

THE LABOUR MARKET NEEDS BASED MARITIME EDUCATION – ESTONIAN MARITIME EDUCATION CONCEPT

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Abstract Referring to the latest studies Europe's maritime sector employs over 5 million employees generating almost EUR 500 billion a year, with a potential to create many more job places [1]. Moreover, almost 90 % of the EU's external freight trade is seaborne. Short sea shipping represents 40 % of intra-EU exchanges. Ensuring a good quality of life on Europe's islands and in peripheral maritime regions depends on good maritime transport services. Each year, more than 400 million passengers embark and disembark at European ports. [2]

Above-mentioned highlights the importance of the maritime sector and the fact that the maritime sector can be internationally competitive if there are working specialists educated according to the labour market needs. Maritime education is facing several challenges. From one side it is required to educate sufficient number of specialist to fill the needs of labour market. On the other hand, maritime education has to tackle at the same time with the existing demographic downturn and with the future development needs of maritime sector, for instance technological developments in the shipping and ports as well as in supply chain systems.

The paper presents integration of maritime labour market needs with the supply of maritime education market based on Maritime Education Concept (*MEC*). The objectives, methodology, and main results of MEC are described. The paper is focusing on labour market needs for the ship officers' professions. General conclusions and recommendations are given.

Keywords: maritime education concept, labour market needs, maritime education and training.

1. Introduction

The Estonian Marine Policy 2012-2020 (EMP) states that the maritime education and training (MET) should meet the follow condition: the maritime education in Estonia must ensure high-

level education to all specialities in balanced capacity and in all fields of maritime sector based on the labour market needs [3]. According to EMP, the concept of Estonian MET (MEC) is developed for achieving this goal.

The concept is based on previous studies' findings: i) the survey of labour market needs in Estonian maritime sector, 2015 [4], and iii) the study amongst alumni of Estonian MET institutions, 2016 [5]. The analysis of the all MET areas studied in MEC is not within the scope of this paper, the authors focus on the education and training of ship officers as an internationally regulated and most specific area of maritime education.

2. Estonian maritime education concept – ship officers' case

2.1. Methodological approach

The main starting point of the MEC development methodology is the assumption that there are two main factors in the formation and operation of maritime education system. The first of them is **an objective educational demand** for maritime education that comes from employers due to need of them for specialists with different levels of professional education. The source for determination of the objective educational demand were the results of abovementioned survey of labour market needs in Estonian maritime sector for years 2015-2025 [5]. This demand must be satisfied by the **supply of the education market** in the field.

Another key factor is **the subjective educational demand**, which is reflected in the number of people who want in the reviewed period to acquire one or another specialty of a certain level of maritime education [6]. It is important to note that subjective educational demand does not equal to supply of the education market, because the number of students inevitably decreases during study time, so the number of graduates is lower as compared to the number of those who have entered. Moreover, some part of graduates proceeds to work outside the maritime sector immediately after the graduating or does it later during observation period. These types of losses should be taken into account by correlation of the supply of the education market by corresponding coefficients. The result would be a **real supply** of the maritime education market.

2.2. The needs of Estonian shipping labour market

In course of investigation of maritime labour market needs the investigated activities were redundant to three operating subgroups: **shipping**, which in addition to the carriage of the goods and passengers contains ships towing, bunkering and crewing, **shipbuilding and ship repair** (including small boats building and repair), and **ports** (including stevedoring, ships agency

services and goods forwarding) [4]. For the purpose of present work, the target of the investigations has been shipping only, moreover, only the situation of the ship officers has been examined.

For drawing up the prognoses of labour market needs three development scenarios until 2025 were composed on the base of statistical analysis, interviews and experts' assessments. They were conservative, basic and optimistic scenarios what has been prepared in accordance with the following principles [4], [6]:

- the conservative scenario - relatively moderate scenario that takes into account some negative businesses estimations;
- the basic scenario - the continued development of the sector in accordance with the current development projection;
- the optimistic scenario - the most positive development opportunities are selected, i.e. the challenges facing the sector will realized in full.

Three development scenarios for subgroup of shipping are shown in Figure 1.

