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Challenges and Opportunities in Maritime Education and Competence Development – a comparative analysis of lessons learnt

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Abstract: This paper sheds light on Maritime Education and Competence Development which has been investigated in various studies, both within and outside Europe. However, the topic is under-researched and still in need of attention, in order to ensure that competences are aligned with technological advancements and the needs that exist in a contemporary maritime industry. It is furthermore paramount that these competences are developed in a manner so that it contributes to the further development of the industry as a whole, in order to maintain a competitive position in the global market. Based on low levels of Research and Development intensity within the EU in comparison to international competitors such as Japan, South Korea and the United States, The EU has committed efforts to 'lift the bar' on these levels in order to achieve the objective of The Lisbon Strategy and The Bologna Process. The individual Member States and the maritime industry are also called upon to contribute to these efforts in 'The European Maritime Strategy 2008-2018', in order to assist in accomplishing this objective. In relation to this, the paper highlights the importance of enhancing the following key factors: maritime know-how, competence development, trans-national collaboration and standardisation. Research programmes within the EU have sought to address the challenges that the industry faces from a European perspective, supporting the development of trans-national efforts and synergies to battle the problems. The European Commission has supported The Maritime Transport Sector through research programmes from both a general perspective and a more specific maritime perspective. The paper then discusses the challenges involved in "lifting the bar" and teases out the findings in previous and current EU projects and National studies that have sought to address these challenges in the search for optimising Maritime Education and Competence Development based on the key factors mentioned above. Among such projects and studies that have been conducted at an EU level is the EU project, "Northern Maritime University Network". With both national and EU funding is "The Danish Maritime Cluster" project, and finally outside the EU is the Asian project by Ahn and McLean.[1] These projects will be presented and compared based on the key factors mentioned above and how these projects in practice enhance maritime education and training.

Keywords: maritime competence development, trans-national and national efforts, maritime know-how.

1. Scope of the topic

Maritime transport is an industrial sector that is global in every aspect of its core competence, such as economy, transport of cargo, insourcing of services and human resources. This demands a dedicated responsibility to national and global policymakers in the industry in order to ensure development, competitive terms and conditions. The international Maritime Organisation has placed efforts in attempting to create a global standard of education through the STCW 95 Convention[2] and the following amendments. This paper does not focus on the contents of this standard, but the maritime education and competence development that takes place beyond this.

The core competence of the maritime industry has thus evolved, from a need of competences in navigational and technical knowledge, to the needs of a global and complex business segment, calling for a range of different competencies[3]. Expanding trade in ports around the world and new emerging markets calls for specialised training and new competences in order to manage technological advancement, a global economy and complex logistic systems.[4] Research has shown that there is a problem in the quality of the training that seafarers currently receive,[5] and the level of competence in the European maritime industry is declining.[6] Another study claims that the lack of efforts to develop human resources in the maritime industry has resulted in a lack of knowledge about career path mobility possibilities within the industry[7]. This invokes a need to attract new upcoming generations and potential work forces in other or related industries. However, despite these studies, the topic of competence development is under-researched and in need of an orchestrated response to the needs of a contemporary maritime industry. Cullinane and Wilmsmeier[8] go so far as to argue that it is essential to battle the challenge that the EU faces due to new and emerging markets and growing knowledge specialisation that can threaten EU's position on the international scene. It is then of paramount importance that competence development in the maritime industry is enhanced in such a way that it contributes to the further development of the industry, in order to ensure a sustainable industry that is ready to meet the challenges of the future. In order to do this, the level of competence must be mapped out – what in reality is meant by competence development? How do real projects in fact seek to accommodate the challenges and opportunities of a competence development in the maritime industry?

2. Defining competence levels

Maritime competence development has been addressed in the maritime industry and in a range of EU initiatives. Relevant to this context, the EU commission has instigated strategies that focus on enhancing maritime education and competence development and maritime know-how. This can be seen in the European Maritime Strategy 2008-2018[9], which aims to strengthen the maritime industry's competitiveness by focusing on six main themes, of which, specifically, themes 2 and 6 are relevant for this paper.

