Anatomy of research and innovation: the knowledge triangle from a Namibian perspective

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ANATOMY OF RESEARCH AND INNOVATION: THE KNOWLEDGE TRIANGLE FROM A NAMIBIAN PERSPECTIVE

By
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Namibia
A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE in MARITIME AFFAIRS

MARITIME EDUCATION AND TRAINING

2022

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Declaration

I, Aaron Shitayi certify that all the material in this dissertation, which 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.

(Signature): ………………………

(Date): 20 September 2022.

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Abstract


Degree: Masters of Science (MSc)

This dissertation aims to evaluate the interaction or connection between education, research, and innovation activities, and the collaboration between the government, high educational/maritime education and training (MET) institutions, and industry. Incorporating data from semi-structured questions, online interviews and documents from three Namibian high educational institutions, the study finds that the synergy within the Knowledge Triangle is very important for the realisation of meaningful innovation through quality education and applied research. Enhancing innovation yields into the attractiveness of the maritime industry and growth of the blue economy with more employment opportunities. The study supports the notion that HEIs serve as a bridge between government and industry, receiving a large portion of government-funded research and serving as the primary source of knowledge. Furthermore, by playing an important role in innovation, they contribute to social responsibility. However, limited funding for HEIs for research and innovation, unclear strategies for unlocking the potential of the national blue economy, ambiguity on the facilitation of collaboration between government, HEIs, and industry to operationalise the KT, unclear models on how HEIs institutions capture innovative ideas from other industry’s stakeholders and incorporate them into education, research, and innovation, lack of institutional and national policies or programs for HEIs on KT integration and operationalisation in the maritime industry as well as imprecise key performance indicators for measuring HEI performance on KT are the key findings of this study. Through this research, the government, HEIs, and industry will recognise and value the importance of collaboration in achieving quality education research and innovation.
**KEYWORDS:** High educational institutions, Maritime education and training institutions, education, research, innovation, government, industry, Knowledge Triangle, Collaboration, Stakeholders, Maritime Industry.
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<th>Description</th>
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<tbody>
<tr>
<td>BIBB</td>
<td>Bundesinstitut für Berufsbildung (Federal Institute for Vocational Education and Training)</td>
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<tr>
<td>CSR</td>
<td>Case Study Research</td>
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<tr>
<td>DHET</td>
<td>Department of High Education and Training</td>
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<td>DMA</td>
<td>Directorate of Maritime Affairs</td>
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<td>EU</td>
<td>European Union</td>
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<td>HEIS</td>
<td>High Educational Institutions</td>
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<td>IMO</td>
<td>International Maritime Organisation</td>
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<td>KIC</td>
<td>Knowledge and Innovation Communities</td>
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<td>KT</td>
<td>Knowledge Triangle</td>
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<td>KTI</td>
<td>Knowledge Triangle Integration</td>
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<td>MET</td>
<td>Maritime Education and Training</td>
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<td>METIs</td>
<td>Maritime Education and Training Institutions</td>
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<td>NAMFI</td>
<td>Namibian Maritime and Fisheries Institute</td>
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<tr>
<td>NAMPORT</td>
<td>Namibia Ports Authority</td>
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<td>NCHE</td>
<td>National Council of Higher Education</td>
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<td>NMA</td>
<td>Nelson Mandela University</td>
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<td>NSDP</td>
<td>National Seafarers Development Program</td>
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<td>NSF</td>
<td>National Skills Fund</td>
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<td>NTA</td>
<td>Namibia Training Authority</td>
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<tr>
<td>NUST</td>
<td>Namibia University of Science and Technology</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
</tr>
<tr>
<td>PESTEL</td>
<td>Political Economical Social Technological Environmental and Legal</td>
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<tr>
<td>SADC</td>
<td>Southern African Development Community</td>
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<tr>
<td>SAIMI</td>
<td>South African International Maritime Institute</td>
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<tr>
<td>SAMK</td>
<td>Satakunta University of Applied Sciences (Satakunnan ammattikorkeakoulu)</td>
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<tr>
<td>SAMSA</td>
<td>South African Maritime Safety Authority</td>
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<td>Acronym</td>
<td>Description</td>
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<tr>
<td>SANUMARC</td>
<td>Sam Nujoma Marine and Coastal Resources Research Centre</td>
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<tr>
<td>SIMAC</td>
<td>Svendborg International Maritime Academy</td>
</tr>
<tr>
<td>STCW</td>
<td>Standards of Training Certification and Watchkeeping for seafarers</td>
</tr>
<tr>
<td>TVET</td>
<td>Technical Vocational Education and Training</td>
</tr>
<tr>
<td>UBCs</td>
<td>University-Business Cooperation</td>
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<tr>
<td>UNAM</td>
<td>University of Namibia</td>
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<tr>
<td>UNSDG</td>
<td>United Nations Sustainable Development Goal</td>
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<tr>
<td>VET</td>
<td>Vocational Education and Training</td>
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<td>WMU</td>
<td>World Maritime University</td>
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Chapter 1: Introduction

1.1. Background
Education, research, and innovation are fundamental functions of any high educational institution (Unger & Polt, 2017). However, there is a considerable variance between different educational institutions around the world in terms of how these three vertices of the Knowledge Triangle are connected and prioritised. The Knowledge Triangle (KT) is a concept that interacts or connects activities of education, research, and innovation, through the collaboration between the government, high educational institutions and industry. In this regard, the performance on the KT is assessed on contribution to knowledge transfer, research, innovation, attractiveness of the industry and employment creation. This study evaluates the HEIs funding, sharing of knowledge, programs and policy frameworks that are employed for the KT, to translate education and research into real innovation. In this context, the government expects HEIs/METIs to play a key role in ensuring that education, research, and innovation are all interacting or linked. According to Perez et al. (2017), the achievement of high education’s ambitions is jeopardized by a lack of coordination within the KT and a disparity in how the three responsibilities of high educational institutions are handled by different institutions. There is a demand for competent and qualified maritime professionals given the potential of the blue economy in Namibia. In order to solve any weak connections between education, research, and innovation, this study aims to evaluate a partnership between the government, HEIs, and industry. Finally, the study aims to pinpoint the KT's shortcomings that stifle innovation and reduce the maritime industry's attractiveness and job opportunities.

1.2. Problem statement
The Namibia Labour Force survey of 2018 reports that Namibia's unemployment rate was 33.4% and the trend suggests to increase. The fishing sector contributes about 20% of Namibia's total export revenues and is the third biggest source of employment after mining and agriculture, employing over 15 000 people directly. These statistics come at
a time when Namibia is still not in the so called IMO’s ‘white list’, which highlights the need to investigate the Knowledge Triangle (KT) in order to identify untapped potential of the maritime industry. According to Peeters and Pilon (2018), the government, HEIs and industry are the key players in the Knowledge Triangle. Namibia, being a coastal state, is expected to have a robust maritime economy that hugely contributes to the reduction unemployment and economic growth in the country. However, it is unclear how HEIs/METIs collaborate with the government, and industry to address societal demands within the framework of education, research, and innovation to boost maritime products and services. Furthermore, how the Knowledge Triangle programs or policies are incorporated into educational institutions’ plans is another issue that needs clarity. The challenges facing the Namibian maritime industry are exacerbated by the METI’s inability to effectively research and innovate, the inability of the maritime industry to create more required jobs, the lack of interest among young professionals to take up the maritime jobs, and the industry's non-compliance with the STCW convention. According to Unger and Polt (2017), the government’s primary responsibilities are to provide resources and policy direction to HEIs/METIs and the industry, while the primary role of maritime education and training institutions is to educate and train competent seafarers and shore-based professionals, who can provide solutions to emerging industry issues, and the industry provides the practical aspect of the knowledge triangle by transforming research breakthroughs into innovation and create employment. Furthermore, the industry has a responsibility to keep HEIs/METIs informed about developing trends in the industry, so that they are recorded and implemented into training programs. When each participant in the KT is not playing its part, innovation, employment creation and skill base are compromised. Around the world, there have been numerous attempts to put the KT concept into practice, as a result, various countries have developed concepts and strategies that connect education with research and innovation, which has produced positive outcomes. However, studies on integrating education with research and innovation within the context of collaboration between the government, HEIs/METIs and industry have not been conducted in Namibia.
1.3. Aim of the study
From the perspective of education and research institutions, the dissertation seeks to assess the relationship between education, research, and innovation activities, as well as collaboration between the government, high education/maritime education and training (MET) institutions, and industry, in order to improve innovation, the attractiveness of the maritime industry, and employment opportunities in Namibia. In this regard, it seeks to discover flaws in the Knowledge Triangle's link between education, research, and innovation by studying how the Knowledge Triangle concept is coordinated in national and institutional policies. Furthermore, it investigates recognised best practices for operationalising the concept of Knowledge Triangle at national and organisational levels (Brorstad, 2017). Finally, the study's findings are intended to inform policymakers and key stakeholders like government, education and industry about how to better implement and operationalise the Knowledge Triangle.

1.4. Objectives of the study
The Objectives of this research are to:

1. Assess the requirements of the Knowledge Triangle from High Education Institutions.

2. Determine what the HEIs are doing to ensure the KT requirements are met.

3. Examine the national and institutional policies and programs on the Knowledge Triangle.

4. Assess the collaboration between government, MET institutions, and industry in Namibia's marine industry and analyse the barriers and enablers for the Knowledge Triangle's success.