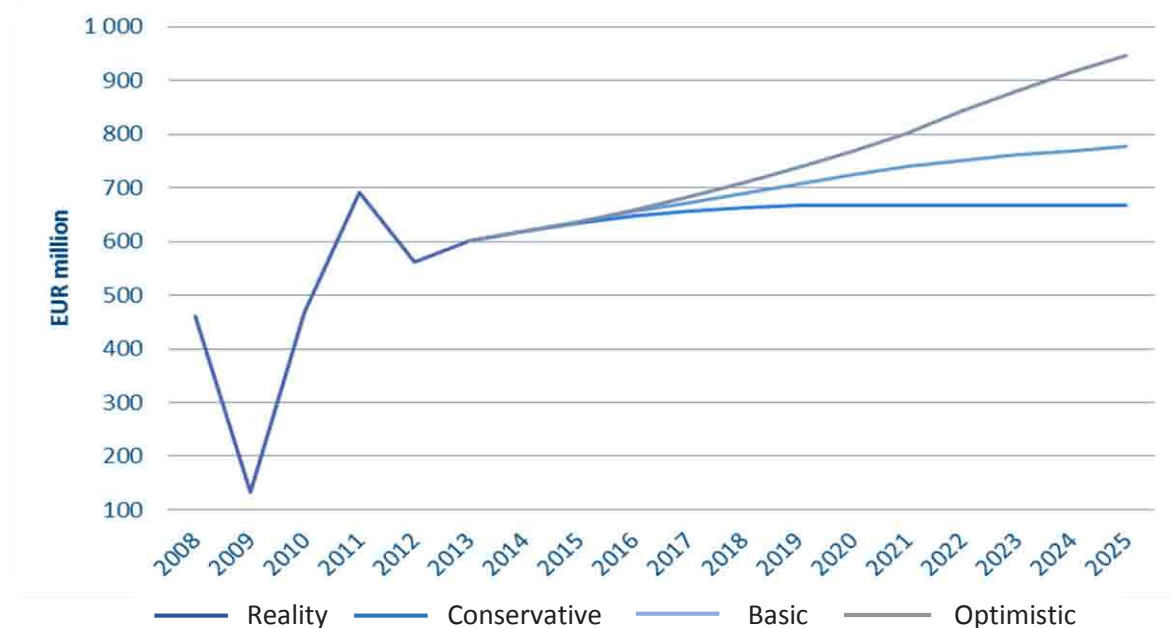


Figure 1. The development scenarios for shipping subgroup until 2025 (EUR million) [5]

The needs for additional labour forces in seafaring until year 2025 are shown in Table 1. Under additional labour forces, we understand in this case the people who will come to labour market in period of observation and who have to have maritime education for being employed on the vessels.

Table 1 shows that the greatest demand in Estonian shipping is for the captains and the chief engineers that correlates with the situation in the European Union and worldwide as a whole.

Table 1. The needs for additional ship officers in Estonian maritime sector until 2025 [4]

Job position	Scenario		
	Conservative	Basic	Optimistic
Captain	42	59	71
Chief Mate	14	18	25
Second Mate	8	12	17
Third Mate	21	24	29
Pilot	10	12	15
Chief Engineer	57	66	79
Second Engineer	13	15	20
Third and Forth Engineers	64	73	89
Refrigerating Engineer	8	10	13
Electro-Technical Officer	21	25	30
Radio-Electronic Officer	11	13	15
Total	269	327	482

2.3. The subjective educational demand

The subjective maritime education market demand is analysed on the base of the entrance to ship officers’ specialities in Estonian Maritime Academy (EMARA) in period 2000... 2016. Statistical data show that the weighted average competition for one student place for this period was 2.6 applicants for the navigation speciality and 2.7 respectively for the marine engineering speciality. True, those numbers annually have shown a downward trend in the last 8-10 years, primarily due to the deteriorating demographic situation in Estonia, which leads to a continuous decrease in the number of secondary and elementary schools’ graduates (see Figure 2).

