HOGERE ZEEVAARTSCHOOL ANTWERPEN

Soft skills in the maritime sector: A gap analysis between the maritime academy curriculum and the demands of the maritime industry

Joren Van Belle

Preface

In this study, the role of soft skills in the maritime sector is examined. In particular, how they are currently represented by the Antwerp maritime academy and the maritime sector, as well as their possible discrepancies.

The writing of this master thesis has provided me with new insights into – and appreciation of – other interesting aspects in the maritime sector.
I would like to thank both of my supervisors, Captain Kathy Speelman and Professor Doctor Geert Potters, for their guidance throughout each stage of this dissertation process.

Summary

Achtergrond: Werkgevers uit de maritieme sector hebben vooral nood aan werknemers met technische vaardigheden. Ook soft skills spelen een belangrijke rol voor de werknemer om te groeien en te promoveren. Diepgaand inzicht in soft skills binnen de maritieme sector ontbreekt echter.

Doel: Deze studie heeft twee doelen: ten eerste het definiëren van soft skills in de maritieme sector, en ten tweede het bepalen van een mogelijke kloof tussen de soft skills uit het leerplan van de Hogere Zeevaartschool Antwerpen en diegene vereist door de maritieme sector.

Methodologie: Om te bepalen welke soft skills tegenwoordig belangrijk worden geacht enerzijds, en welke aanwezig zijn in de maritieme industrie en het leerplan anderzijds, werden vijf studies uitgevoerd. Daarna werd de kloof onderzocht tussen deze twee soorten skills.

Resultaten: Deze studie toont aan dat de eisen van de maritieme industrie grotendeels overeenstemmen met de skills die worden aangeleerd aan maritieme studenten, alleen het besef en de toepassing van de skills door werkgevers en werknemers is niet aanwezig.

Conclusie: Er zou meer nadruk gelegd moeten worden op de training van soft skills, alsook op de erkenning van soft skills door werkgevers.

Abstract

Background: Although employees of the maritime sector need – and are characterized by – hard and technical skills, soft skills are required as well. More specifically, these skills are of increasing importance in order to evolve and promote in their professional career. However, in-depth insight in these soft skills in the maritime sector is lacking.

Aim: The aim of this study was two-fold: define soft skills in the maritime sector, and secondly, more in particular to determine a possible gap between soft skills of the Antwerp Maritime Academy and those required by the maritime industry.

Methodology: Five studies were performed to specifically identify which soft skills are considered important, and which ones are currently present in the maritime industry and curriculum. Afterwards, the possible gap was determined between these two sets of skills.

Results: The present study showed that the demands of the maritime sector mostly agree with the skills taught to maritime academy students, however the awareness and application of the employers and employees is missing.

Conclusion: Therefore, we suggest that more emphasis should be put on adequate training of soft skills as well as the recognition of soft skills from employees.

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List of abbreviations

AMA   Antwerp Maritime Academy

AP   Artesis Plantijn University College

IMO   International Maritime Organization

STCW   The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers

TEAMS   Teaching Entrepreneurship, Advancing the Maritime Sector

SOLAS   The International Convention for the Safety of Life at Sea

1. Introduction

The maritime industry is a very versatile and diverse sector, both the people who work in it as well as the various job opportunities. Hence, it is not an industry that is characterized by just one or two departments. When looking into all the different steps through which cargo has to go, from departure to destination, it is astounding to see how many people and job profiles are involved; from logistics to transport to the administrative part of the journey.

Apart from cargo, the number of applications in the nautical world is endless. Dredging vessels can create land; tourists can see the world on board of cruise ships; research can be established in no matter what part of the ocean; and those are just a few examples. And for every different branch in the sector, there are several other parts that contribute to the success: the ports, the shipping companies, the transport companies, the logistic companies, etc.

The gap between how people are trained and what skills are required in the maritime industry presents an important challenge, in particular the role of **soft skills**.

Students at the Antwerp Maritime Academy are trained to work in this industry where the focus relies more on hard and technical skills; which are essential to have. But in order to rate someone's abilities, soft skills can be as important as hard skills.

This paper will define what soft and hard skills are, as well as identify the most important skills applicants should have. More in particular, we will identify what the maritime industry expects and what the future employees have to offer, by investigating the soft skills that are part of the current curriculum of the Antwerp Maritime Academy.

The research question is formulated as follows: What is the vision of the maritime sector on soft skills?

To answer this question, it can be divided in three sub questions:

- What is the opinion of the maritime industry?
- How does the International Maritime Organization (IMO) deal with soft skills?
- Which soft skills are currently present in the curriculum of the Antwerp Maritime Academy?

