

# **Opportunities and challenges for seafarers in higher education: A comparative study of the German and the Swedish system.**

Nicolas Nause<sup>a,\*</sup>, Olle Lindmark<sup>b</sup>, Peter John<sup>a</sup>, Elisabeth Klimmek<sup>a</sup>

<sup>a</sup> Jade University of Applied Sciences Wilhelmshaven/Oldenburg/Elsfleth, Weserstr. 52,  
Elsfleth, D-26931, Germany

<sup>b</sup> Chalmers University of Technology, Gothenburg, SE-412 96, Sweden

\* Corresponding author. E-mail: [nicolas.nause@jade-hs.de](mailto:nicolas.nause@jade-hs.de)  
telephone number: +49 4404 9288 4309

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## **ABSTRACT**

The paper compares Maritime Education and Training (MET) at undergraduate and postgraduate level at two maritime faculties, one located in Germany and one in Sweden. While undergraduate education in both countries is mostly defined by their adherence to the STCW convention, a different approach is adopted in the provision of postgraduate and lifelong learning programmes. While Chalmers University in Sweden has opted for different on-campus courses, Jade University in Germany aims to further the education of active nautical officers while they still work at sea. Both institutions have identified a clear need for an ongoing MET beyond the bachelor's degree level, given the increasing complexity of the maritime trade. Offering courses to cater to the needs of maritime professionals ensures their progress from a navigational to a more advanced managerial position.

## **1. INTRODUCTION**

The international shipping business transports about 80 percent of the global trade by volume and over 70 percent of the global trade by value. [1] The global maritime industry is one of the world's largest economies and employs, directly or indirectly, more than 200 million people on a worldwide scale [2]. Supplying this industry with a competent and well-educated workforce is a challenge for the international seafaring nations [3, 4, 5]. Maritime companies face an area of tension between a (forecasted) global shortage of seafarers and the higher importance of well-being at sea in terms of an increased work-life-balance. This conflict is reinforced as the shipping profession becomes increasingly sophisticated in terms of social, economic and ecological factors. Therefore, lifelong learning and continuous education pose modern challenges for future trends in maritime education, training and research.

## **2. METHOD**

Following up on this, the present article presents two case studies of German and Swedish IAMU (International Association of Maritime Universities) members. A case study design [6] was chosen and conducted in order to inquire a comprehensive and in-depth insight into the two cases by finding out similarities and dissimilarities as well as addressing questions that ask why, what, and how the cases developed. This has led to a sample (case selection) of

two universities, one from Germany and Sweden each, which includes the status quo of maritime education, both on an undergraduate level in terms of the education of nautical officers and on a postgraduate level in terms of further education in two higher-education institutions. In the further course, a general introduction is given. Afterwards, the two cases of German and Swedish maritime education and training (MET) are introduced (data collection). Data was obtained by information publicly available on the Internet pages of the two universities. Moreover, data is based on intrinsic knowledge of the corresponding authors as they are employed as coordinators of the master programmes discussed. On that basis, a comparative analysis will be conducted to highlight differences and similarities between the German and Swedish system (data analysis). The text closes with a summary, some lessons learned and ways forward (results and discussion). The research is carried out in accordance with the universities' research ethics' regulation.

### **3. THE ROLE OF SHIPPING AND THE STATUS QUO OF MET**

Without shipping the exchange of goods would not be possible, it is thus necessary for the modern world. In other words, the maritime industry constitutes a pillar of our society. For the manpower report 2015 “[t]he world merchant fleet [...] was defined as 68,723 ships” [7] and a global population of 1,647,500 seafarers serving on these ships [ibid.].