5. Evaluate the performance of HEIs/METIs on the Knowledge Triangle.

1.5. Research questions
The study seeks to answer the subsequent questions:
1. What are the requirements of the Knowledge Triangle from High Education Institutions?
2. What are the HEIs doing to ensure that the requirements of the KT are met?
3. What national and institutional policies and/or programs are in place to ensure that education, research, and innovation flourish inside the knowledge triangle?
4. What collaboration mechanisms are in place for the Knowledge Triangle key stakeholders?
5. How well are the HEIs doing in meeting the requirements of the KT in the maritime industry?

1.6. Research methodology
This study aims to examine the relationship between government, maritime education and training (MET) institutions, and industry in order to find creative solutions to the weak link between education, research, and innovation in Namibia. In doing this, it seeks to investigate the lack of institutional and national policies on the Knowledge Triangle, elements that generally contribute to the Knowledge Triangle’s success, performance management for the Knowledge Triangle in MET institutions, information sharing between governments, MET institutions, and industry in Namibia's marine industry.

Empirical research methodology in which study findings are exclusively dependent on verifiable evidence, empirical evidence is acquired from a contemporary phenomenon in a real-life setting utilising a logical plan from research questions to the research conclusion (Yin, 2009). It is on this basis that the empirical research is thought to be the best methodology for starting this quest, utilising the qualitative research method and a case study approach to investigate cases and arrive to the conclusion.

According to Yin (2009), a qualitative research method is used to develop research questions, collect and analyse data, and then draw conclusions to support the issue under discussion. The qualitative method of this empirical research employs a case study approach in which a case is a contemporary problem in real life that can involves events,
circumstances, individuals, a group, or an organisation (Yazan, 2015). Furthermore, a case study aims to understand why particular decisions were made, how they were implemented, and what influence they had. In this regard, this study employs a multiple case study approach by utilising numerous cases from three different institutions. Finally, the case study design has four parts: research questions, research propositions (if any), research analysis, research data linkage to propositions, and criteria for turning data into information (Yazan, 2015).

1.7. Structure of dissertation
This section summarises the structure of the dissertation's several chapters. The following are the chapters that make up this study:

Chapter 1
Introduction: The background and context of the research issue are presented in this chapter. It describes the research aims and objectives and explains the problem as stated in the problem statement. It also specifies the research questions that the inquiry aims to answer, as well as the methodology and methods that the study uses to reach its conclusion.

Chapter 2
Literature review: This chapter introduces earlier studies on the same topic done by other researchers on the subject. It examines the relevant literature considering the Knowledge Triangle, the relationship between educational institutions, government, and industry, with a focus on the linkage between education, research, and innovation. It also considers the national and institutional policies that can be used to put the Knowledge Triangle into practice in the maritime sector.

Chapter 3
Methodology: The study goes through the nature of empirical research in detail at each stage of the research process or cycle. It also explains how to gather and analyse data at
each stage of the research process, as well as how to interpret data into useful findings. Finally, it considers the constraints and ethical considerations that the inquiry faces or overcomes.

Chapter 4
Case overview: The data collected from the HEIs are shown in this chapter. It shows data from the Namibian Maritime and Fisheries Institute (NAMFI), the University of Namibia (UNAM), and Namibia University of Science and Technology (NUST) which provides an overview of the collaboration between government, HEIs/METIs, and industry in Namibia, as well as the interaction or linkage between education, research, and innovation, from high educational institutions perspectives.

Chapter 5
Data analysis: Data analysis in a case study research approach entails evaluating, grouping and testing of qualitative data to answer the presiding questions of the research (Yazan, 2015). For this purpose, according to her, there are five primary techniques used for data analysis of the case study research: explanation building, pattern matching, time-series analysis, and cross-case synthesis and program logic models. This research utilises the pattern matching method. To establish internal validity, it is best for a researcher to carry out pattern matching in order to identify patterns that do not match with predicted pattern that were highlighted in the theoretical proposition (Mishra, 2021). The researcher uses a diagrammatic representation with steps leading to the matching of patterns.

Chapter 6
Discussion: This chapter discusses the conclusions of the literature review and the data analysis, to explain how the study findings link with the research questions and past researches, thereby interpreting the meaning and recognising the significance, and relevance of the findings.
Chapter 7

Conclusion and Recommendations: The conclusion is taken from the research findings, and recommendations for further research are made on this premise.
Chapter 2: Literature Review

2.1. Introduction

**Topic:** Anatomy of Maritime Education and Training, Research and Innovation: The Knowledge Triangle from a Namibian Perspective.

To achieve quality education, meaningful research, and tangible innovation in the maritime sector, a close collaboration between government, maritime education and training (MET) institutions, and industry is critical. This dissertation aims to better comprehend the link between education, research, and innovation within the Knowledge Triangle (KT), as well as to identify existing gaps at national and institutional levels. The good integration of the KT leads to the maritime industry's attractiveness and more job opportunities created within the maritime sphere. The relevant literatures that relate to the dissertation topic cover the concept of the Knowledge Triangle, concepts that complement the Knowledge Triangle, role of key actors of Knowledge Triangle, challenges and opportunities of the Knowledge Triangle, and different approaches to the Knowledge Triangle around the world. The figure below illustrates the connection between education, research, and innovation, forming a Knowledge Triangle:
2.2. The Concepts that complement the Knowledge Triangle

While the KT require government, educational institutions and industry to join hands in achieving quality education, research and innovation, there are other concepts that call for different approaches, but the same intended outcome. The open innovation concept was created to facilitate collaboration between different institutional settings, whereby it fosters a technology age perspective toward invention, as opposed to traditional industrial research centres’ secrecy and silo thinking (Meissner & Shmatko, 2017). Another notion that benefits the Knowledge Triangle is the scientific community, which fosters the exchange of research breakthroughs among interested parties, according to the research. Furthermore, the study finds that open-access online courses aid in knowledge management, which is critical for the operationalisation of the Knowledge Triangle. Moreover, the concept of an entrepreneurial learning ecosystem complements the Knowledge Triangle by linking education to society’s economic, social, cultural, and political components in order to foster innovation and progress. Etzkowitz and
Leydesdorff (2000) find that the Triple Helix calls on government, educational institutions, and industry to collaborate in order to achieve innovation, economic progress, and prosperity without emphasis on research, while the Quadruple and Quintuple Helix concepts are an expansion of the Triple Helix concept. The study reveals that the Quadruple Helix has four actors in the innovation process, primarily government, educational institutions, industry, and society while Quintuple Helix requires important players such as the government, educational institutions, industry, and the natural environment to achieve commercial innovation. The study reveals that all these models encourage key players to share their knowledge and talents, and require a strong link between them in order to accomplish societal innovation.

According to the study done by Mavroeidis and Tarnawska (2016), the KT notion is similar to the triple helix in many ways, like both concepts attempt to clarify how knowledge and innovations are developed. However, unlike the KT, which takes an activity-focused approach to connecting education, research, and innovation, the triple helix usually starts with the key stakeholders in the respective national or institutional innovation systems. This means that the KT emphasizes the importance of education and the necessity of keeping a strong link between research and education. Furthermore, non-academic institutions, as well as higher education institutions, require competent research personnel who should be prepared at high educational institutions. The study summarizes that the Knowledge Triangle concept regards knowledgeable human capital and creativity as the primary drivers of economic prosperity.

2.3. The concept of the Knowledge Triangle

The Knowledge Triangle is a term that is utilised all over the world, and in Europe, educational institutions are expected to play a key role in knowledge creation, with its impact assessed from social, economic, and environmental aspects (Sjoer et al., 2013). According to this study, by promoting a link between education, research, and innovation, the Knowledge Triangle requires collaboration between government, educational institutions, and industry. Therefore, for Europe to accomplish its innovation
goals, capable leadership is a critical component in integrating the three vertices of the Knowledge Triangle. It suggests that within the regional innovation system, where educational institutions are at the vanguard of transformation, they are expected to establish communities of practice to create knowledge.

In this regard, European countries united under the European Union in 2000 to declare the EU ambition as the most dynamic, knowledge-based, and globally competitive region (Etzkowitz & Leydesdorff, 2000). To do so, they took the approach of a close collaboration among the Knowledge Triangle's main actors, as well as combined efforts from various national governments in facilitating public and private research programs. These research undertakings should then transform into real innovation, and adjustments must be made to national and institutional policies so that they remain relevant to and supportive of innovation demands.

The shift in expectations from governments and society places pressure on higher education institutions (HEIs) to establish new models for education management (Stolze & Sailer, 2022). They suggest that educational institutions must meet the widespread demand for the formation of new techniques and models that create management competence, which has traditionally been identified with the business industry only. In the end, this will assist high educational institutions in transforming into entrepreneurial organisations that give economic, social, and technological advantages in the places in which they operate, thereby adding a third mission of innovation to their customary two, education and research. Educational institutions with dynamic skills may successfully capitalise on opportunities and manage risks to remain competitive in the market; yet, the third mission of high education institutions, according to them, is underexplored.

Governments, HEIs or METIs, and industry can collaborate effectively thanks to several factors (Cai & Etzkowitz, 2020). According to their work, effective collaboration within the knowledge triangle is achievable because of educational institutions' ability to generate and provide knowledge, supportive mechanisms, flexible regulations, and a
thirst for knowledge and creativity in business or industry. Further, they submitted that intangible enablers include the organisation's shared values, which influence the organisation's culture, information management, situational awareness, and successful management.

The Knowledge Triangle integration tries to transform the conventional approach in which knowledge transfer moves from higher education institutions (HEI) to industry, which is one of the key challenges in translating scientific achievements into commercial inventions (Shtereva, 2017). Furthermore, through bringing social engagement into the mainstream of the knowledge triangle, entrepreneurship, which is a bridge between knowledge and innovation, can become easier.