2. Literature review

2.1 What are soft skills?

The first question to ask in this paper is what soft skills exactly are and how they are currently used.

Soft skills are described in different research papers but there is no universally accepted definition. By summarising the view of different authors on soft skills and by opposing them to the opposite term i.e. hard skills and knowledge (Table 1), a more general description of this concept can be created.

Every author describes distinct differences between soft and hard skills. Soft skills are more referred to as interpersonal and transferable skills whereas hard skills are described as technical skills and knowledge. Another important difference is that hard skills are specific and different for every job or sector, in contrast to soft skills that are a general set of skills, being widely applicable and not necessarily job-specific.

Both skills can be trained in a different way; many soft skills such as leadership, communication, organization, and creativity can already be well established in one person while other people still need training. This is not the case for hard skills, as hard skills are job-specific and no one can possess these skills naturally. People need training, teaching and coaching to master the hard skills required for a particular job and when this job changes; hard skills also change.

Table 1 Definitions of hard and soft skills
Source: Own work

Hard skills	Soft Skills	Author
Hard skills are the technical expertise and knowledge needed for a job.	Soft skills are interpersonal qualities, also known as people skills, and personal attributes that one possesses.	Robles, 2012
Hard skills are skills associated with technical aspects of performing a job and usually include the acquisition of knowledge. Hard skills thus are primarily cognitive in nature and are influenced by an individual's Intelligence Quotient (IQ).	Soft skills are skills often referred to as interpersonal, human, people, or behavioral skills, and place emphasis on personal behavior and managing relationships between people. Soft skills are primarily affective or behavioral in nature and have recently been associated with the so-called Emotional Quotient (EQ).	Rainsbury, Hodges, Burchell & Lay, 2002
	Personality traits, goals, motivations, and preferences that are valued in the labor market, in school, and in many other domains.	Heckman & Kautz, 2012

Technical skills consisted of specialized knowledge of tools and techniques, and abilities to execute processes and procedures relative to a particular discipline.	Soft skills are a collection of people management skills, important to many professions and job positions.	Matteson, Anderson & Boyden, 2016
Hard skills are about the person's skill set and ability to perform a certain type of task or activity.	Soft skills relate to a person's ability to interact effectively with coworkers and customers and are broadly applicable both in and outside the workplace.	Nitonde & Nandapurkar, 2014
Technical skills that involve working with equipment, data, software, etc.	Intrapersonal skills such as one's ability to manage oneself as well as interpersonal skills such as how one handles one's interactions with others.	Laker & Powell, 2011

To highlight the difference between these two sets of skills, let us look at the two main departments on board a vessel: the engine department and navigation department. The hard skills used by an engineer cannot be compared to those of a deck officer, as maintenance and knowledge of an engine is not required to sail and maintain a vessel. Soft skills on the other hand do not greatly change when the job changes, as these skills are important for management, interpersonal relations and communication, which are deemed important for both departments.

2.2 The importance of soft skills

As mentioned before, soft and hard skills are a useful tool to determine whether someone is qualified to do a certain job. The next step in defining soft skills is determining how *important* these skills are. *Deloitte* made a report in 2017, stating that by 2030 more than 65% of the jobs in Australia will be soft skills intensive. And with an increase of soft skills there is an expected growth of revenue by 90,000 dollars per average business. However, people do not report soft skills on their resume and one out of four employers experience a lack of soft skills in applicants.

In today's society soft skills have become more recognised as an important value for an employee. Let us therefore look at an example from Google and their project *Aristotle*. In this research, Google collected data from several teams, and came to the surprising conclusion that the highest and smartest teams, which consisted of mostly scientists, were actually less important when it came to new ideas. The teams responsible for these innovations were not the smartest people in the company but the ones that possessed a large range of soft skills (Agarwal, 2018).
This example shows that soft skills can have a major impact in a company and why both employees and employers should pay attention to develop these skills.

In the UK, several reports were published involving soft skills, with overall results pointing out that soft skills are being trained to students and that employers are seeking for the same skills. This showed a good equilibrium between what is available and what is demanded, however it was also reported that there is still room for improvement in training these skills (Neves, 2019).

ManpowerGroup (2019) have done research on soft skills and automation in multiple countries and have come to several interesting results. Their

first finding is that organizations find it harder to train soft skills than in-demand technical skills.

They also made a projection that by 2030 there would be an increase in demand for human and soft skills of 26% in the U.S. and of 22% in Europe across all industries.

In the report it is also stated that up skilling will be a must for companies. They have to realise that perfect employees are not available and waiting, they have to be trained *within* the company.

Bishop (2017) found that a lack of soft skills affects productivity and performance and that people will as a result be held back in the future. He claims that productivity is the sum of three attributes: education, experience *and* soft skill development, with the latter being the most important factor to determine an employee's future. If an employee lacks one of these, productivities can be negatively affected.