In the beginning, the shipping industry traditionally employed a largely unskilled, labour-intensive workforce, which over the years has experienced a massive transformation to the capital-intensive, sophisticated sector we find these days. The same development applies to MET which has also morphed from a highly practical, hands-on approach with an operational education and on-the-job training paradigm to a university-style and tertiary education scheme with a focus on business and analytical skills. We find, for example, an increasing number of tertiary institutions which offer undergraduate as well as postgraduate maritime degree courses not only leading to a certificate of competency but also to a Bachelor's of Science degree. Moreover, this development can be retraced over time by means of established conventions in shipping. It started with the Officers' Competency Convention (ILO C53) of 1936, which was followed by different amendments before the first international shipping convention on education entered into force in 1984. This was the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). This convention was developed further with different amendments, e.g. the Manila Amendments of 2010 [8]. It is not only important for seafarers to learn highly contextualized/situated knowledge of navigation and how to sail a ship safely from the start to the final destination (any more) as MET is far more than this. Officers have to be able to work together in teams. As a starting point, learners are given the chance to learn critical thinking and leadership as well as to apply their knowledge in specific collaborative learning activities such as simulator training which are close to reality [9]. Future officers should have the possibility to experience how people react in practice and in how far they interact with their team (members) [10]. It has been argued that the current MET system, particularly competency-based assessment, does not address students' higher cognitive skills (e.g. comprehension, application, analysis, synthesis and evaluation). These skills are highlighted in the STCW as prerequisite for competent seafarers [11]. Building upon all this, it is now time to shed light on the two cases.

### **3.1. EXEMPLARY CASE OF JADE UNIVERSITY OF APPLIED SCIENCES**

Jade University of Applied Sciences (Jade UAS) is located in north-western Germany. Approximately 700 of the total number of 7,600 students are enrolled at the Faculty of Maritime and Logistics Studies in Elsfleth, which makes it the biggest maritime university in Germany. Its tradition goes back to the year 1832. The undergraduate degree course of Nautical Sciences and Maritime Transport is an eight-semester, full-time degree course which concludes with a Bachelor's of Science (BSc) degree.

The study course includes two seagoing service periods of 26 weeks each in the second and seventh semester in order to fulfil the demands of the STCW convention to issue the certificate of competency. In the first onboard semester, emphasis is placed on seamanship, basics in navigation and basic cargo handling operations. Whereas in the seventh semester, cadets should apply what they have learned by taking on the role of an officer of the watch under supervision. Besides, students sail twice for two weeks on a traditional training sail ship. The lectures cover a wide range of nautical subjects. Building on the basics, specific subjects follow which are related to commanding and loading a ship, subjects related to technical aspects as well as economics. Moreover, elective subjects are included in order to enable students to concentrate on specific areas. In the final semester, extensive exercises in the ship-handling simulator are carried out. The studies conclude with a bachelor's thesis.

### **3.2. EXEMPLARY CASE OF CHALMERS UNIVERSITY OF TECHNOLOGY**

Chalmers University of Technology is located on the west coast of Sweden in the city of Gothenburg. The University was founded in 1829 which makes it one of Sweden's oldest. Out of roughly 10,000 students, 600 are enrolled in shipping related programmes at the Department of Mechanics and Maritime Sciences. Like Jade UAS in Germany, it is also Sweden's largest Maritime University. The education ranges from BSc degrees in nautical sciences (Master mariner), Shipping and logistics and marine engineering to full PhD programmes in marine technology. Chalmers also offers a wider range of continuous education for active seafarers.

The programmes are delivered over three or four years, depending on the programme. The programme leading to a certificate of competence according to the STCW conventions (four years) also includes four periods of onboard training (three months each). The periods of onboard training start with ship knowledge and familiarisation with the tasks of a rating, to then advance to more qualified tasks (those of second mate, chief officer and finally master). The classroom-based education follows different tracks, e.g. communication, leadership, navigation, cargo handling etc. The education also includes extensive training in various types of simulators. In their final year, students also have the possibility to specialize in one of the following categories: Cruise industry, Tanker (oil, gas and chemical) or Offshore industry.

### **3.3. DISCUSSION**

Training to become a master mariner in northern Europe is an education mostly offered by universities or other bodies of higher education. Since the STCW convention regulates the curriculum, there are no major differences in the two examples. Also, the European Maritime

Safety Agency (EMSA) inspects and assesses providers of MET in Europe on a regular basis to safeguard a common standard of training within the European Union.