2.4. Roles of key actors of the Knowledge Triangle
High educational institutions (HEIs) are important for three reasons, according to Cervantes (2017). Firstly, they act as a medium between the government, which is charged providing capital and policy direction, and the private sector or industry, which supplies the labour that drives economic growth. The study argues that knowledge transfer is a vital ingredient for economic progress, and HEIs help to generate effective human capital. Furthermore, effective education is essential in developing and or emerging economies to support the development of a better knowledge base.

High education Institutions (HEIs) are adequately funded in the Organisation for Economic Cooperation and Development (OECD) countries, where they get good return on investment through the acquisition of knowledge capital (Cervantes, 2017). Secondly, HEIs get a significant percentage to carry out basic and applied research that are public funded, with strong HEIs increasing the efficiency of research operations to obtain the best knowledge capital in the Knowledge Triangle, according to the research. Ideally, high educational institutions are the primary sources of knowledge for research, with research and development (R&D) institutions serving as secondary sources. Thirdly, HEIs are significant because of their third mission of social contribution and
knowledge transfer, in which educational institutions are expected to play a significant role in innovative activities within their jurisdictions (Cervantes, 2017).

The government should act as a facilitator, ensuring that the knowledge triangle is well coordinated and challenges affecting the industry are addressed as they emerge (Peeters & Pilon, 2018). The study suggests that apart from its facilitation function, the government must also offer appropriate financial support and a guarantee that a good climate is formed within the knowledge triangle to encourage active education, research and innovation. It argues that there is unlikely to be progress, a drive to innovate, and achieving an appealing industry if there is a missing link within the Knowledge Triangle. The HEIs/METIs, according to the study, give solutions to challenges in the marine sector by pioneering education and research that are transformed into pragmatic innovation, hence promoting the maritime industry’s professionalism and creativity. Furthermore, the industry oversees the practical part of the knowledge triangle, where the theories of HEIs/METIs are put into practice to create products and services.

Although universities' roles vary by area in Europe, their ultimate purpose is to introduce knowledge and build on it in order to achieve long-term success (Markkula & Kune, 2015). The study reveals that under the EU’s Smart Specialisation program, universities make four contributions to society: firstly, universities conduct both basic and applied research, which results in corporate innovation. Secondly, they contribute to individual learning by developing knowledge capital. Thirdly, universities foster collaboration between government and industry in order to achieve community development. Fourthly, for institutional strengthening in the region; universities' contributions to organisational learning via communities of practice and other instruments. Understanding the roles and competencies of each actor in the Knowledge Triangle is essential for its synergy and, more importantly, for the universities or METIs third mission to be realized (Meissner & Shmatko, 2017). They argue that policymakers who draft legislation that affects the Knowledge Triangle's operation should be well-versed
in education, research, and innovation in order to create policies that promote the Knowledge Triangle.

2.5. Challenges and Opportunities of the Knowledge Triangle

Despite its advantages, the Knowledge Triangle has its own set of difficulties (Meissner & Shmatko, 2017). They suggest that maritime education and training institutions should deal with the challenges posed by the Knowledge Triangle's interconnectedness. Furthermore, they suggest that it is critical that actors in the Knowledge Triangle use operational models that are consistent with those of other Knowledge Triangle actors in order to achieve the desired output that benefits society.

The operational nature of educational institutions, as well as how the Knowledge Triangle concept is entrenched in the activities of the institutions, remains a difficulty (Sjoer et al., 2013). To date, according to the study, educational institutions have not recognised fundamental drivers of Knowledge Triangle success, such as cultivating an entrepreneurial mindset that allows critical stakeholders to collaborate. As a result, it is unclear who, according to them, should support the push for a successful Knowledge Triangle in educational institutions: the administration or the institution's leadership.

Recent technology breakthroughs, such as the fourth industrial revolution, have presented a great opportunity to achieve the United Nations' sustainable development goals, according to Zhou and Etzkowitz (2021). Simultaneously, these changes have made it increasingly difficult to locate suitable employees to fill technologically advanced positions, they argued. Furthermore, the risk that technology poses to the maritime environment is another area of concern, where they submit that inside the Knowledge Triangle; these new occurrences necessitate more contacts than ever before, in which each party must provide its unique strength in finding solutions to the maritime industry's problems.
Performance-measuring systems for educational institutions have not yet been fully created (Groumpos & Meissner, 2021). However, and according to them, it appears that educational institutions follow the Knowledge Triangle, which focuses on the transfer of education into research and then research into innovation. In this regard, these indicators are important for evaluating the performance and status of educational institutions.

The main obstacle to full participation and commitment of HEIs in the Knowledge Triangle is a lack of government funding for education and research institutions (Shtereva, 2017). Moreover, missions and priority issues also play a role in the integration of a knowledge triangle, from the HEIs’ perspective; a participation in knowledge triangle activities is not a priority, making them to focus on other aspects of their purpose. Industry, on the other hand, does not invest enough in research and innovation to optimise the use of knowledge offered by higher education institutions, they, on the other hand, focus more on achieving their bottom lines (Shtereva, 2017).

Furthermore, the Knowledge Triangle concept is not incorporated into policies of the knowledge triangle’s primary actors, primarily the government, educational institutions, and industry, making it difficult to withstand shifting priorities (Shtereva, 2017). He believes that strengthening entrepreneurship and capacitating stakeholders of the knowledge triangle to flourish are efforts aimed at solving the integration paradox, by physically putting HEIs, industry, and research agencies together to form a united front known as Knowledge and Innovation Communities (KICs). He concludes that the KICs can then collaborate in established centres to discuss and solve issues on education, research and innovation in the public interest in which governments have a crucial role in policy direction and financial support throughout the process.

Since the addition of innovation as a third dimension to the Knowledge Triangle, new requirements have emerged that affect other vertices of the triangle and to turn research into innovation, henceforth, national and institutional policies that guide and govern
innovation are essential (Lassnigg et al., 2017). Therefore, soft skills like communication, persuasion, and teamwork appear to be required for the innovation vertices of a knowledge triangle, according to the study, which have not been required for the other vertices.

Before a higher education institution communicates creative ideas to industry, it must first be able to innovate inside, argues Shtereva (2017). In practice, and according to him, the difficulties in implementing the knowledge triangle integration lies within the Knowledge Triangle, whereby there is limited information sharing, commitment and a desire for practical action among the primary actors. Another issue he found is that HEIs, research institutes, and industry have differing perspectives on how they might meaningfully contribute to and operationalise the Knowledge Triangle. With a mismatch in knowledge and skill needs he finds, university or MET graduates appear unprepared for solving problems in the workplace.

2.6. Different approaches to the Knowledge Triangle around the world.

The Nikola Vaptsarov Naval Academy in Varna, Bulgaria, in collaboration with the government and industry solved the scarcity issue of experienced trainers by changing one employment contract policy to two per individual (Belev, 2018). According to Belev, the initiative is one of the success stories of the Knowledge Triangle to date, where employees of the academy could keep their certificates of competence or licenses up to date by working at sea for around four months. Not only do they get their certifications updated, he noted, but they also learn about modern ships, research and increase their innovative capacities. The study found that other maritime organisations have adopted for the same dual-contracting strategy, allowing employees to freely trade their knowledge and skills. To this end, many marine experts from port authorities, shipyards, surveyors, and naval architects, and others, have been permitted to work part-time at the academy, contributing the much-needed knowledge and skills transfer, he commented. Hence, not only has the academy alleviated the institution’s lack of skilled educators, according to the findings, but it has also enabled employee mobility by
switching professions. Furthermore, employees with two employment contracts earn more and are highly motivated to work hard, innovate, and make the industry more attractive.

The Bayh-Dole Act was enacted in the United States of America to control government-funded research in order to stimulate innovation in the country, according to Vonortas (2017). According to him, the government would retain ownership of research conducted with public funds, and access to these findings would be made easier without the need for a license. The act’s major goal was to simplify the bureaucratic process of property rights and to bring education, research, and innovation together under a single national policy, he found. As a result, the Bayh-Dole Act gave higher educational institutions in the United States the ability to formalise their third mission of innovation through national legislation, addressing a lack of legal framework governing the connection of education, research, and innovation. He argued that because of its success, it was adopted in other parts of the world, including Europe, and has since become the most widely used act establishing a legal framework for collaboration between government, educational institutions, and industry in the pursuit of cutting-edge education, pragmatic research, and industrial innovation. He emphasises that there is no universal Knowledge Triangle model in terms of implementation and integration; rather specific demands of the country and the various missions of knowledge triangle participants, shape the approach that must be used.

Casagrande (2018) found that the ‘Blue Denmark’ Campaign was launched in Denmark to ensure that more people were brought into the mainstream of Danish maritime occupations. The findings show that the maritime sector actors such as ports, shipping firms, shipyards, maritime equipment suppliers, maritime service providers, educational institutions, regulatory bodies, research organisations, and the government support the ‘Blue Denmark’ initiative. The campaign brings together the above-mentioned key maritime industry players to consider the industry’s opportunities, strengths and developing educational programs that prepare graduates for engagements in research and
industrial innovation while also providing job opportunities and a knowledge base for the maritime sector. The Blue Denmark program, which responds to the government’s plan for blue economy growth, is spearheaded by the Svendborg International Maritime Academy's (SIMAC) educational program for seafarers. In this regard, SIMAC collaborates with other maritime industry players to raise international awareness of Blue Denmark, thereby expanding the maritime cluster and strengthening Danish maritime product and service exports. A strong maritime cluster, a conducive environment for maritime business, Quality shipping, strong competencies and qualified labor, and developing high tech, green maritime solutions for the future are all goals of Blue Denmark.