As a solution he proposes that the decision to hire employees should be based more on soft skills than on hard skills, as hard skills can be trained in an easier and cheaper way than soft skills.

All sources acknowledge a lack of soft skills is present but expect a growth in the upcoming years. However, this growth will not happen by itself, employers need to be aware of the benefits of soft skills and should focus more on training. Furthermore, more attention should be paid to soft skills of an applicant during job interviews as hard skills may show that someone is ready to perform a job while soft skills assure that this person can grow and can be useful for the company on many (other) different levels. In summary, soft skills have been increasingly reported to be of major importance in the industry, however the practical implementation, adequate training and evaluation seems to be lacking.

2.3 List of soft skills according to literature

The next step in understanding soft skills is defining exactly which skills are considered "*soft*". By listing the skills that are recognized as soft skills, a list can be created from most common to least common skills. The sources used for this information were selected based on their relevance with soft skills, of which the method is explained in annex A and the results being set out in table 2.

Table 2 List of soft skills
Source: Own work

Soft skills	Amount
1. Communication (oral, written)	16
2. Teamwork	15
3. Leadership	10
4. Planning and organization	9
5. Motivation	9
6. Interpersonal skills (interaction with others, influence, relationship building, impact…)	7
7. Problem solving and conflict resolution	7
8. Creativity and innovation	7
9. Responsibility	6
10. Flexibility	6
11. Time management	6
12. Critical thinking	5
13. Self confidence	5
14. Working under pressure	5
15. Integrity (honesty/moral)	4
16. Professionalism	4
17. Work ethic	4
18. Courtesy	2

What stands out in this table is the high frequency with which communication and teamwork were mentioned. Together with leadership, they make up the top three. Skills such as self-control, persuasion skills, knowledge of the industry/company, emotional intelligence, insight… were not included in this list, as they occur only once or were deemed less important.

Soft skills can be interpreted in different ways, depending on the sector they are used in. In order to avoid confusion, they will be described separately below.

2.3.1   Definitions of soft skills

Communication
Every behavior is communication, even behavior that you are not aware of. There are two basic types of communication: verbal communication and non-verbal communication (Volwassen onderwijs KISP, 2019).
Verbal communication happens through verbally, vocally or through written words, which express or convey the message to others ("Types of Communication", 2014).

It is clear that the concept of communication is broader than just verbal language. We communicate not only by what we say, but also by our gestures, facial expressions, volume, speech speed, voice color, posture, distance, ... in short, by our non-verbal communication. Your body language is the outward reflection of your emotional state. Body language is "complementary" to verbal language: it clarifies the actual meaning of the message (Volwassen onderwijs KISP, 2019).

Another type of communication is internal communication, often perceived as a synonym for intra-organizational communication. It simply means all forms of communication within the organization. Internal communication

is the aspiration of achieving a systematic analysis and distribution of information at all layers simultaneously coordinated in the most efficient way possible (Tkalac Verčič, Verčič, & Sriramesh, 2012).

Teamwork

Teamwork is defined as "the combined action of a group working together effectively to achieve a goal" (Cambridge Dictionary, 2020). A team is a group in which the members gain synergy benefits, which means that the effect of the collaboration is greater than what the individual parties would have achieved in total if performed separately. Thus, one can state that all teams are groups, but not every group is a team (Valkeneers, 2016).

In a group there are also group roles, with a distinction between functional and non-functional roles. Functional roles include task-oriented and group-oriented roles, which means that the members can work on their assignment and that they can work together in a pleasant way. Non-functional roles are those in which the contributions to the group are not constructive, but focus on their own interests, such as obstructions and seeking recognition. Good cooperation is only possible if the task-oriented and group-oriented roles are fulfilled and the non-functional roles remain limited. When looking at the soft skill that someone can have; then teamwork is more, it is also the ability of someone to be able to work with people. Some people find it hard to work well with other people, they can express themselves less in groups or they do not feel confident to speak out in groups (Valkeneers, 2016).

Leadership

Often leadership is confused with a position, for example a director, mentor, manager, supervisor, … But being in one of these roles does not make one a leader (Mott, 2006). This skill is rather hard to define as people have a different view on what leadership is – or should be. When looking at the soft skill the most obvious definition is: "the skill to manage

a group of people and instruct them to focus their energy on a certain objective" (Cyert, 1990). A leader must be willing to challenge himself and others to provide the best possible care. A leader should set high standards while encouraging, supporting and rewarding those who work with him or her (Mott, 2006).