The differences can mainly be found in details, e.g. the way the onboard training is distributed throughout the years and what kind of specializations and courses can be elected outside the mandatory STCW competencies. Thereby, students are given the opportunity to set the course of their future career at an early stage for both their primary career at sea aboard seagoing ships, as well as in shore-based management positions as a second career.

#### **4. CHANGE AND FUTURE DEMANDS OF MET**

Megatrends (i.e. demographic change, digitalisation, climate change, mobility, etc.) will transform and reshape markets, societies and the global order, and they have therefore to be included in this discussion. Such megatrends lead to different developments in shipping: remotely controlled and/or autonomous ships, technology becoming more advanced, cost pressure and bureaucratic burdens rising, etc. All these factors cause an increased workload on board as well as the need for an MET which caters for these requirements. These developments may also cause different types of stressors in an officers' job as well as diverging levels of satisfaction, motivation, demands and resources. Moreover, we find typical stressors which influence seafarers' wellbeing on board as they live and work in one (small) place: these are isolation and loneliness, small crews and their small living spaces, fatigue and occupational health problems [12].

The purpose of this text is to explore future career paths as well as officers' reasons and factors which motivate or demotivate them to stay on board or to leave the sea behind [13]; the initial reasons for choosing a career at sea are not taken into account. Subsequently, the higher importance of an increased work-life-balance has to be considered [7]. Following up on this, the author group of the Aegean University [14] presents three alternative career paths: on board, on shore (which resembles a maritime company) and in port (which resembles a maritime business). Moreover, they present an equation of the ideal maritime industry employee: ideal employee = onboard experience + shore-based job experience. At the same time, persons undergo education on different levels: undergraduate, postgraduate, lifelong learning. In this article, emphasis is placed on the postgraduate level. However, this may also lead to a fluent transition to lifelong learning as graduates should have gained the ability to organise their own lifelong learning process autonomously upon completion of their master's degree studies. Building upon all this, it is now time to shed light on the two cases.

##### **4.1. EXEMPLARY CASE OF JADE UNIVERSITY OF APPLIED SCIENCES**

In general, after finishing their undergraduate degree, graduates can either start their professional career (at sea), or they can further their studies with a consecutive master degree course. A third way is to start the professional career and return to the university as "recurrent learners" in order to achieve a further (and usually higher) degree in the context of lifelong learning [15] by enrolling in a cooperative programme of work and distance education studies. Jade UAS offers two post-graduate degree programmes with 90 credit points according to the European Credit Transfer System (ECTS; each point equals 25-30 hours of student workload): Maritime Management (MM, three semesters full-time studies, on-campus) and International Maritime Management (IMM, distance learning). Although the contents of both

degree courses are similar to each other (they include aspects of maritime economy, law and insurance, project work as well as methodological aspects in order to develop problem-solving skills amongst other aspects and lifelong learning), the programmes differ with respect to the target groups they address as well as their concepts.

MM students proceed with their bachelor's studies consecutively at the maritime faculty and pursue their master's studies in Elsfleth. By contrast, IMM students are located around the globe while they study at the maritime faculty. The professionals are mainly junior managers in the maritime and logistics sectors – ashore as well as on board sea-going ships. IMM enables students to achieve a Master of Science (MSc) degree in five semesters' (2.5 years) part-time study without interrupting their work. The time taken may deviate; in case family or professional duties prevail, students can slow down or even pause their studies.

IMM is mainly based on distance learning, which enables students to study in a self-determined manner concerning pace, time and location. Moreover, students' projects and their day-to-day business can be included in the learning modules. IMM includes professional experience into students' studies in order to achieve practical value and mutual benefits: theory and practice go hand in hand. In line with that, the majority of the learning modules ends with a home assignment. However, some on-campus elements are added. The IMM students start in a first attendance phase, which serves mainly for familiarisation purposes. Later, students have to travel to Elsfleth in order to complete three learning modules throughout their studies by means of a written examination, a corporate strategic planning simulation as well as a presentation including a discussion. Studies conclude with a 30 ECTS credit points master's thesis. Moreover, professionally experienced students have prior knowledge acquired outside the sphere of higher education, which could be cross-credited into the studies in order to avoid repetition as well as to save time and costs. Moreover, a possible shortening can, for those with a limited time budget due to professional and/or family responsibilities, even facilitate the decision to study part-time and make it easier to plan this accordingly.