Brancatelli and Souza (2016) uncovered the concept of ‘Doing Brazil in Brazil’, in which a collaboration between university professors/lectures, government officials, students, and industry representatives was introduced in Brazil. According to the study, the effort was spearheaded by Jesuit universities with the goal of removing the barriers to collaboration between higher educational institutions, government, and industry, using the knowledge triangle as a metaphor. They argued that the Knowledge Triangle vertices’ dynamism aims to achieve economic advancement with technology by eradicating long-held organisational ideas and cultural beliefs that obstruct the connection between education, research, and innovation, thereby suffocating economic and technological competitiveness. Therefore, ‘Doing Brazil in Brazil’ deals with the operationalisation of the Knowledge Triangle from a Brazilian perspective by first understanding the country’s complexity, including history and diversity, and then asking industry or businesses to understand this complexity, in order to produce products and services that are compatible with the needs of the Brazilian society.

The Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung (BIBB)) was founded in Germany to work with the German government, civil societies, and industry to revise training policies in the field of vocational education and training (VET) and integrate technical vocational education and training (TVET)
into the mainstream of innovation and economic development (Etzkowitz & Leydesdorff, 2000). The findings show that BIBB guarantees that the training provided is relevant, thorough, and responsive to labour market demands; additionally, it aims to foster national and international innovation systems by establishing practical solutions for new and existing vocational education and training programs. At the same time, BIBB is keeping an eye out for new difficulties in vocational education and training. The study finds that due to evolving economical, technological, and social trends, businesses are under pressure to stay competitive, relevant, and current. As a result, BIBB is bridging the gap between the labour market demands and workforce supply. As a result, Germany has a dual system of vocational education and training qualifications, with learning first acquired through first VET schooling and subsequently, lifetime learning attained through employer-facilitated work-based vocational education and training.

The South African International Maritime Institute (SAIMI) was established in South Africa in 2014 by the Nelson Mandela University (NMU), the South African Maritime Safety Authority (SAMSA), and other partners including the government, MET institutions, and industry. The first of SAIMI's four intervention areas is skills development and capacity building, where it supports, coordinates, facilitates, and implements initiatives from various maritime industry stakeholders, including those in aquaculture, marine transport, marine protection and governance, harbour development, oil and gas, maritime manufacturing, and coastal marine and tourism. The second is, SAIMI was entrusted with facilitating stakeholder relationships and collaboration, particularly between the government, educational institutions, and corporate sector. The third program is the national seafarer development program, which is managed by SAIMI under the National Seafarer Development Program (NSDP) umbrella. In order to increase the number of South African seafarers working in the local and global shipping fleet, it establishes win-win agreements with local and international shipping companies. The fourth is, a national vision and strategy for maritime research, innovation, and knowledge management whereby the roadmap establishes the national
strategic agenda for research, innovation, and knowledge management in priority areas, guiding the national blue economy’s sustainable growth. The National Skills Fund (NSF) and the Department of Higher Education and Training (DHET) provide support for SAIMI (NSF).

2.7 The Burke-Litwin Causal Model

The Burke-Litwin Model is suggested by the study as a conceptual framework for explaining the comprehensive system involved in high educational institutions’ shift from conventional learning environments to much more research and innovation education systems (French et al. 2022). Therefore, the Burke-Litwin Model is used in this study because it provides a compressive framework for assessing factors or gaps that could impede the proper integration and implementation of the Knowledge Triangle (KT) in the industry. As stated in chapter one, this study seeks to answer the following questions:

1. What are the requirements of the KT from High Educational Institutions (HEIs)?
2. What are the HEIs doing to ensure that the requirements of the KT are met?
3. What national and institutional policies and/or programs are in place to ensure that education, research, and innovation flourish inside the KT?
4. What collaboration mechanisms are in place for the KT key stakeholders?
5. How well are the HEIs doing in meeting the requirements of the KT in the maritime industry?
The Burke – Litwin Analytical Framework as shown in Figure two provides a comprehensive analytical framework, covering all the factors that may affect the ability of institutions to effectively implement and operationalize the Knowledge Triangle (KT).

The external factors: political, economic, social, technological, environment and legal factors are known by PESTEL acronym. The first group of factors in this model are those over which the high educational institutions have little or no control. As the name implies, these factors come from the external environment and can either be political factors such as wrong or poor political decisions, political support, government policies and political situation; economic factors such as the economic growth at both national
and global levels, and unemployment rate; social factors such as the availability of appropriate skills and the imbalance of skills supply and demand; technological factors such as the tools and infrastructures necessary for education, research and innovation, technological awareness and the level of innovation; environmental factors such as environmental conditions, environmental impacts, policies and regulations that affect the operationalisation of the KT and legal factors such as institutional, national and international programs, policies and regulations that affect the KT, research copyright issues and employment laws.

The second group of factors are the strategic factors, which look at the ability of the institutions’ management to create a mission and vision of education, research and innovation, with a clear roadmap on achieving them. They also look at the ability of management to exercise leadership, guide and influence team members towards quality education, research and innovation. Moreover, they evaluate management practices such as leadership styles that break or make organisational culture. It requires a transformational leadership to navigate through these factors for the realisation of a functional Knowledge Triangle.

The third group of factors are the operational factors which evaluate the organisational structure which depicts the hierarchical order, and guide how decisions on education, research and innovation are made. They investigate the work environment aspects such as trust, support, risk-taking and accountability in the organisations. Furthermore, they examine the institutional policies and procedures that are in place for the implementation and operationalisation of the Knowledge Triangle, all of which require a transactional leadership.

The fourth group of factors are the individual factors which evaluate the job and skills match in the organisations, motivation of employees to go extra miles on creativity around research and innovation. The values and needs whereby employees develop standard of behaviours, commitment to the organisation and uphold a firm belief that
what they do is for the common good. These factors dictate the contribution of individual performance of employees on the Knowledge Triangle.

Lastly and most importantly is the output which is the result of the combination of individual and collective performance, and of which decides the overall organisational performance on the Knowledge Triangle integration and operationalisation. The output is measured on the actual output of the organisation against its desired output on the KT performance.

2.8. Summary
After reviewing works by various authors, the following issues were discovered regarding the Knowledge Triangle: Firstly, a good collaboration between government, high educational institutions (HEIs)/maritime education and training (MET) institutions, and business/industry is vital to achieving good education, research, and innovation in the maritime domain. The government provides required financial support and ensures that a favourable environment is created for the knowledge triangle. High educational institutions provide solutions to difficulties in the maritime industry through pioneering education and research that are translated into innovation, while the industry oversees the Knowledge Triangle's practical aspect, innovation or development. Secondly, the operational architecture of high educational institutions, as well, as how the Knowledge Triangle concept is embedded in the institutions' activities, continues to be a challenge. Furthermore, performance-measurement systems for educational institutions have yet to be fully developed based on the Knowledge Triangle. And the Knowledge Triangle integration is difficult to implement because there is limited information sharing, commitment, and a desire for practical actions among the primary actors. Thirdly, many countries have come up with national policies or programs such as: The Bayh-Dole Act, Doing Brazil in Brazil and Seafarers/Staff Development Programs, to create a knowledge-based marine economy that is attractive and contributing to employment creation. Consequently, the purpose of this dissertation is to address the above highlighted issues.
Chapter 3: Methodology

3.1. Introduction
This study aims to examine the relationship between government, maritime education and training (MET) institutions, and industry in order to find creative solutions to the weak interaction or link between education, research, and innovation in Namibia. Through a case study, it seeks to investigate the institutional and national policies on the Knowledge Triangle, elements that generally contribute to the Knowledge Triangle's success, performance management for the Knowledge Triangle in MET institutions, information sharing between governments, MET institutions, and industry in Namibia's marine industry.

A case study, according to Yin (2009), is an empirical investigation that examines a current phenomenon in-depth and within its actual context, such as organisational and management processes, particularly where there are no obvious borders between the context and the phenomenon. Furthermore, a qualitative research method is used to develop research questions, collect and analyse data, and then draw conclusions to support the issue under discussion. Yazan (2015) argues that a case study aims to understand why particular decisions were made, how they were implemented, and what influence they had. The first phase, according to Yin (2009) is about theory building, case determination, and research ethics processes. This research employs a multiple case study which is presented in a flow diagram below in accordance with Yin (2013):

The Burke-Litwin Casual Model is created as indicated in a multiple case study diagram below to guide the approach of the entire dissertation and to determine if the empirical evidence supports the theory.
Therefore, the researcher develops a theory to provide the analytical framework to the problem. Secondly, the researcher identifies three educational institutions to provide the KT perspectives and designs the data collection procedures. The research collects data from three educational institutions, following this stage, the researcher writes a report on each data collection case and evaluates the findings; data gathering details are provided in chapters four and five. The researcher then examines the research questions by comparing research findings with the literature review in chapter six. Finally, in Chapter 7, the conclusion is reached and recommendations are made for future research.
3.2. Data collection

The researcher identifies three stakeholders for data gathering mainly the Namibian Maritime and Fisheries Institute (NAMFI), University of Namibia (UNAM) and Namibia University of Science and Technology (NUST) in Namibia. These three institutions were chosen for research data collection because they are the main players in high education/MET, research, and innovation. They can also best explain the relationship between the government, high educational institutions/MET institutions, and industry, given their cross-cutting functions.

In this study, the researcher collects data using the following methods: emailed questions, record archives, document reviews, and online interviews to follow up on answers provided to emailed research questions. Therefore, the researcher collects data via emails, in which educational institutions and a research centre reply to research semi-structured questions posed to them, and then follow-up interviews for additional questions or clarifications will be conducted online, based on the responses to the research questions. Additionally, documented evidence is requested to back up the claims. To assure the validity and credibility (trustworthiness) of the study findings, the triangulation method is applied in this research. Validity refers to how well the study reflects the topic or case being studied, whereas credibility refers to how legitimate the study appears to the readers. As a result, triangulation helps in ensuring that no biases arise from a single case study (Noble & Heale, 2019).

