standards

While the analysis indicates that quality standards exist in the Kenyan education system, literature analyzed on STCW Convention Section A-I/8 indicates that quality standards in MET are more complex, as they are guided by the requirements of STCW Convention. Furthermore, quality standards should be tailored to suit a particular program or task, hence the difficulty in interpretation of the relationship between the objectives and the actual achievement.

Regulation A-I/8 is significant in Kenyan MET institutions at this early stage of implementation and development. This is so, as it is imperative to link MET objectives and achievements which should be guided by the IMO Model Courses, STCW Convention and Code, as well as national and international standards. In addition, during acquisition of simulators and other equipment for training, making reference to established standards such as the DNV standards for certification No.214 on maritime simulation systems may be expedient (DNV, 2011). These standards may provide useful guiding information including, clarification of terminology and performance requirements for various types of simulators among other elements.

From the knowledge gained during this study, quality standards include quality of human resource (teachers), academic programs, approval of new courses, assessment processes among others. It is therefore clear that without competent human resources and adequate technological resources, MET institutions cannot meet the required quality standards. In addition, quality standards should be more visible and transparent to the community that MET institutions serve.

5.5 Reflection on past Literature on Kenyan MET situation

This reflection of previous dissertations written by Kenyan students is aimed at evaluating how far the MET implementation process has evolved and if the current situation is any different than it was when the dissertations were written.

Wainaina (1989) in his dissertation discussed the marine technical training which was undertaken in the United Kingdom and recommended to the Government of Kenya the establishment of a Merchant Navy Training Board to enable recognition of the Marine Engineers trained abroad by the local engineering bodies. The dissertation also highlighted the need to train marine technicians and proposed the technical institutions which existed at the time to take up training in Marine Engineering.

Furthermore, Olango (1990) wrote a case study on "the minimum requirements for founding an MET Institute", which confirms that Wainaina's recommendations had not been implemented and Kenya still did not have an MET institution when Olango wrote his dissertation. He concludes his dissertation by expressing disappointment in the lack of an MET institution in Kenya and he recommends the establishment of a Ratings Training Institute.

Additionally, Musa (2000) in his dissertation "A Model –MET Institute in Kenya for the East African Region" expressed frustration in the existing Merchant shipping Act of 1983 which did not indicate examination subjects for any certificates of competency or periods of sea service. He attributed this drawback to failure of enactment of the law, hence Kenyan seafarers could not be trained locally or even certified despite the existence and potential of Bandari College, an institution owned and operated by the Kenya Ports Authority.

These reflections illustrate a protracted process to implement MET in Kenya. As explained in Chapter 2 and confirmed by the previous work written by Kenyan students and submitted to WMU, there was no legal framework to support establishment of an MET institution in Kenya. The enactment of the Merchant Shipping Act in 2010 changed the scenario, hence enabling the commencement of MET in Kenya.

This dissertation is therefore a continuation of the previous dissertations written by Kenyan MET students and a confirmation that MET has now been implemented in Kenya. In addition, collection and analysis of real time data from institutions in Kenya and abroad enables this dissertation to deduce and suggest feasible strategies that MET in Kenya may adopt to alleviate the challenges it is currently facing.

In summary, objectives of the study were achieved to the extent that the study established the current situation of MET in Kenya and noted that it is still at the initial stages of implementation. The study established that human and technological challenges are the key deterrents to implementation and growth of MET programs.

Furthermore, careful consideration should be given to the impact of human resources especially when introducing simulator training, computer based networks and distance learning if these options are considered for adoption by Kenyan MET institutions. These proposals are supported by Fisher and Muirhead (2005) for progressive and sustainable development of MET. They emphasize that development of technological resources should be matched against financial and human resources capability.

5.6 Evaluation of Dissertation methodology

The four methods of data collection (triangulation methodology) were well selected as each method complemented the other, hence enabling filling in gaps and answering the research questions. The literature review was useful in informing what other scholars

have written concerning human and technological resources challenges in MET. However, since MET in Kenya is just in its formative stages, there was not much MET related literature available, hence the writer referred to various Government policy documents and legislations relating to the implementation of MET in Kenya.

The electronic questionnaire was particularly useful as it enabled collection of data from geographically dispersed locations and provided the anonymity requested by some respondents, hence aiding data collection. The interview guide was used to collect data from maritime organizations and was instrumental in probing respondents and obtaining their in-depth views. However, the downside of the interviews was that most respondents interviewed were senior managers in their respective organizations and with tight schedules, hence sometimes were in a hurry to complete the interview.