#### **4.2. EXEMPLARY CASE OF CHALMERS UNIVERSITY OF TECHNOLOGY**

The career path for the students interested in the maritime cluster varies a bit. The graduates in more practically oriented education areas, such as marine engineers and master mariners, are usually eager to initiate their career at sea. However, some choose to remain on land and continue their education. This also applies to the students attending programmes more oriented towards logistics and supply chain management. Chalmers attaches great importance to lifelong learning and offers a wide range of continuous education for active seafarers as well as two Master of Science programmes (two years, 120 ECTS credit points) aimed towards the student group. The two MSc programmes are Maritime Management and Naval Architecture and Ocean Engineering.

The Maritime Management programme is specifically aimed towards those persons who aspire to become future leaders in the maritime cluster. All persons with a BSc degree relevant to the maritime cluster are eligible to apply. Since the start of Maritime Management in its current form, it has mirrored the industry in being an international market very well. Last year there were over 200 applicants from all over the world.

The programme has a long history at Chalmers (since the mid eighties) and has over the years been delivered in many different forms. It started as a part time Master's programme of 60 ECTS to serve the need of sea-going personnel that wanted to acquire a new skillset to be attractive for onshore positions. The curriculum was later developed to encompass a full two years and was jointly developed by five Scandinavian maritime Universities under the name of Nordic Master in Maritime Management (NOMAR). NOMAR was given as a seminar-style programme with a combination of seminars and home studies. NOMAR was discontinued mainly because of administrative reasons, but the graduation rate of students was also problematic. Since 2013 it has been delivered as a full-time on-campus international Master's programme (time in class is usually 10-20 hours a week). Since it is a management programme by name and content, it is recommended that the students have acquired some work-life experience before entering the programme. Usually, there is a good mixture in the class of both ages and nationalities, which provides a great foundation for a thriving learning environment. Incorporating the more experienced students' experience into the teaching provides good leverage. The curriculum covers varied aspects of management and the programme design rests on three pillars: quality, sustainability and business acumen. The format of the examinations varies throughout the courses from traditional written examinations to home exams and project assignments; emphasis is put on teamwork skills. The programme finishes with a master's thesis worth 30 ECTS credit points, which is usually conducted with an industry partner.

Even if the programme is designed as a full-time on-campus education, some active seafarers try to combine these studies with part-time work, albeit with mixed results. One of the key motivations for persons attending the programme is shifting from a seagoing career to a land-based one but periods of training to achieve such a goal can put a considerable strain on their work-life balance. Usually, this group extends their study period to more than two years. The programme management is aware of the occasional problematic shift from work life to becoming a student again and are looking at possible options to solve this problem.

#### **4.3. DISCUSSION**

When it comes to the education at a master's level, the definition of MET undergoes expansion to its application to serve the STCW convention as it is not limited to the education of seafarers any more. The application scope goes beyond the organisation of transport chains in the modern world, which is driven by change, new trends and the need for lifelong learning. It demands the ability to react to all these factors. This is reinforced as the shipping profession is becoming increasingly complex in terms of social, economic and ecological factors. Therefore, lifelong learning and continuous education pose modern challenges for future trends in MET, as shown above.

The career path towards becoming a shipmaster consists of a theoretical and practical part. The theoretical part is covered by the BSc degree in Nautical Sciences (see above). After achieving the licence, the practical part commences with work on board for at least 24 months (without counting holidays) according to STCW. According to Eler et al. [16] the mean duration from achieving the captain's license until the actual promotion to the position of shipmaster amounts to some six years. However, in Germany and Sweden, most seafarers only work on board ships for a few years (in mean approximately some six to seven years),

after which they start a second career in shore-based management positions [17]. The work conditions on board, mainly the long absence phases from home, cause male and female nautical officers to see this work environment as incompatible with raising a family [18]. The active time as seafarers can be combined with further education without the need to give up the position on board [19].