Data is collected from the following three institutions:

Namibian Maritime and Fisheries Institute (NAMFI) – This institution was selected on the basis that it is the main provider of maritime education and training (MET) courses that meet STCW convention requirements in the country. However, MET institutions have struggled to go beyond just meeting the STCW convention requirements with less participation on research and innovation activities within the maritime sector.
University of Namibia (UNAM) – This institution offers courses at a degree level in Marine/Ocean Science. It also provides courses on Nautical Science under the school of military science that cover both marine engineering and navigation. The institution is in the process of establishing a school of marine engineering and maritime studies. It is however not yet clear how the institution’s marine and maritime education contributes to research and how that research adds value to real innovation in the country.

Namibia University of Science and Technology (NUST) – Namibia University of Science and Technology (NUST) was chosen because it offers a Bachelor of Technology degree in Marine Engineering in collaboration with Satakunta University of Applied Science in Finland. Students of this program are provided with knowledge and skills that can allow them to work on ships and land-based maritime institutions. The two universities work together with Namibian Maritime and Fisheries Institute (NAMFI) in Namibia to provide the practical aspect of the program.

3.3. Data analysis

Data analysis in a case study research approach entails evaluating, grouping and testing of qualitative data to answer the presiding propositions of the research (Yazan, 2015). The thematic analysis, which is a form of qualitative research analysis that is used to identify, analyse and interpret data patterns by explicitly analysing data, pinpointing similar trends in the content and providing the meaning and conclusion is used.

The thematic analysis is chosen in this research because it is compatible with data from semi-structured questions, online interviews and archived documents. The steps that were taken in analysing the qualitative data are as follows:

1. Research data familiarisation

The researcher familiarises himself with the research data from semi-structured questions, online interviews and organisational documents then transcribes or puts them in a written format. He reads through the content, observes similar patterns and notes the observations down.
2. Codes creation
The researcher does the coding of the thematic analysis by reading and finding interesting extracts from the contents and assigns them corresponding codes depending on how they relate to one another.

3. Compare the codes with the data from different sources
The researcher groups together all the extracts from all the sources, that are related to a certain code by using a pen and a paper.

4. Group coding the data into themes
The researcher arranges the codes into possible themes to observe patterns and trends in the data. He also combines, re-arranges and removes some themes where appropriate in order to make meaningful sense.

5. Writing the narrative
The researcher communicates the validity of the analysis to the readers, by telling a logical story emanating from the research data. The author also includes his own interpretive evaluation and discusses the claims presented. This includes the evaluation for the suitability of answering the research questions, where if the information from the collected data answers the research questions, the research process shall proceed to the next phase. If the information does not provide answers to research questions, then the questions shall be re-written.

As stated in the literature review, the researcher utilizes the Burke-Litwin Causal Model - Organisational analysis to assess organisational conditions that could impede the proper implementation and integration of the Knowledge Triangle in the maritime sector. The organisational analysis considers five main factors that interdepended: External factors (PESTEL), strategic factors (Mission/Strategy, Leadership, and Organizational Culture), Operations factors (Structure, Management Practice, and Policies & Procedures), Individual factors (Individual skills & tasks, Rewards & Motivation, and Individual needs & Values) and Outputs (Individual & Organisational Performance), according to Lewin (2007). After identifying the element groups that require change, the specific factors within the primary groups are identified and
assessed. The analysis is then performed to determine how each element affects the next factor, and an action plan is produced to bridge the discovered gaps.

3.4. Validation of Data
Construct validity is established by capturing data from different stakeholders or respondents who have a role to play in a case, and drawing of a conclusion on research findings should be supported by data (Mishra, 2021). Therefore, the researcher establishes reliability by developing a research protocol with the following five sections: overview of the multiple case study, procedures for data collection, research questions, documentation and presentation. Finally, the researcher shall keep record of the entire multiple case study database linked to the findings that can be tracked as evidence (Mishra, 2021).

3.5. Limitations of data collection
Even though the research seeks to investigate maritime education, research and innovation within the framework of collaboration between the government, high education institutions/maritime education and training institutions, and the industry, the researcher admits that data collection is limited to high educational institutions, and this may not represent the diverse view of the maritime industry stakeholders such as port authorities, shipbuilding companies, classifications societies and shipping companies.
Chapter 4: Case Overview

The qualitative research data collection process involves three high educational institutions, using semi-structured questions, documents review and online interviews.

4.1. Namibian Maritime and Fisheries Institute (NAMFI)

According to archived documents, NAMFI is mandated to further the practical education of Namibians to take up qualified positions within the maritime and sea fisheries industries in Namibia in particular, but without limiting the generality of the foregoing, as certified officers on-board fishing vessels, or other skilled positions on ships or regarding the functioning of harbours, and regarding the processing and marketing of fish and maritime products. The mission is to provide high quality Marine and Fisheries Training in accordance with national and international standards. While the vision is to be a leading Maritime and Fisheries Training Centre of choice in the SADC region. To

Figure 5: Namfli main campus – Photo by Namfli
carry out this mandate, and to fulfil the mission and vision, the answers to semi-structured questions reveal that NAMFI engages in maritime education and innovation, since the constant changing trends in the maritime industry, necessitates innovative approaches in order to be competitive. However, due to staff shortage at the institute, the responsibility of innovation is entrusted with executive committee (EXCO), heads of departments (HoDs) and Senior Instructors, and it has been observed not to be given the desired attention. The institute is being encouraged through its review meetings to become more innovative and results driven, notwithstanding the fact that most of the employees lack knowledge and experience on research and innovation. There are feelings that it is impossible for research and innovation responsibilities to be added to the already overloaded daily academic duties, especially for teaching staff.

The semi-structured questions reveal that the Ministry of Higher Education provides national legal framework on education, the Namibia Training Authority (NTA) gives regulatory cover for technical vocational education and training (TVET), Namibia Qualification Authority (NQA) regulates high education and training in the country and the Directorate of Maritime Affairs (DMA) is responsible for certification and compliance enforcement regarding STCW regulation. The Namibian Maritime and Fisheries Institute offers training to personnel of the maritime sector at different levels, with the main objective of providing high quality training to marine navigators, marine engineers and safety courses in accordance with the International Standards. Archived documents indicate that the main tool used to reach this objective is the International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW 78/95 and STCW – 95 /F). The semi-structured questions also show that the Directorate of Maritime Affairs of the Ministry of Works, Transport, and Communication has authorised all the training curricula. Now, NTA is embarking on Maritime Skills Training program and has formed a committee to investigate the national needs in maritime sector, however, the undertaking of research and innovation remain a challenge in TVET and MET institutions.
The semi-structured questions further reveal that NAMFI’s education and training is centred around TVET. As such the institute is not much into applied research as well as innovation since it strictly follows the guidance of STCW convention. The possibility of the connection between education, research and innovation in the future depends on the Ministry of Fisheries with the introduction of new programs at higher levels than what they currently are. The Institute continues to experience slow growth, in terms of its product offering to accommodate the ever-increasing and diverse market requirements and to facilitate accessibility to learning. In this regard, the Institute continues to uphold its business model around collaborative partnerships. These are reviewed on an ongoing basis for relevance and competitiveness, as the institution continues to evolve. The online interview highlights that the reviews are conducted with a view to put in place partnerships that are aligned with where the institution is going in terms of its Corporate Strategy. Nevertheless, the Institution continues to make great strides towards positioning itself as an institution that “transforms lives, in the region and beyond” through these collaborative arrangements.

The semi-structures questions further disclose that the institute gets an annual grand from the central government through its line Ministry of Fisheries and Marine Resources for operational costs. Furthermore, it collaborates with other industry players through stakeholders’ workshops in achieving quality education. Archived documents show that a memorandum of agreement was signed in March 2021 by NAMFI and the Namibian Ports Authority (Namport), with a considerable emphasis placed on maritime training and job creation. The partnership presents a fantastic chance to enhance the MET cooperation between the two institutions. Under the terms of the agreement, the institutions will work together to produce curricula in a few important and emerging study areas as per the needs of the maritime industry.
Figure 6: The Namibian Ports Authority (Namport) and the Namibian Maritime Fishing Institute (Namfi) signing a memorandum of understanding (MoU)- Photo by Erongo News
4.2. University of Namibia (UNAM)

Archived documents show that UNAM’s mandate is to provide higher education, undertake research, advance and disseminate knowledge, to provide extension services, to encourage the growth and nurturing of cultural expressions within the context of the Namibian society, to further training and continuing education, contribute to social and economic development of Namibia, and to foster relationships with any person or institution both nationally and internationally. Its mission is to contribute to the achievement of national and international development goals through the pursuit of translational research, quality training and innovation. While the vision is to be a sustainable international hub of excellence in higher education, training, research and innovation by 2030. In this regard, the semi-structured questions reveal that UNAM employs latest innovation in research and technology. It has a specialised research campus that deals with all marine related studies. The publications of these researches
are published with reputable journals and to some extents are made available on the UNAM library website. UNAM have also introduced short courses in Big Data Technologies; Advanced Web Technologies; and Ethical Hacking and Information Security. This comes as a result of the newly established Centre of Excellence in Information Technology.