1. Shipping trends and business conditions
2. Human Resources
3. Quality shipping
4. International scene

5. Short-sea shipping
6. Research and Innovation

2.1 Theme 2 - Human resources

This theme contains a description of the growing shortage of maritime professionals that can fill the knowledge-intensive and high-quality jobs that are available in the maritime industry today. This shortage poses a great threat to the industry of losing its critical mass of human resources, which in turn contributes to the development of competencies in a maritime EU. The initiative that this theme encompasses in order to address this threat is to intensify employment possibilities, facilitate life-long career paths and maintain high levels of competence development within a framework of education offerings through collaborations between maritime training institutions. The latter seeks to promote student mobility and move forward to create what is called maritime certificates of excellence. This strategy clearly addresses many of the foci points in the EU's Bologna declaration and the concrete efforts requested call for a standardization of maritime education and competence development offerings within the EU, which can enhance both student and teacher mobility. Human Resources are generally managed in organisations by focusing on increasing the effectiveness and efficiency through performance development based on three main elements: training and development, career development, and organisation development[10]. As part and parcel of Human Resource Management, the EU strategy specifies the necessity to maintain high levels of competence development in maritime organisations. In order to unfold how it is possible to maintain high levels of competence development, it is necessary to settle on a definition. The EU has sought to define the concept of competency, as entailing cognitive, functional, personal and ethical functions[11]. However, this definition is not very specific. Stewart and Brown define competency as the knowledge, skill, ability and other personal attributes, such as values and attitudes that are required in order to perform a specific task[12]. Lucia and Lespinger elaborate on the definition a little more to include "a descriptive tool that identifies the skills, knowledge, personal characteristics and behaviours needed to effectively perform a role in an organization and help the business meet its strategic objectives".[13] What divides the two latter definitions is that Lucia and Lespinger hinge in a business's strategic objectives. However, what connects the two definitions is that they both fail to define the level of knowledge and how it has been obtained in order to coin it 'a competence'. This task has been attended to by Quinn[14], who has based his study on the early works of Dreyfus et al..[15] Quinn believes that mastering a task or activity entails both a learning process over a length of time and that the capacity to learn evolves. This means that in order to learn a task, the learning process will be influenced by how far an individual's learning capacity has developed. Quinn coins five learning capacity stages, of which the third stage is called 'competency', which he defines as a further development of confidence and a reduced reliance on absolute rules by recognising a wider variety of cues from the working context. There is a greater degree of learning by trial and error, experimenting with new behaviours. It is not abandoning the rules, but being able to use them more imaginatively and with an interpretation that suits one's own personnel strengths and inclinations. This definition is seemingly equivalent to Piaget's concept of assimilative learning, where an individual adds a new element to existing cognitive schemes.[16]

Inspired by Piaget's[17] adaptation theory, Illeris has devised a typology for learning processes comprising four learning types. The starting point is that we through adaptation processes seek to create equilibrium between the world and ourselves. This dynamic balancing takes place constantly and creates new cognitive schemes for our actions and thus increases our competences. The first and most basic learning type is cumulative learning, also called mechanical learning. This is when a new cognitive scheme is created such as when a person has to learn a bank code for a credit card.

The second and most common learning type is assimilative learning, which was mentioned above. This is the case when new impulses are attached to existing schemes, which can be used in other similar situations. The third type of learning is accommodative learning which is when existing schemes must be restructured in order to establish understanding and meaning. Finally, Illeris emphasizes the fourth learning type, transformative learning, which is a substantial accommodative process. This learning type is a process of the acquisition of learning with a major restructuring of schemes, where an individual undertakes a personal change. However, the EU strategy makes specific knowledge-intensive and high-quality jobs and the increasing loss of critical mass of human resources due to the massive tendency to outsource, and this does point to a level of knowledge that involves the necessity of competence development that involves transformative learning.18

This then makes it possible to conclude that the definition by Lucia and Lespinger of the concept of competence as "a descriptive tool that identifies the skills, knowledge, personal characteristics and behaviours needed to effectively perform a role in an organization and help the business meet its strategic objectives" can be used to define that the EU strategy involves the development of maritime competencies at a transformative learning level.

However, the EU strategy also points to the necessity to continue to develop maritime know-how as part of the theme of human resources which does not necessarily involve transformative learning levels.

2.2 Maritime know-how

The maritime industry consists of a broad palette of professionals, ranging from seafarers, technical superintendents, shipowners and forwarders. This palette of professionals represents a vast knowledge base about maritime transport that is based on many years of history and tradition. This includes knowledge of the sea, extensive experience and an ability to seize challenges. Practical knowledge has been valued in the maritime industry, and this knowledge is based on the fact that the predominant and preferred form of learning in the industry is situated learning.[19] This entails the social dimension of learning which integrates the components of meaning, practice, community and identity that are necessary in order to characterize social participation as a learning and a realization process. The components are both interconnected and mutually defining.[20]