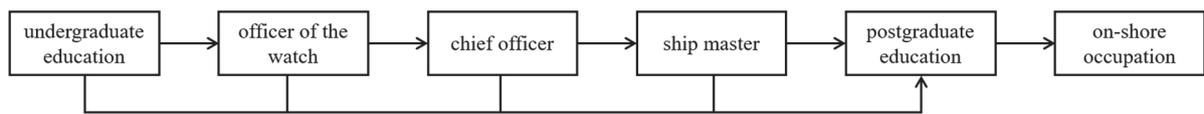
The similar situation sparked the development of postgraduate programmes in Sweden. The situation on board is usually referred to as a driving motivator for a change of career. Fewer crew on board, longer times away from home, increased demands on efficiency and turnaround and increased administrative workload are usually described as contributing factors [13]. As mentioned earlier, Maritime Management has been a postgraduate education programme at Chalmers for a long time and industry, academia and authorities have identified the need for such a training scheme. The aim is to ease the transition from a seagoing career to a shore-based one.

The maritime domain in Sweden employs roughly 150,000 persons while only about 2,000 of those are seagoing personnel. It is, therefore, reasonable to assume that there are several career paths available for persons interested in the maritime industry also after a sea-going career. On a global scale, 10 billion tons of goods are transported every year. The OECD expects the transport need to triple by the year 2050. The cruise industry and other types of passenger traffic are also developing positively, and there are no signs that the industry will decline.

## **5. SUMMARY AND CONCLUSION**

The MET systems in Germany and Sweden have been introduced on both levels, the undergraduate level as well as the postgraduate level. They are quite similar, and the common motivator for students to continue their education is more or less the same. One of the significant differences in this context is that Jade UAS offers IMM as distance learning education, which enables the students to maintain an active seagoing career in combination with studies (see figure 1). There are pros and cons to both systems. One can argue that what one lacks in online education could be made up by the flexibility and adoption possibilities it provides. On the other hand, students may find going without a regular income, and focusing solely on their studies, to be unaffordable. It may also be that family reasons force them to study part-time and independently of time and place, e.g. in the evenings.

1) sequential alignment:



2) increasingly parallel setting:

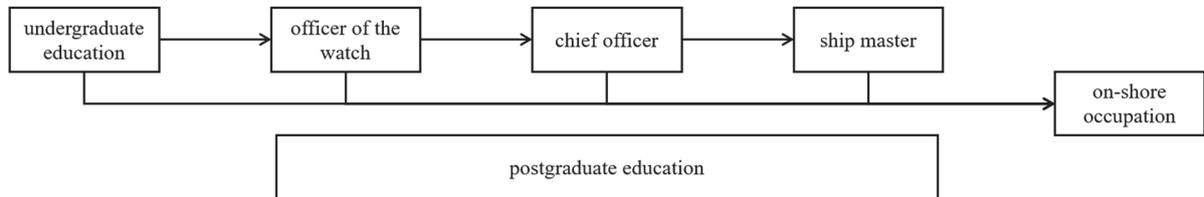


Figure 1: Sequential alignment versus increasingly parallel setting.

Moreover, in the past, we found an idealised understanding of the three phases of life, reaching from education (youth) through to work (middle age) to leisure (old age). Nowadays, this sequential alignment is no longer applicable, and it needs to be replaced by an increasingly parallel setting in terms of lifelong learning [20] as knowledge becomes increasingly out-of-date and obsolete faster and faster and therefore needs to be renewed regularly.

Building up on these results, future research could include a comparative analysis between the institutes from Germany and/or Sweden but also a country from another continent in order to analyse the possible impact of cultural diversity, similarities and differences.

Finally, transportation is one of the four pillars of globalisation [21] and all signs point toward an increase in European and worldwide transportation needs. With an industry employing more people than forestry and logging and air transportation combined, and with a total GDP contribution of € 145 billion [22], there is a clear need to provide a good educational regime for competent managers in the industry to cope with new challenges.

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