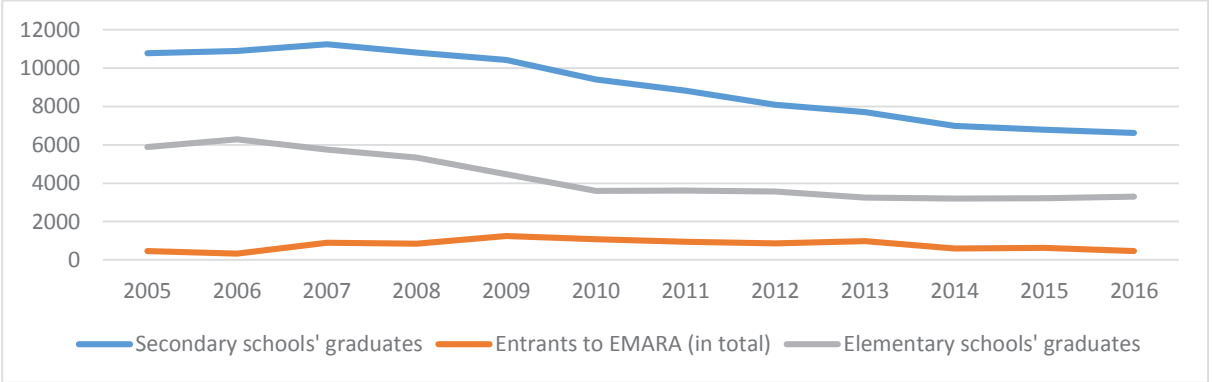


Figure 2. The number of schools’ graduates in 2005...2016; the number of entrants to EMARA

For instance, for the period 2007... 2016 number of graduates completed their secondary education decreased by 1.7 times and, for the period 2006... 2014 number of elementary schools' graduates decreased by 1.9 times (see Figure 2).

Based on the Estonian Statistical Office forecasts can be argued that the number of graduates of secondary schools continues to decline in a few years and reached its lowest state in 2018. Next, however, the process returns since 2019, and begins a slow but consistent growth, so the number of secondary education graduates will increased about 1.2 times by 2025 compared to 2018. It means that by the year 2025 the entrance to ship officers' specialties may be increased, if necessary, by 20% to 30%.

2.4. The real supply of the maritime education market

The subjective demand affects the number of people wanting to come for learning every year but for identification of the real maritime education market supply the number of graduates is very important as well as the number of people who move after graduating to jobs, corresponding to the acquired education.

Table 2. The ratio of entrees and graduates in the years 2000 ... 2011

Curriculum		Years of entry												Completion percentage in average
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
Navigation	Entrees	62	86	54	54	54	60	54	62	70	70	70	70	63
	Graduates (5 years later)	29	46	59	56	37	44	29	43	38	42	35	26	
Ship engineering	Entrees	38	30	36	36	36	37	34	40	32	45	45	46	70
	Graduates (5 years later)	19	40	33	27	28	20	22	26	27	33	14	28	

It is clear that, as a rule, for different reasons the number of graduates would be lower than the number of entrees to curriculum 5 years ago (nominal study period for ship officers' specialties). In Table 2 the number of entrees in 2000... 2011 is compared to the number of graduates 5 years later and the average completion percentage has been calculated on the base of it.

Table 3. The forecast of the graduates for the period 2017 ... 2025

Curriculum	Graduating years									Total
	2017 (real number)	2018	2019	2020	2021	2022	2023	2024	2025	
Navigation	30	42	37	43	40	39	42	45	48	366
Ship engineering	20	32	23	32	32	35	35	39	39	287

Based on this analysis and the results of the subjective educational demand forecasts, it is possible to predict how many people would annually graduate both curriculum for the period until 2025. The predicted numbers of graduates are given in Table 3.

2.5. Maritime career dynamics

In sections 2.3 and 2.4 analysis conducted allows to prepare forecasts for so to say initial output of maritime education and training curricula. Based on for relatively long period collected statistical data and taking into account the demographic situation of Estonian education market and its possible developments in the next 10 years, it is possible with a certain probability to determine how much people could come to the labour market each year from maritime training institutions.