Additionally, the observation method augmented collection of primary data where the researcher was able to observe and record observations from which conclusions were drawn. However, as mentioned in the chapter 3, the duration of time spent in the institutions was not long enough as the maximum duration was one week. On the other hand, as Swetnam (2007) argues, observation may be open to subjectivity as observed sessions may be conducted differently from normal situations since the subjects are aware of the observer's presence. It can also be argued that this length of time cannot provide adequate observation.

The writer is of the opinion that if the Government of Kenya decides to adopt suggestions from this study, a follow up study should be undertaken especially with the global maritime organizations, including shipping companies who are the main stakeholders of MET institutions. If this study is undertaken with the support of the

Government and senior maritime officers from Kenya, it might yield more detailed information than currently obtained within the scope of this dissertation.

On the whole, the four methods informed and complemented one another, provided a link to the data collection process, hence enabled the process of answering the research questions albeit the limitations mentioned. The following matrix Table 5.2 summarizes the research questions and the possible short-term and long-term responses to the research questions from the dissertation analysis.

Table 5.2 Summary matrix of research questions and responses

Research Question 1	**Findings**	**Response (Short or Long-Term)**
What is the contemporary situation of MET implementation process in Kenya?	*Implementation on-going*	Government support, financial (MET budget), political will, Technical support from IMO and cooperation with maritime bodies *(long-term)*
	Initial stage of growth, accreditation of MET institutions in process	
	Low levels of public awareness of MET in Kenya, Government realising the potential of MET in economic growth	KMA initiative to create public awareness of MET and industry profile especially in schools and colleges. *(long-term)*
	Four (4) institutions providing training one level of responsibility respectively	Maintain the accreditation process for training institutes in line with KMA (2013) Guidelines for Accreditation of Training Institutes *(long-term)*
Research Question 2	**Findings**	**Response (Short or Long-Term)**
How are the human and technological challenges influencing implementation and growth of MET in Kenya?	*Evidence of shortage of appropriately qualified teachers, instructors and assessors.*	In the short run, contract expatriates especially for specialized training with attractive offers, new teachers to understudy *(short-term)*
		Utilize retired mariners for competency training and assessment. Trainers for in-service training be equipped with pedagogical skills (IMO Model Course 6.09) *(short and long-term)*
		Cooperation and collaboration with recognized MET institutions and join international maritime education associations like IAMU *(long-term)*
		Consider, web-based, distance, computer based learning in collaboration with other MET institutions and maritime research intuitions *(long-term)*
	Computer laboratories required for Multimedia training platform, Internet Connectivity (reliable broad band)	Government of Kenya to consider establishment of a national simulation centre *(long-term)*
		Cooperation for technical support on multimedia training platform, integrated e-learning and assessment, simulation, up-to-date innovations in maritime sector *(short and long-term)*
		Cooperation between MET institutions to share CBT, laboratory, workshops and simulators for mutual benefits *(short and long-term)*
	Reliable power supply for operation and sustainability of electrical equipment like computers and simulators	Ensure stable power supply (have a system of uninterrupted supply, alternative power supply such as standby generators *(long-term)*
	Cadet berths	Government policies (incentives) to encourage ship-owners to avail cadet berths for Kenyan students
		Cooperation with shipping companies *(long-term)*

Research Question 3	Findings	Response (Short or Long-Term)
What are the impacts of STCW 78, as amended on implementation and development of MET in Kenya?	*In line with this dissertation whose focus was the "T" in STCW hence:*	The STCW Convention 78, as amended emphasizes on competency of teachers, instructors and assessors hence Kenya MET institutions must recruit and develop qualified teachers, instructors and assessors *(long-term)*
	Section A-I/6 – Teaching and assessment	Develop quality standards, documentation process, procedures, self-assessment and independent external evaluation *(long-term)*
	Section A-I/8 – Quality standards (QS)	Simulation provides competency training in a safe environment. ARPA and Radar simulator training is mandatory in the STCW Convention, 78 *(long-term)*
	Section A-I/12 - Simulation	
Research Question 4	**Findings**	**Response (Short or Long-Term)**
Which good practices can Kenyan MET institutions learn from other MET institutions?	*Other MET institutions are mostly fully fledged maritime institutions or academies, developed over a long period to current status*	The Government of Kenya could give greater prominence to maritime Kenya, encourage Public Private Partnership (PPP), establish maritime academy and equip it adequately *(long-term)*
	Appropriately qualified Human resource is a concern for many MET institutions and the shipping industry	Encourage collaboration with national, regional and global MET institutions and organizations to gain mutual benefits in teaching and learning methods *(long-term)*
	Various initiatives and research are on-going to develop sustainable MET and maintain quality, especially in the EU	Keep close contact with global MET organizations e.g. IAMU for universities *(long-term)*
	Shortage of cadet berths is a common problem across MET institutions except a few as noted in the study	Forge cooperation with shipping companies. The Government could provide incentives to shipping companies to encourage allocation of cadet berths *(short and long-term)*
	Simulation is currently an accepted mode of developing competencies and MET institutions have implemented simulators beyond STCW mandatory requirement of RADAR and ARPA	Invest in simulation, CBT, integrated learning systems, e-learning, virtual learning among other MET technologies *(long-term)*