The distribution of this know-how and situated learning has tended to take place in so-called maritime clusters. The concept of clusters was introduced by Porter,[21] who defined the notion as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also cooperate".[22] Clusters are thus

demarcated geographical areas where businesses that are co-related in some way have the possibility of obtaining better access and distribution of knowledge and by clustering businesses, competitiveness can be intensified and new products and solutions to challenges can arise. Maritime competence development has greatly profited from various regional, national and European so-called "maritime clusters", which have also been enhanced by national political policies that promote "national maritime clusters".[23] Research shows that shipping nations with strong maritime clusters have the best possibility of economical sustainability. This is the case in countries such as Norway and Denmark, and is also the case in Singapore. A study by the Danish Shipowners Association[24] showed that maritime clusters do have an impact on a nation's economy, i.e. in the year 2000, the economic contribution of the Italian maritime cluster was 26.3 billion Euros which was 2.3% of Italy's GNP. This shows that there is an economic incentive for nations to ensure the sustainability of maritime clusters by possibly diverting funds to facilitating the further growth of their economic significance, and the whole idea of clusters has also become more and more an integrated part of EU policies.[25] These maritime clusters have contributed to increasing maritime activities, productivity and innovation and this competence development should continue to be supported. The learning type of competence development here is seemingly equivalent to accommodative learning.

2.3 Theme 6 – Research and innovation

In the sixth theme, the EU admits that maritime transport is greatly dependent on research and innovation efforts. The EU calls on the maritime industry to utilize the vast amount of knowledge that has already been generated in EU research programmes and activities and to enhance advancement in specific technological and information heavy areas. The strategy also touches on the initiatives within the industry regarding a greener and sustainable sector. This focus is also necessary as the research and development intensity is general is still below the 3% target that was set for 2010 in the Lisbon Strategy. Below in Table 1.0., the research and development intensity levels can be seen for EU countries in comparison to countries that comprise international competition.

Table 1.0: Research & Development Intensity levels in % for EU-15, EU-27, Japan, South Korea, China and United States, 2007-2008[26]

	R&D intensity in % 2007	R&D intensity in % 2008
Japan	3.44	-
South Korea	3.21	-
EU-goal 2020	3.0	3.0
United States	-	2.76
EU-15	-	1.99
EU-27	1.85	1.90
China	1.44	-

Note: Research and Development Intensity entails R&D expenditure as a percentage of a country's GDP.

EU-15 encompasses the EU consisting of only 15 Member State members. EU-27 encompasses the EU with 27 Member State members. Not all R&D Intensity levels were available from United States and EU-15 in 2007 or Japan, South Korea and China 2008, and are therefore marked, - .[27]

Table 1.0 shows that the EU is slow to achieve the goal of 2020, which is 3% of GDP, and is overtaken by The United States, Japan and South Korea. This pace must change and can only be accomplished if more efforts are put into allocating resources to research and development. However, the EU policy of the EMTS 2008-2018 shows that the EU has acted on the obvious low levels of R&D intensity, and has addressed how these levels can be lifted by focusing on areas such as research and innovation, maritime know-how, human resources and competence development. These foci comprise both accommodative and transformative learning types. Although this data shows that there is expenditure in Research and Development, the data also underlines the fact that the EU still lacks serious actions towards enhancing research and development in order to ascertain a position in relation to international competition. The paper will now proceed to the comparative analysis of three selected projects that each seek to enhance maritime competence development

3. A comparative analysis of lessons learnt

The grounds for the selection and comparison of the projects will firstly be unfolded. The projects are related due to the fact that they all focus on the themes from the EMTS 2008-2018 that have been explicated above. Firstly, the project by Ahn and McLean is a project that focuses on human resources, and it seeks to map out a human resource management plan for a specific cluster within the maritime sector, that takes place outside the EU. The second selected study focuses on research and innovation, and is called the Northern Maritime University Network project. This project seeks to provide academic and research-based offerings to maritime professionals that are based on the needs expressed in trans-national stakeholder studies in three different countries. The third and last study to be presented is a Danish study with both a national and a regional impetus that focuses on creating competence development of the Danish maritime cluster.

3.1 Project by Ahn and McLean

The study by Ahn and McLean[28] is an excellent example of how to utilize maritime cluster competences. Ahn and McLean investigated Busan city in Korea as a case study in order to create a plan for Regional Human Resource Development. This was used to create an educational program that was built on existing knowledge and a regional human resource management policy that could be used as a strategic plan for enhancing growth and competence focusing on specified strategies industries, of which the port and logistics industry was the most competitive and value-added. The study shows how a concentrated effort is a simple yet clever way of building education on existing and emerging industrial needs.

3.2 The Northern Maritime University network project.

The Northern Maritime University Network is an EU financed project consisting of ten universities and maritime businesses which aims to build a strong trans-national

network and knowledge cluster and to integrate relevant stakeholders from the maritime business sector in order to provide multi-disciplinary and internationally oriented qualification offerings for the maritime industry. The project seeks to contribute to providing research-based qualification offerings that are based on the needs that exist in the industry. A trans-national stakeholder group has been interviewed as to which offerings are relevant and how these offerings could be construed. It is the objective of the project that these offerings and the collaboration between the universities strengthen the competitiveness of the European education industry and the maritime business sector.