For ship officers should be taken into account the specifics of their professions and career. Both mates and engineers can move by “career ladder” only following certain rules. As a rule, they can start after graduation their seafaring career from the lower ship officers’ steps, and to move to higher position not earlier than the requirements of the respective practical experience and the other qualification requirements are met. Life has shown that not all will reach the top of the career ladder as the post of captain or chief engineer (actually not all want to do it). This is probably one of the main reasons, why both the European and the world's fleet have in recent decades a constant shortage of labour on leading staff positions (captain, chief mate, chief engineer, second engineer). Hence, in determining the market offering for the lower-tier ship officers' level it is necessary to have in mind that only part of these officers can come later to higher positions on vessels. It may be illustrated by so-called “career pyramid” (see Figure 3).

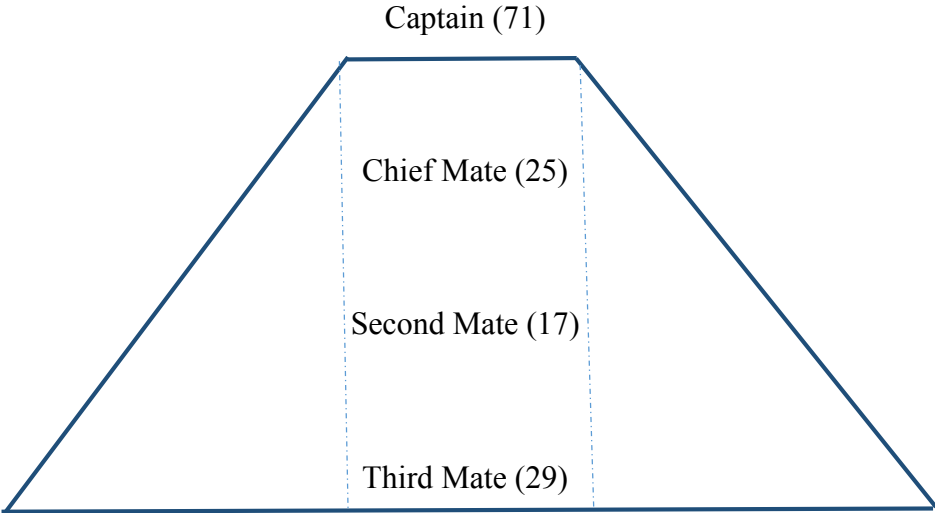


Figure 3. “Career pyramid” for deck officers

Numbers in brackets indicate how many ship officers of the respective stage should additionally come to the Estonian labour market in next nine years according to optimistic scenario (see Table 1). Looking at the Figure 3 it turns out that all the mates in "pyramid" must to become in 2025 the captains, because the total need for all ranks of mates (71 people) are the same as need of captains. However, this is unrealistic, because, firstly, as stated above, by far not all the officers can and want to become captains, and secondly, reaching the captain' position takes a certain number of years. From this perspective it is clear that for the satisfaction of labour demand in entire extent of the pyramid, watchkeeping qualified people (the third, fourth mate) should come to the labour market in times more than shown in the Figure 3. Similar approach can also be used for the ship engineers.

The Research and Development Centre of EMARA conducted from November 2015 to June 2016 a survey among the graduates of maritime education institutions. In a questionnaire, the respondents answered *inter alia* to work-related questions: on what job position they started after graduation; which their job position now and how much time was taken to reach this post etc. [5] Among those whose first job was at sea, began to work not in the maritime sector only 9% of the graduates.

2.5.1. Deck officers

From graduates of the navigation speciality 97 people answered the question about his first post. Of these 83 people or 86% were located in his professional work after graduation, 11 people or 11% were recruited maritime sector, but not exactly according to profession acquired, and 3 people (3%) did not have after school graduation worked in the maritime industry. The actual number of graduates should be to adjust by a career transition coefficient $K_{ESN} = 0.85$.

The question of the current (in the response moment) job answered 90 people. Among them 72 people or 80% worked at the sea, of which, in turn, 14 or 19% occupied the captain position. The longest time for becoming captain was 21 years and the shortest was 4 years. The weighted average time for reaching of this position is 9.4 years. Figuratively speaking, that one person could obtain in the year x the captain certificate of competence, 9 years earlier at least 5 people must completed the navigation speciality in maritime education institution.