The structured questions further reveal that the Sam Nujoma Marine and Coastal Resources Research Centre (SANUMARC) core functions are to provide higher education, undertake research, advance, and disseminate knowledge, to provide extension services, to encourage the growth and nurturing of cultural expressions within the context of the Namibian society, to further training and continuing education, contribute to social and economic development of Namibia, and to foster relationships with any person or institution both nationally and internationally. The online interview reveals that the university commits to enter collaborations and partnerships that are aimed at building and exchanging knowledge, skills, expertise and resources with other universities as well as other key stakeholders and customers particularly, Government, staff, students and the community. The semi-structure questions reveal that UNAM is endowed with the necessary social networking connections, information infrastructure, technical know-how and corporate reputation, teleconferencing capacities, strategic social projects nationwide and occupies a central role in the social stratum of the country.

The semi-structured questions further disclose that UNAM will take stakeholders’ aspirations into account during design, development, and delivery of envisaged programs. The University will further ensure that knowledge creation, production, applicability, and practicality are key to sustainable community engagements. Research activities at the SANUMARC are geared towards developing the fisheries and aquaculture sectors, desert and coastal agriculture to complements research and development efforts by the Ministries of Fisheries and Marine Resources, and Agriculture, Water and Forestry, Ministry of Mines and Energy, and the Ministry of
Environment and Tourism. UNAM carries out various govt commissioned research, training and consultancies and collaborations in its various faculties.

The semi-structured questions further reveal that UNAM is a state sponsored institution and thus receive annual operational funding from the government. The government further provides scholarships and bursaries to several students from undergraduate to Postgraduate. UNAM has various collaborations and funding from several maritime time institutions which includes the government’s Ministry of fisheries. The online interview reveals that UNAM collaborates with the Ministry of Defence to run a Bachelor of Science in Military Science, specialising in Nautical and Mechanics for the Namibian Navy.

4.3. Namibia University of Science and Technology (NUST)

*Figure 8: Namibia University of Science and Technology (NUST) main campus – Photo by NUST*

Archived documents show that NUST’s vision is to become a premier technological university known for knowledge creation, innovation, and entrepreneurship, while its
mission is to be a responsive university, meeting the needs of stakeholders through excellent education, applied research, innovation and service. In order to successfully accomplish the two, the semi-structured questions show that a division of research, innovation, and collaborations was founded in 2018. This was made more necessary by the university's overall desire to accelerate research and innovation. Additionally, this section enhances research development activities, solicit external funding and forge connections with industry, local communities, and international alliances to entice chances for consulting, applied research, technology innovation, and transfer.

In a similar spirit, the online interview reveals that the program for a double degree was created in collaboration with Finland's Satakunta University of Applied Sciences (Satakunnan ammattikorkeakoulu (SAMK)). By offering hand-on training in marine engineering, in which it seeks to prepare students who want to work at sea as Marine Engineer Officer. Overall, the curriculum provides students with the in-depth and organised knowledge and abilities needed to properly manage, operate, maintain and repair ships and land-based installations. Due to the program's emphasis on hands-on learning, one of NUST's industry partners, the Namibian Maritime and Fisheries Institute (NAMFI), collaborated closely with both universities to design it. Document reviews show that the program is available full-time for four and a half years, during which students can study in Finland and participate in Work Integrated Learning.
The semi-structured questions reveal that all NUST programs are benchmarked at least with three Universities in the SADC region and three international universities. And every academic department at NUST is required to achieve a minimum research output. Furthermore, NUST allocates time to academic staff members for community engagement. This helps the staff members to identify community problems and come up with innovative solutions. To advance the institutional research fund management policy, the Project Services Unit (PSU) at the university was created to provide strategic guidance for developing collaboration among all Faculties, Institutes, and Centres with the goal of maximising efficiency, igniting, and enhancing current research endeavours, according to documents review. Hence finding chances to use research project funds or grants as leverage for regional and global development initiatives. As a result, the Unit supports grant creation, management, including project plan.

Figure 9: Faculty staff and Bachelor of Technology in Marine Engineering students at NUST - Photo by NUST
Archived documents further show that teaching and learning, community involvement, and research have historically been the three pillars upon which the main operations of universities have been based. Research is a major factor in the good standing and ratings of all top universities. This is not to argue that other fields are less valuable, but a university needs a strong research strategy to produce knowledge and innovation. In the end, important and pertinent research ought to advance the nation's socioeconomic progress, upon which the impact of education, research and innovation can be measured.

Semi-structured questions’ further reveal that in order to fulfil the demands for industrial innovation, NUST examines its academic programs every five years in collaboration with the relevant stakeholders. NUST has spent the last ten years investing in infrastructure to assist efforts to provide high-quality education, in which programs at the university are created with the input of the business community or industry, and they go through a rigorous accreditation and endorsement process that includes Namibia Qualification Authority (NQA) and the National Council of Higher Education (NCHE). Document reviews indicate that NUST has so far collaborated with some of the following institutions and organisation in research and innovation: The International Conference on Data Science, Machine Learning and Artificial Intelligence (DSMLAI), the African Research Symposium programme, Namibia-India Centre of IT (INCEIT), The International Multi-Disciplinary Information Technology and Engineering Conference (IMITEC) and Computer Society and the IEEE Technical Committee on Data Engineering.
5.1. Objectives of the research
The dissertation seeks to evaluate the relationship between education, research, and innovation activities as well as collaboration between the government, high education/maritime education and training institutions, and industry, in order to enhance innovation, the attractiveness of the maritime industry, and employment opportunities in Namibia. The qualitative research method is used in data collection and its analysis.

5.2. The Burke-Litwin Causal Model
It has been demonstrated that the Burke-Litwin model of organisational analysis offers a reliable framework for outlining the connections between various elements of an institution (Burke & Litwin, 2002 as cited in Benjamin, 2017). As stated in chapter two, the qualitative research data is evaluated based on this analytical framework, specifically on PESTEL (which is an acronym for political, economic, social, technological, environmental and legal), Transformational leadership, Transactional leadership, Individual performance and organisational performance.

5.2.1. PESTEL

Political
The political support from the government is very important for the operationalisation of the Knowledge Triangle (KT) in Namibia. In this regard, NAMFI’s line Ministry is that of Fisheries and Marine Resources, while both UNAM and NUST resort under the Ministry of Higher Education, Training and Innovation (MHETI). The literature review suggests that KT main actors should have their operational models that are consistent with those of other actors (Meissner & Shmatko, 2017). In this case, the data from the semi-structured interviews and the document review reveals the issue that due to that the HEIs fall under different ministerial administrations has resulted in different levels of political support, which is demonstrated by the budget disparity between the two ministries.
**Economical**

Namibia needs innovation that leads to economic growth, with the same resources input generating bigger output. Therefore, according to the literature review, the European Union achieves its ambition as the most dynamic, knowledge-based and global competitive region by using the Knowledge Triangle approach, through the promotion of collaboration between governments, HEIs and industry businesses to realise quality education, research and innovation (Sjoer et al., 2013). Organisational documents show that both UNAM and NUST want to transform society through quality education, research and innovation, while NAMFI endeavours to change society through high quality maritime and fisheries training and innovation. However, the literature review argues that the main obstacles to full participation and commitment of HEIs to the Knowledge Triangle (KT) is the lack of government funding for the HEIs to conduct education, research and innovation (Shtereva, 2017). In this case, the insufficient funding of some HEIs affects quality education, research and innovation output.

**Social**

The three main functions of any high educational institution are education, research and innovation, with innovation driving more social responsibility and Namibian HEIs are not exception. The data from the semi-structured questions suggests that NAMFI does not have the capacity in terms of material and human resources to conduct applied research and innovation. Given this, it focuses on its primary mission, education. The literature review supports that high educational institutions capitalise on opportunities and manage risks to remain competitive in the market, yet their third mission, which is innovation, remains unexplored (Stolze & Sailer, 2022). Furthermore, mission priority issues play a role in the integration of the KT, whereby for many HEIs, the participation in research and innovation is not a priority. The question that arises is, can high educational institutions innovate without research? The results also show that UNAM and NUST perform education, research and innovation; nonetheless, the level of innovation in Namibia is still relatively low, suggesting that the issue of innovation is not entirely addressed. For the sake of KT integration, institutions that are unable to conduct education, research, and innovation should establish a division inside the
institutions to investigate research and innovation-related matters while they concentrate on their primary mission, which is to provide education.

**Technological**

Namibian HEIs should embrace technology to facilitates education, research and innovation. For this reason, the data from online interview confirms that UNAM has an artificial intelligence and High Technology Laboratory to bolster innovation, while NUST has an Innovation Design Lab for transforming applied research into creative innovation. However, the literature review cautions that recent technology breakthroughs such as the fourth industrial revolution have presented the good opportunity to achieving the UNSDGs, and on the other hand, they have made it difficult to find employees to occupy technological advanced positions (Zhou & Etzkowitz, 2021). This means that technology helps speed up operational and management processes that are instrumental in advancing education, research and innovation and the shortage of skills in the maritime industry as a result of a paradigm shift in technology is obvious.

**Environmental**

The Namibian maritime industry operates within the natural environment where technology has made life easier. According to the research data, there are no environmental factors that hinder the implementation of the Knowledge Triangle. However, the literature review takes note that the risks that technology poses to the marine environment, such as digitalisation and new fuels are areas of concern and these new dynamics necessitate more integration of the Knowledge Triangle, in which each side providing its unique strength to finding solutions to problems facing the marine environment (Zhou & Etzkowitz, 2021). The construction of new digital equipment requires raw materials that must be transported by sea, thereby contributing to carbon emission and subsequently to climate change. Furthermore, new fuel alternatives have their pros and cons, and their risk on the marine environment is not yet fully known.