6.0 Conclusion

This dissertation is an exploration of human and technological resources challenges facing implementation of MET in Kenya. The literature review and the data analysis results confirm that there is a notable shortfall in officer quantities globally. It is also clear there is need for quality training since seafarers have a key role in safety, prevention of marine accidents and efficient operation of ships.

Furthermore, the shortage of MET trainers and assessors in Kenya is aggravated by a knowledge gap which resulted from lack of training of seafarers locally. This gap needs to be filled through provision of quality education and training of seafarers in the newly established MET institutions. Efforts to train appropriately qualified teachers, instructors and assessors have commenced. In the interim, MET institutions are currently utilizing experienced seafarers to restart the knowledge spiral and build a knowledge repository for the Kenyan MET system.

Likewise, the STCW Convention places great emphasis on competency and proficiency. This fact makes it necessary for MET institutions to provide effective simulation; computer based training and appropriately equipped laboratories to enhance practical training. This is in addition to assisting the students to secure cadet berths, as the STCW Convention 78, as amended specifies an irreducible seagoing service.[37] This challenge can be eased through collaboration and sharing of resources among the MET institutions,

[37] STCW Convention, 78 as amended: Competence based training: 12- months for certification of officers taking charge of a navigational watch and 6- months for certification of officers taking charge of an engine room watch.

employing e-learning, integrated learning tools and CBT where applicable. However, efforts to lobby and convince the Government of Kenya of the importance of establishing a national maritime simulation centre should continue as initiated by KMA and with support from MET institutions.

Moreover, to develop sustainable MET and mitigate the challenges of human and technological resources, Kenyan MET institutions should forge a mutual working relationship with the shipping companies and maritime affiliated institutions globally. This will keep them abreast with industrial developments and demands, in addition to networking with the experts in these institutions to uphold continuous growth. In the same breadth, collaboration with shipping companies will provide an opportunity to negotiate for the much needed cadet berths for practical training. From this initiative, the shipping companies may have an opportunity to impart practical skills and company culture to their future employees.

Besides, the study reveals that technological resources challenges exist not only in Kenyan institutions but also in institutions abroad mainly in developing countries. The foregoing notwithstanding, the STCW Convention 78, as amended requires compliance with training standards which include competence of MET instructors and assessors, appropriate sea training, in addition to mandatory simulation training as stipulated in Section A-I/6, A-I/8 and A-I/12.

The above facts taken together and having assessed the contemporary situation of MET in Kenya, it is noted that there is an urgent need of capacity building in terms of human and technological resources for sustainable implementation and development of MET. The dissertation has proposed various responses as outlined on the summary matrix Table 5.1, to mitigate the challenges facing MET institutions in Kenya. Although the government's support in form of infrastructure, finance and legal mechanism is crucial at this stage, MET requires consistent communication and interaction between stakeholders, shared

understanding and a commitment to collaboration in order to grow and reap optimum benefits.

Finally, further research is needed in order to create short-term and long-term structures for all necessary initiatives, in order to ensure that they take place in line with the informed political and industrial decisions. The data analysis and findings from this dissertation therefore provide a framework for further research on Kenyan MET.

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Appendices

Appendix A - Questionnaire for MET Institutions

I am an Msc in Maritime affairs student at the World Maritime University, Malmo, Sweden.
I am undertaking a dissertation on the above subject and would kindly ask you to answer a few questions to enable collection of data for my dissertation. The information obtained from this questionnaire will be used entirely for academic purposes. Names of individuals and/ organizations will be treated with anonymity.

1. **Name of Institution**

   .....

2. **Classification of institution**
   Mark only one oval.

   - ◯ College
   - ◯ Technical Training Institute
   - ◯ University College
   - ◯ University
   - ◯ Academy
   - ◯ Other: .....

3. **Which specializations of Maritime Education and Training (MET) do you offer?**
   Mark only one oval.

   - ◯ Nautical
   - ◯ Engineering
   - ◯ Other: .....

4. **Which level/ s of responsibility are you currently training?**
   Mark only one oval.