2.5.2. Ship engineers

From graduates of the ship engineering speciality 50 people responded to the questionnaire, of whom answered the question about his first post 36 people. Of these 33 people or 94% were located in his professional work after graduation, 1 person or 3% were recruited maritime sector, but not exactly according to profession acquired, and 1 person (3%) did not have after

school graduation worked in the maritime industry. Extrapolating the results the actual number of graduates should be to adjust by a career transition coefficient $K_{ESE} = 0.94$.

The question of the current (in the response moment) job answered 34 people, or 97% of all respondents to the questionnaire. Among them 31 people or 91% worked at the sea, of which, in turn, 16 or 50% occupied the chief engineer position. The longest time for becoming chief engineer was 10 years and the shortest one was 3 years. The weighted average time for reaching of this position is 7 years. It can be concluded that about 50% of graduates reach the chief engineer position by approximately 7 years.

2.6. The European Union's labour market impact on the real MET supply

Since maritime is by its nature an international activity, it is clear that the EU maritime sector, especially in the labour market of shipping has a significant impact on the labour movement in the Member States, including Estonia, and it also greatly influences the Estonian maritime education market supply. [7] A significant part in Estonia marine-trained seafarers going to work for foreign shipping companies and other foreign flags.

Table 4. Ships division between flag states [5]

Flag state	Estonia	Finland	Netherlands	Man Islands	Liberia	Cyprus	Others	Total
Ship officers in total	37	18	11	7	5	4	20	102
%	36	18	11	7	5	4	19	100
Deck officers	25	7	8	6	3	4	17	70
%	36	10	11	9	5	6	23	100
Ship engineers	12	11	3	1	2	-	3	32
%	38	34	10	3	6	-	9	100

Responding to the questionnaire at sea working people answered, inter alia, to the following questions: "Is there a company in which you are currently working, registered in Estonia?", "Under which flag sail the ship on which you work?", and "Where do you permanently live in (country)?" [5]. The survey results showed that from 102 currently working on ships officers 40 people, or 39% of the respondents work in companies registered in Estonia; almost the same number of respondents, or 37 people (36%) are sailing on ships flying the Estonian flag [5]. Respondents' ships division between flag states is shown in Table 4.

The same may be said about division between Estonian and foreign shipping companies. In Estonian companies working 28 deck officers of 70, or 40%, to the engineers this number is 12 people of 32, or 38% [5].

The situation of seafarers' residence is quite different. The answers reveal that from 102 respondents, only 3 people (3%) named some other country than Estonia as the country of their habitual residence (one captain, one chief mate, one third mate) [6]. This confirms the long-time known fact that, in spite to the international character of their work seaman is generally devoted to his homeland, and selects it almost exclusively for himself and his family's residence. This means not only the seafarers' contribution to the Estonian economy by spending their income here, but, given the context of the MEC, more importantly, the potential willingness to go to work in companies in Estonia and under Estonian flag as soon as possible.

3. Conclusions

A detailed description of results of survey would go beyond the scope of this paper even if confined only to the ship officers' specialities, so authors bring out only some general conclusions and findings leaving a deeper and more detailed presentation of the subject for future publications purposes.

1. Analysing labour market demand and the education market supply for the highest positions (captain, chief engineer) it should be taken into account that reaching these position requires time. Average time for acquiring of the captain position is 9 years; accordingly, and for the chief engineer it is 7 years (see p. 2.5).
2. Taking into account statistically calculated coefficient of the achievement of the captain position $K_{ACP} = 0.2$, and the EU labour market transition coefficient $K_{LMT} = 0.6$ it can be concluded that the existing maritime education market offering will cover only about 50% of the shipping labour market needs.
3. At least half of in foreign companies currently employed mates and captains should move to companies registered in Estonia. To do this, however, firstly, should be sufficient numbers of job places for all steps mates in Estonian companies, and secondly, employment in Estonian shipping companies should be for all stages of deck officers and captains more attractive than working in foreign companies or under foreign flags. It does not seem to be real, at least now.
4. Needs for chief engineers can be satisfied to the extent of 85%, and annually entrance should be increased by 1.2 times.

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