**Legal**

There could be legal barriers and enablers to education, research and innovation in Namibia. The data from the semi-structured questions indicates that NAMFI operates
under the regulatory frameworks of the Namibia Training Authority (NTA), Namibia Qualification Authority (NQA) and the Directorate of Maritime Affairs (DMA) as a custodian of STCW convention. While both UNAM and NUST are regulated by the NQA, National Council of Higher Education (NCHE) and other universities. The online interview advices that NAMFI only strives to meet the STCW convention requirements. However, the STCW requirements are just minimum requirements that MET institutions must fulfil and the same institutions can go beyond just meeting these minimum requirements. In addition, although the three HEIs operate under national and international legal provisions, the literature review highlights that the concept of the KT is not incorporated into policy documents of the KT’s main actors, making it difficult to obtain commitments from different high educational institutions. One example of removing legal barrier in the KT is the Bayh-Dole Act which was enacted in the United States to promote and control government funded research in the country, making it easily accessible by the government, high educational institutions and industry for innovation purposes (Vonortas, 2017).

5.2.2. Transformational leadership

Mission, vision, and strategy

There must be a clear desired state of the Knowledge Triangle in the Namibian maritime industry and the way of getting there. The document analysis shows that NAMFI’s vision is to be a leading Maritime and Fisheries Training Centre of choice in the SADC region, while for UNAM is to be a sustainable international hub of excellence in higher education, training, research, and innovation by 2030, and for NUST is to become a premier university known for knowledge creation, innovation, and entrepreneurship. To achieve this, it requires a transformational leadership that looks at the vision and rallies the team behind the vision to achieve quality education, research, and innovation. However, none of the three high educational institutions have specified the type of innovation they are engaged in or intend to do. This can either be incremental innovation which focuses on small contentious improvement on existing products and services offering, sustaining innovation which looks at big improvements on products and
services to better position the organisation in the market, radical innovation which involves technological breakthroughs that change the industry and its market and disruptive innovation which disrupts the current status quo in an industry by developing new technologies and business strategies.

The literature review suggests that the high educational institutions (HEIs) act as medium between the government and the private sector. Secondly, they get a significant percentage of public funded research, hence, serving as the primary source of knowledge for research while R & D institutions serving as secondary source of research knowledge. Thirdly, HEIs contribute towards their third mission of social contribution and knowledge transfer whereby they are expected to play an active role in innovation (Cervantes, 2017). These answer the first question of the research on the requirements of the Knowledge Triangle from High Education Institutions.

While all three high educational institutions have ambitious visions on education research and innovation, there is no clear strategy on achieving the national blue economy. The government has potential of collecting more revenue from the maritime industry, many Namibians could be employed in the maritime industry, thereby reducing the unemployment level and business communities in the industry could benefit from a larger knowledge base, when there is active research, innovation, and knowledge transfer across different stakeholders. However, to achieve these visions, there should be a clear roadmap with specific deliverables where high educational institutions and other key industry stakeholders play a role to make sure that the KT is operationalized. 

Leadership

Different leadership styles drive employees to be more creative, hence the Namibian HEIs need dynamic leadership for the KT. Consequently, the Literature Review explains that the Naval Academy in Bulgaria has a program in place that allows teaching staff to work at sea for a certain period and renew their STCW licenses (Belev, 2018). It also permits for switching of professionals within the maritime industry in order to promote knowledge management. Similarly, SAIMI was established in South Africa to develop
the maritime industry and unlock its potential in terms of growth for sustainable blue economy and employment creation. This is done through the creation seafarers development programs that ensure that seafarers get the employment demanding skills and knowledge and that the international shipping companies absorb many local seafarers. According to the documents data, a memorandum of understanding was signed between NAMFI and the Namibian Ports Authority (Namport) on maritime education and training, and job creation. While UNAM collaborates with the Ministry of Defence to run a Bachelor of Science in Military Science for the Namibian Navy. And NUST runs a double degree program in collaboration with Satakunta University of Applied Sciences in Finland. These co-operations and collaborations are some of the organisational creativities meant to leverage organisational knowledge through development and sharing of new knowledge within and between organisations. This clarifies the fourth question on what collaboration mechanisms are in place for the Knowledge Triangle key stakeholders. However, it remains unclear how the facilitation is done between the government, high educational institutions, and the business industry in the maritime domain to achieve the sustainable blue economy as provided for in the national development goals and the United Nations Sustainable Development Goals (UNSDGs).

To this end, it is important to have national programs that would help seafarers in their career progression and enhance their employability in the maritime industry. Currently, Namibian seafarers are faced with a dilemma, whereby when they decide to end their career at sea, they are unable to secure jobs with other industries. The national seafarers’ program may be the best way to solve the problem and build a beneficial relationship with local and international shipping and offshore companies, allowing many qualified Namibian seafarers to work on these companies, thereby reducing unemployment in the country.

*Management practice*

Namibian HEIs need good management practices to help in directing team efforts towards the achievement of a common goal. Unfortunately, the research data does not
address the elements of management practices that are necessary for quality education, research, and innovation, such as quality improvement programs, empowerment of staff members to take initiatives on the Knowledge Triangle, communication and leading by example, just mention some. On the other hand, the literature review suggests that HEIs must meet the widespread demand for the creation of new techniques and models that create management competency, which has traditional been only identified with the business industry (Stolze & Sailer, 2022). This is to say that soft skills like communication, persuasion, and teamwork are becoming increasingly important in the innovation aspect, and HEI management should be competent in them in order to preside over innovating teams.

Organizational culture
A good organisational culture facilitates decision making, activities to be performed and procedures of initiating and implementing innovative ideas by HEIs. Organisational culture therefore, is another aspect that high educational institutions missed addressing throughout the data gathering. While the literature review shows that effective collaboration within the KT main stakeholders is achieved through generating and providing knowledge, supportive mechanisms, flexible regulations and stimulating a thirst for knowledge and creativity in the industry or business (Cai & Etzkowitz, 2020). A strong organisational culture influences the information management, situational awareness, and good leadership. Moreover, it shapes employee behaviour and fosters loyalty among its members. By providing prompt feedback, establishing clear channels of communication, managing implicit knowledge, allowing individual employees to explore and utilise innovation work, and recognising and rewarding strong innovation performance, a good organisational culture is cultivated.

5.2.3. Transactional leadership

Structure
The structure allows HEIs leaders to create tasks for employees and other stakeholders, assign resources and guide on performing the tasks. Accordingly, the literature review submits that before HEIs communicate creative ideas to industry for innovation, they
must first be able to innovate internally (Shtereva, 2017). However, limited information sharing, lack of commitment and different perspectives on the KT, obstruct its integration. Nonetheless, the data from semi-structured questions, UNAM has a specialised campus that deals with marine related studies, although not necessarily maritime, while NUST has a division for research, innovation and collaboration that makes sure that there is synergy in education, research, and innovation. This gives insight to the second question of the research on what are the HEIs doing to ensure that the requirements of the KT are met. Although there are efforts made from the high educational institutions on skills enhancement and capacity building, it is not clear how the initiatives, ideas, and creativities from different maritime industry stakeholders such as government, aquaculture, maritime transport, marine environment protection, defence and security, harbour construction, oil & gas, ship repair and construction, and coastal tourism are captured and implemented.

Work Environment
Quality education, research, and innovation of HEIs require modern infrastructures, latest technology, financial resources, and the work environment that encourages employees to independently think. That being the case, the data from semi-structured questions put forward that UNAM enjoys the required social networking connections, IT infrastructures, technical know-how, good corporate reputation, teleconferencing equipment, strategic social programs, and collaboration with foreign institutions. Moreover, it allots time for academic staff members to participate in community outreach programs within the realm of education, research, and innovation. This helps scholars and researchers in identifying issues facing the community and developing creative solutions for the industry. Hence, the creation of a conducive environment for education, research and innovation is a prerequisite in achieving a functional KT.

Policies and Procedures
Actions of HEIs on the collaboration with stakeholders to attain education, research, innovation are guided by policies and procedures. As stated above, the naval academy in Bulgaria, in collaboration with the government and industry has changed the single employment contract to dual employment contract policy which allows academic staff
with licenses to renew them by working for a certain period at sea. This arrangement allows other professionals from different institutions within the maritime industry to work at the academy for a certain time frame, contributing to knowledge and skills sharing. Likewise, the BIBB was formed in Germany to revise and monitor policies in the field of TVET, by making sure that the training provided to young people are relevant to the needs of the industry, and that TVET institutions are brought into the mainstream of research and innovation. The research data contests that there are no clear policies, procedures or programs for the HEIs on the integration and implementation of the KT in the maritime industry. This sheds light on the third question of the research on what national and institutional policies or programs are in place to ensure the success of the KT.

5.2.4. Individual performance

*Employee - Job match*

It is the individual effort that leads to organisational performance; therefore, talent management is important to have the correct skill at the right job, filters those coming into the HEIs and have a clear succession planning of those leaving the institution. That being the case, the literature review put forward that technological advancement has made it easier to achieve institutional and universal goals, however, the paradigm shift in the industry has made it difficult to find qualified and suitable professionals for certain positions (Zhou & Etzkowitz, 2021). Furthermore, performance measuring systems for high educational institutions on the KT has not yet been fully created. However, the documents review shows that NAMFI uses the Balanced Scored Card performance management method which looks at learning and growth (innovation) perspective, business processes perspective, customer perspective, and financial perspective. The online interview indicates that UNAM also utilises a score card method while NUST employs a Management by Objectives (MBOs) approach with goal 1 (Building a vibrant and engaging learning environment, goal 2 (Leading research, innovation, partnership, and entrepreneurship), goal 3 (securing institutional efficiency and sustainability and goal 4 (Driving human-centric digital transformation for industry 4.0 and beyond). This
attests to the fact that all the three HEIs have a performance management system in place, on education, research, and innovation, however, the literature review confirms that it remains difficult to measure how the KT is incorporated into the activities of HEIs.