   - ◯ Management level (Degree)
   - ◯ Operational level (Diploma)
   - ◯ Support level (Artisan)

5. **How long have you been training in MET?**
Mark only one oval.

- ◯ 1 year and below
- ◯ 2 – 3 years
- ◯ 3 years and above
- ◯ Other: .....

6. **How many MET specialist teachers do you have?**

.....

7. **How many teachers do you have in the following categories?**
Mark only one oval.

- ◯ Graduates from non-maritime background
- ◯ Graduates from MET Institutions/academies
- ◯ Graduates with seagoing experience
- ◯ Retired Mariners
- ◯ Other: .....

8. **Have you had any difficulties in recruiting appropriately qualified teachers and assessors as per the STCW 78 Convention as amended?**
Mark only one oval.

- ◯ Yes
- ◯ No

9. **If yes, how are you overcoming this challenge?**

.....

10. **How is practical training and assessment undertaken in your institution?**
Mark only one oval.

- ◯ Bridge simulator
- ◯ Engine room simulator
- ◯ RADAR simulator
- ◯ Computer Based Training (CBT)
- ◯ Training ship /On-board training
- ◯ Other: .....

11. **How do you procure Equipment for Practical Training?**
Mark only one oval.

- ◯ Government grants
- ◯ Institutional finance
- ◯ Partnership with other institutions
- ◯ Other: .....

12. **What plans do you have for sea training in MET?**
Mark only one oval.

- ◯ Institution's training vessel
- ◯ Institution's agreement with shipping companies (MOU)
- ◯ Students' individually to find training vessel
- ◯ Other: .....

13. **Are you facing challenges in offering practical training in MET as per the STCW 78 as amended?**
Mark only one oval.

- ◯ Yes
- ◯ No

14. **If yes, please indicate the challenges you are facing**

.....

15. **Who conducts quality standards audit in your institution?**
Mark only one oval.

- ◯ Internal audit
- ◯ Ministry of Higher Education
- ◯ Directorate of Industrial Training
- ◯ Maritime Authority
- ◯ Classification society e.g. Det Norske Veritas (DNV)
- ◯ Other: .....

16. **What are the key elements of your institutions quality standards system in MET?**

.....

17. **Which other challenges are you facing in your efforts to implement the requirement of STCW Convention 78 as amended?**

.....

Appendix B - Interview Guide Template

I am a student pursuing Msc in Maritime Affairs at World Maritime University, Malmo, Sweden. As part of the course requirement, I am undertaking a dissertation on the above subject and kindly ask you to answer a few questions as part of data collection for my dissertation. The information obtained from this interview will be used entirely for academic purposes. Names of individuals will be treated confidentially.

1. **What is the minimum qualification expected of teaching staff in an MET institution**

2. **Which equipment would you recommended for simulation and practical training of seafarers?**

3. **Can simulation be alternative to sea training?**

4. **What duration of sea training can be substituted with simulator training?**

5. **Which challenges are MET institutions facing in the implementation of the STCW Manila amendments?**

.....

.....

.....

.....

.....

6. **How are the MET Institutions addressing the challenges of Human resource challenges and Equipment for practical training?**

.....

.....

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.....

.....

Appendix C:

MANDATORY REQUIREMENTS CONCERNING QUALIFICATIONS OF INSTRUCTORS, SUPERVISORS AND ASSESSORS

IN-SERVICE TRAINING

Any person conducting in-service training of a seafarer, either on board or ashore, which is intended to be used in qualifying for certification under the Convention, shall:

1. have an appreciation of the training programme and an understanding of the specific training objectives for the particular type of training being conducted;
2. be qualified in the task for which training is being conducted; and
3. if conducting training using a simulator:
    - 3.1 have received appropriate guidance in instructional techniques involving the use of simulators; and
    - 3.2 have gained practical operational experience on the particular type of simulator being used.

Any person responsible for the supervision of in-service training of a seafarer intended to be used in qualifying for certification under the Convention shall have a full understanding of the training programme and the specific objective for each type of training being conducted.

ASSESSMENT OF COMPETENCE

Any person conducting in-service assessment of competence of a seafarer, either on board or ashore, which is intended to be used in qualifying for certification under the Convention, shall:

1. have an appropriate level of knowledge and understanding of the competence to be assessed;
2. be qualified in the task for which the assessment is being made;
3. have received appropriate guidance in assessment methods and practice;
4. have gained practical assessment experience; and
5. if conducting assessment involving the use of simulators, have gained practical assessment experience on the particular type of simulator under the supervision and to the satisfaction of an experienced assessor.