3.3 The Danish Maritime Cluster project – a national project with a regional impetus

The Maritime Development Center of Europe (MDCE)[29] has initiated a large research and development project, called Denmark's Maritime Cluster (DKMC). DKMC is a project that is co-financed by the EU social foundation and the Capital region of Denmark's Growth forum and has ten consortia partners, such as Copenhagen Business School, Denmark's Technical University, Force Technology and the maritime education institutions, such as Svendborg International Maritime Academy [30] (SIMAC).

MDCE is Lead partner of the project and apart from project administration, is also committed to the delivery of two analyses, so that each will contribute to the identification of competence gaps in the maritime industry, by conducting a SWOT analysis of, and an analysis of best practice in, maritime cluster development. The SWOT analysis will identify the strengths, weaknesses, possibilities and threats that the maritime cluster faces today and in the future. The analysis will then identify which maritime competence areas need attending to, which areas can easily be strengthened and which areas need to be constructed in order to sustain a competetive position in the global maritime industry. MDCE will also conduct a Benchmark analysis, which will function as a comparative analysis of the maritime cluster's current position in comparison to other maritime clusters. The analysis will tease out what it is that characterizes the Danish maritime cluster in comparison to others and identify possible actions necessary in order to sustain a strong and competetive cluster compared with other clusters.

SIMAC is conducting an analysis of the competences that a dual-officer contributes to growth in the maritime sector. The analysis will identify whether there is a competence potential that is not utilized which could be activated in other relevant education offerings, or the establishment of new job functions, either at sea or ashore. SIMAC will also establish an Educational Guidance Center that will provide methodical guidance for maritime instructors and tutors and academic writing guidance for students. SIMAC will finally establish a course in automation.[31]

4. Comparative analysis and lessons learned

The selected projects all focus on producing concrete education offerings to maritime professionals in the industry and thus enhance the collective competence level of the maritime cluster,

respectively, in Busan City in Korea, The North sea Region, the Danish national and regional cluster. However, it is only the NMU project that is trans-national.

The project by Ahn and McLean and the NMU project both base their competence development on competence needs and the maritime know-how that already exists in the industry, whereas the DKMC has defined beforehand which competence offerings it will provide. Although all projects contain academic offerings, it is only the project by Ahn and Mclean, where there is a clear regional human resource management plan for the competence build that is initiated. Such a plan enables a very specified and focused action plan that can be executed in the demarcated area. Lessons learnt from such a regional study can be replicated and used in other regional clusters focusing on industries relevant for that respective region. Such efforts can also be part of larger orchestrated development plans, such as a National Human Resource Development plan. Such a plan will harness and develop the maritime competences and thus enhance a sustainable industrial development. Finally, the learning levels of competence development do seem clear in the case of academic offerings, however it is not explicit.

Although all of these three projects are commendably working to 'lift the bar' of the competence level of knowledge in the industry, they all create their own individual standard of excellence. The consequence of this is three different standards that can be difficult to harmonize. The lesson learned here could then be that whilst these projects are seeking to enhance competence levels of both accommodative and transformative learning types, efforts should be put into establishing a global 'standard of excellence', which enables borderless education offerings, and precisely as it reads, ensures a standardised level of maritime education and competence development in a sustainable global industry that excels across Illeris's learning types to also include transformative learning.

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Endnotes

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4 Ircha, 2006
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9 http://ec.europa.eu/transport/strategies/2018_maritime_transport_strategy_en.htm acessed 26 march, 2012.
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11 Commission of the European Communities, 2005
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13 Lucia and Lespinger, 1999, p. 5
14 Quinn 1988, Quinn et al. 2002
15 Dreyfus et al. 1986
16 Illeris , 2001
17 Piaget, 1954
18 Illeris, 2001
19 Lave and Wenger, 1991
20 Wenger, 1998
21 Porter, 1990
22 Porter, 1998
23 Porter, 1990
24 Danish Shipowners' Association, 2010
25 The Danish Shipowners' Association, 2010
26 Eurostat
27 Eurostat
28 Ahn and McLean, 2006

29 The MDCE is a national maritime cluster organization that is situated in Copenhagen, close to the large maritime shipowners and maritime businesses with over 7800 members and is a common secretariat of six different organizations. This includes The Promotion of shipping, Transport Innovation Network, Transport Economic Association, the Development Center of Europe and the MARsters network.

30 SIMAC is the largest maritime education institution in Denmark, has over 500 students and offers three fields of studies, The ship's officer study programme, marine engineer study programme, and the shipmaster study programme.

31 It can be mentioned that the DKMC project also contains university education offerings at both BSc and MSc levels and there are two Ph.D positions.