Motivation

Motivation in HEIs employees diffuses innovation. Thus, the literature review suggests that effective collaboration within the KT is motivated by tangible enablers such as knowledge management, supportive mechanisms, flexible regulations and a desire for creativity and innovation. Moreover, there are intangible enablers like organisational shared values which immensely contributes to the motivation of employees (Cai & Etzkowitz, 2020). However, the data from the three high educational institutions does not address the intrinsic and extrinsic motivation factors which are used by organisations to foster innovation and creative ideas from their employees. Intrinsic motivation is crucial in quality education, research, and innovation because when employees have a drive to go extra mile from their assigned duties and responsibilities, they can always dedicate time and effort to innovate and bring new ideas to the organisation that are vital for the competitive advantage and innovation performance. The extrinsic motivation which is driven by reward or praise after meeting the expectations, drives innovation. Moreover, it has been proven that when individuals deeply connect with the organisation, they are more likely to make special efforts in innovative activities.

Values and Needs

Shared values in HEIs help in creating solutions to societal problems. As stated above, the literature review suggests that the organisational shared values influence organisational culture, communication, situational awareness and subsequently the success of the KT. Alas, the research data does not address the issue of values and needs of employees. It is important to note that the more the employees feel the sense of belonging to the organisation, the more they can think independently and innovate. Moreover, the individual characters of employees and their values are important factors in innovation.
5.2.5. Organizational performance

**Performance**

The performance of the HEIs on the KT is measured on the actual output against the intended deliverables. As stated earlier, all the three educational institutions have a performance management system which provides for innovation and growth. This provides a good foundation for measuring the performance of the Knowledge Triangle of HEIs in the constituencies they operate. As prerequisite, the literature reviews advises that the KT requires close collaboration between government, high educational institutions, and industry, in order to achieve quality education, research and innovation (Sjoer et al., 2013). Even so, the three educational institutions do not clearly state the key performance indicators for the Knowledge Triangle performance. Apart from education and research output as measures of success, it remains unclear how the innovation aspect is measured to clearly reflect the output on new products, process improvement, new processes and technology development. Be that as it may, it is unclear how the facilitation is done between the government, high educational institutions and the business industry in the maritime domain to achieve the sustainable blue economy as provided for in the national development goals and the United Nations Sustainable Development Goals (UNSDGs). This explains the last research question on how well are the HEIs doing in meeting the requirements of the KT in the maritime industry.
Chapter 6: Discussion

6.1. Introduction
As stated in chapter one, the objectives of this research are to: assess the requirements of the Knowledge Triangle from the perspective of High Educational Institutions; determine what the HEIs are doing to ensure the KT requirements are met; examine the national and institutional policies and programs on the Knowledge Triangle; Assess the collaboration between government, MET institutions and industry in Namibia's marine industry; analyse the barriers and enablers for the Knowledge Triangle's success and evaluate the performance of HEIs/METIs on the Knowledge Triangle. This chapter discusses the findings from the previous chapter and how they contribute to related work.

6.2. What are the requirements of the Knowledge Triangle from High Education Institutions?
High educational institutions are primary source of knowledge and play a leading role in innovation when there is a clear strategy to do it. The literature review suggests that high educational institutions (HEIs) act as medium between the government and the private sector (Cervantes, 2017). They get a significant percentage of public funded research and serve as the primary source of Knowledge. Furthermore, they contribute towards their third mission of social contribution and knowledge transfer, playing an active role in innovation. The analysis reveals insights about the issue when there is no clear strategy on achieving the sustainable national blue economy to support economic growth and strengthen the KT.

6.3. What are the HEIs doing to ensure that the requirements of the KT are met?
The two universities have centres dedicated to research and innovation, but lack a shared commitment from other stakeholders to make a meaningful impact on the KT. The data indicates that UNAM has a specialised campus that deals with marine related studies,
although not necessarily maritime, while NUST has a division for research, innovation and collaboration that strives for synergy in education, research, and innovation. The related work argues that limited information sharing, lack of commitment and different perspectives on the KT, limits its operationalisation (Shtereva, 2017). The analysis identifies that when ideas and creativities from different maritime industry’s stakeholders are not captured and implemented into education, it affects research and innovation output of HEIs.

6.4. What national and institutional policies and/or programs are in place to ensure that education, research, and innovation flourish inside the knowledge triangle?

Namibia lacks an innovation model to guide the research and innovation efforts to boost blue economy growth. The literature review informs that the Naval Academy in Bulgaria, in collaboration with the government and industry has changed the single employment contract to dual employment contract policy, which allows academic staff with licenses to renew them by working for a certain period at sea and for other maritime professionals to work at the academy (Belev, 2018). Furthermore, BIBB was formed in Germany to revise and monitor policies in the field of TVET, by making sure that the trainings provided are relevant to the needs of the industry, and that TVET institutions are brought into the mainstream of research and innovation (Etzkowitz & Leydesdorff, 2000). According to the analysis, when there are no clear policies, procedures, or programs in place for HEIs on the integration and implementation of KT in the maritime industry, the industry suffers from a lack of knowledge and skills transfer, a lack of staff development, an unappealing industry, and high unemployment.

6.5. What collaboration mechanisms are in place for the Knowledge Triangle key stakeholders?
The Namibian maritime industry recognises that the collaboration among the KT's main stakeholders is crucial to realizing education, research, and innovation in the society. However, the analysis found that it remains unclear how the facilitation is done between the government, HEIs and the business industry in the maritime domain, to achieve the sustainable blue economy. According to the research data, a memorandum of agreement was signed between NAMFI and the Namibian Ports Authority (Namport) on maritime education and training, and job creation. Furthermore, UNAM collaborates with the Ministry of Defence to run a Bachelor of Science in Military Science. And NUST runs a double degree program in collaboration with Satakunta University of Applied Sciences in Finland. The analysis identifies that a lack of facilitation for collaboration among the KT's main players leads to poor education, research, and innovation, resulting in a non-impactful maritime industry, less development, and high unemployment.

6.6. How well are the HEIs doing in meeting the requirements of the KT in the maritime industry?

The lack of clear performance indicators on education, research and innovation to measure the performance of maritime industry on the KT makes it difficult to measure what is working and what is not. The data supports that all the three educational institutions have a performance management system which provides for innovation and growth. The literature review suggests that the KT requires close collaboration between government, high educational institutions and industry, in order to achieve quality education, research and innovation (Sjoer et al., 2013). The analysis suggests that a lack of clear key performance indicators for the Knowledge Triangle performance makes it difficult to measure the performance of HEIs on the KT. However, the researcher found it interesting in previous studies that some countries have used various innovation models to remove barriers to successful Knowledge Triangle, such as the Dual Employment Contract system for METIs and other industry players, the Bayh – Dole Act, the Blue Denmark, Doing Brazil in Brazil, BIBB and SAIMI, with clear output targets on education, research and innovation thereby creating employment in the
maritime industry, growing the blue economy and making the maritime industry more attractive to both employers and employees. The research data suggests that Namibia lacks similar innovation frameworks for integrating and operationalising KT to fully develop the country's blue economy with more employment opportunities and a larger skill base. In the absence of a national innovation model, the maritime industry struggles to innovate, which translates to lack of knowledge transfer, less competitive advantage, the inability to adapt to technological changes and a weaker blue economy.
Chapter 7: Conclusion and Recommendations

The marine industry's ability to innovate depends on the high educational institutions (HEIs), also known as maritime education and training institutions (METIs), which act as a conduit between the government and industry. Government funding for HEIs is insufficient, and there is no clear plan in place for exploiting the potential of the country's blue economy, which hinders the link between education, research, and innovation. A coherent strategy for facilitating the collaboration between the government, HEIs, and industry to ensure the success of the KT is also lacking. Uncertainty surrounds the HEIs' ability to gather and apply creative and innovative ideas from other KT actors in the maritime sector. Namibia also lacks the policies and/or programs for HEIs on the KT integration and operationalisation targeted at expanding the blue economy, employment, and industrial attractiveness, which culminate in the blue economy having limited skills and employment opportunities to offer. Furthermore, it is challenging to assess the KT performance of HEIs, particularly in the area of innovation, making it difficult to determine how well or poorly these institutions are performing. This research sheds new insight on the Knowledge Triangle concept, particularly as it relates to education, research, and innovation. Through this study, the government, educational institutions, and business will be able to comprehend the value of working together to produce high-quality education research and innovation. Furthermore, the study findings and conclusions open new avenues for further investigation into the Knowledge Triangle.

This study is not without limitations, the research data is exclusively from higher education and training institutions raises the possibility that they might not accurately reflect the broader perspectives of the maritime industry. Additionally, the effects of innovation on the marine environment, as well as the role that management practices, organisational cultures, motivation, and shared values play in innovation, are not adequately investigated. Future researchers must therefore consider examining the Knowledge Triangle concept from the perspectives of various maritime industry participants, as well as the effects of innovation on the marine environment and the
contribution of management practice, organisational culture, motivation, and shared values to the KT in the maritime industry.
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Appendices

Semi-Structures questions for high educational institutions:

NAMFI

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<tr>
<th>Research Questions</th>
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<td>What initiatives is NAMFI carrying out to ensure the realization of the UNSDG 4: quality education and the UNSDG 9: industry, innovation, and infrastructure?</td>
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<td>How does NAMFI collaborate with the Namibian government, local and international organizations to improve education, research, and innovation and to support the UNSDG 17?</td>
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What are the HEIs doing to ensure that the requirements of the KT are met, and what national and institutional policies are in place to ensure that education, research, and innovation flourish inside the knowledge triangle? |
the Knowledge Triangle stakeholders?

## UNAM

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