Retrieved from ISF Guidelines (2010)

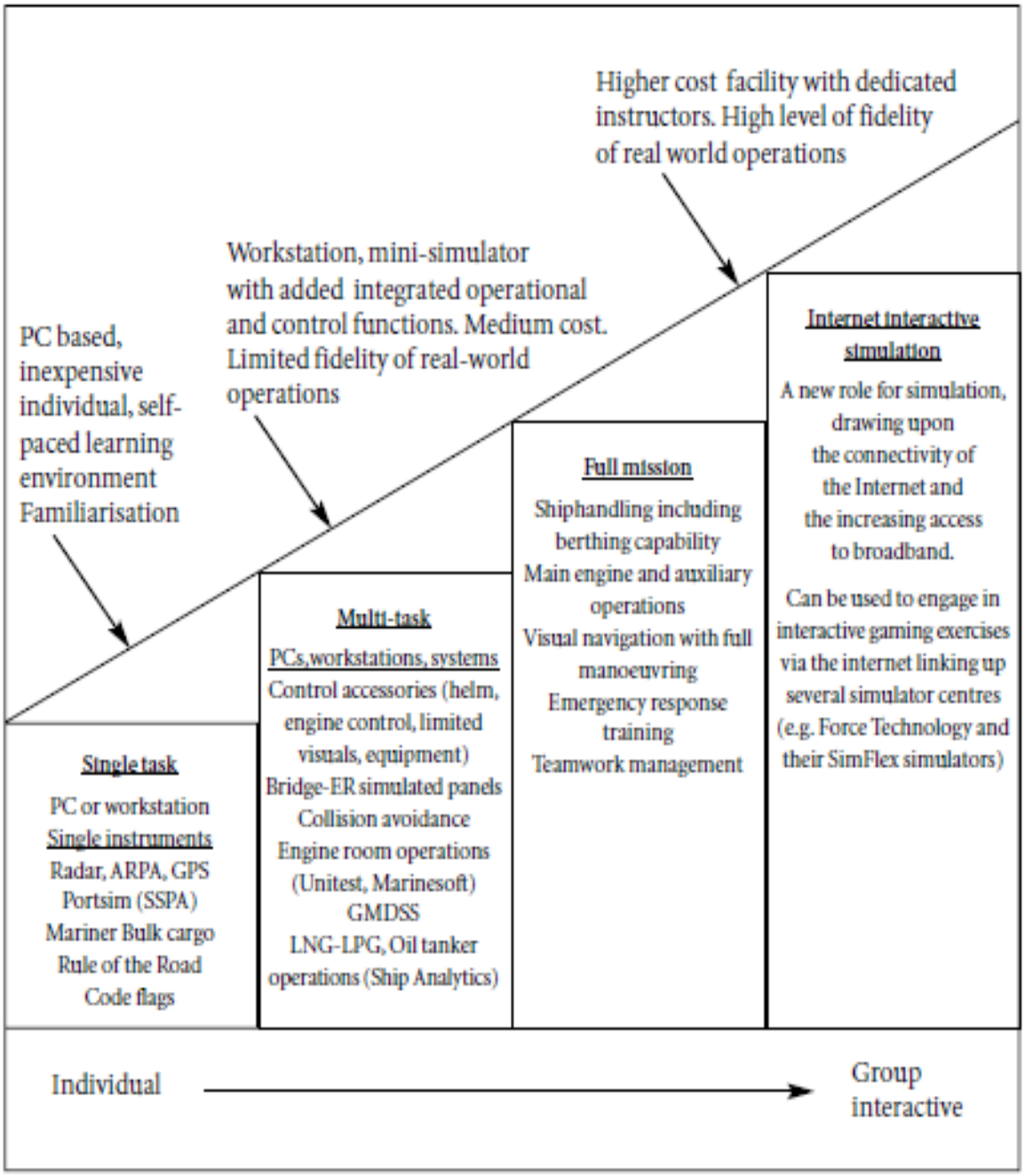
Appendix C

TRAINING AND ASSESSMENT WITHIN AN INSTITUTION

Each Party which recognises a course of training, a training institution, or a qualification granted by a training institution, as part of its requirements for the issue of a certificate required under the Convention, shall ensure that the qualifications and experience of instructors and assessors are covered in the application of the quality standards provisions of section A-I/8. Such qualification, experience and application of quality standards shall incorporate appropriate training in instructional techniques, and training and assessment methods and practice, and shall comply with **[the above requirements]**.

[SECTION A-I/6]

Appendix D: A Continuum of Simulation Technology Developmement



Source: Muirhead (2004, p.150)