A leader is someone who can influence and train people and has the ability to align the interests and goals of the employees to the mission and objectives of the organization. Causing them to focus their efforts and energy to achieve the organizational mission and objectives. A leader achieves this by creating a clear vision of the future that corresponds to the beliefs and values of the employees in such a way that they can plan out every step (Winston & Patterson, 2006).

Planning and organizing

Planning refers to looking ahead and making decisions with a view to securing the future. Organizing means collecting the necessary machines, equipment and people basically everything you need to execute your plan (Valkeneers, 2016).

Motivation

Motivation is described by Cambridge dictionary as: "enthusiasm for doing something" (Cambridge Dictionary, 2020). When applying this skill to a student or employee this would mean that this person is driven to learn more or to do more to achieve a certain goal. The motivation depends on the goals set by each individual, such as salary, promotion and working conditions but it also depends on the environment created by the employer; such as recognition, responsibility and the work tasks (Dobre, 2013).

The term motivation comes from the Latin word "*movere*", which means to move. Motivation is used to achieve a certain goal and consists of a

process where the perseverance, the passion and the course are determined. However, two types of motivation exist, intrinsic and extrinsic motivation. Intrinsic motivation means the job is executed for the pleasure that can result from it. Extrinsic motivation implies that the employee executes the job for a reason other than the work activity, e.g. high wages (Valkeneers, 2016).

Interpersonal skills

These skills are used to establish, maintain and develop relationships between people. They are a vital aspect of the social life, largely on a one-to-one basis. Interpersonal skills are involved in dealing with and relating to other people (Barakat, 2007). We gain support, comfort and recognition in this two-way process. Communication is naturel; we need to communicate with others from birth. The definition of interaction is having an effect upon each other (Wright, 2007). Social and personal health is an important consequence of these skills as they can improve or worsen a person's health (Spitzberg, & Cupach, 2011).

Problem solving and conflict resolution

Problem solving is a difficult skill to master, as most problems do not have a clear solution as problems could be complex or the information given is not sufficient. When these problems occur, the solution can best be found by collecting relevant information and by being able to select and use the right information found in these sources. (Chen, 2010)

Creativity and innovation

Creative people think more out of the box, and can provide new approaches, inventions or insights (Khessina, Goncalo, & Krause, 2018). Innovation is proactive and self-starting. It means grabbing opportunities and acting on them, taking action and actively influence events (Gibert, Tozer, & Westoby, 2017). Innovation is linked to creativity and is the outcome or result of an idea or concept. So basically, in the creative stage

an idea is formulated, and the innovative stage develops, conceptualizes and defines this idea further (Heunks, 1998).

Responsibility

According to Merriam-Webster, responsibility is the quality or state of being responsible: such as moral, legal, or mental accountability and reliability, trustworthiness ("Responsibility", n.d.). The most important matters of responsibility are accountability, trust and appropriate moral decision-making (Pless & Maak, 2011).

Taking on responsibilities associated with a professional role is an important aspect. However, responsibility is a complex concept that is connected to issues of trust and risk as well (Clouder, 2009).

Flexibility

According to several papers, flexibility cannot be explained in one simple definition. Golden and Powell (2000) defines flexibility as "the capacity to adapt" and explains that different types exist depending on specific dimensions. For the scope of this research we will not explain these dimensions.

Flexibility is being adaptable and receptive to new ideas. These people can respond and adjust easily to changing work demands and circumstances. They are not bound by old ways of doing things (Gibert, Tozer, & Westoby, 2017).

Time management

It is important to note that time management is a broad subject that covers many different areas from day-to-day actions to long-term goals (Chen & Kao, 2012). Time management can also be defined as the process of organizing and planning how to divide your time between specific activities ("What Is Time Management?: Working Smarter to

Enhance Productivity," n.d.). This definition explains what it is but Macan (1994) goes further. She explains that the needs of the activities should first be defined and then they should be classified by importance. The next step would be to link them to time and resources available for completing them by planning and scheduling (Macan, 1994). Chen and Kao (2012) add more details to the definition. They define time management as the use of a set of principles, practices, skills, and tools to accomplish specific tasks and goals. You need to be aware of several skills including prioritizing, planning, scheduling, goal setting and maximizing efficiency in a good time management system. The goal is to have a consistent set of tools designed to work well with each other (Chen & Kao, 2012).

Critical thinking

The word "critical" derived from the Greek word "kritikos" meaning "discerning", originally from "krinein" meaning "judge, decide". The modern word "criterion" came from "criterion" or "means of judging". The connection of these ancient words to modern views is apparent in the idea that critical thinking involves the use of criteria in making reasoned judgments (Horvath & Forte, 2011).

Understanding and thinking critically about scientific evidence is a crucial skill in the modern world (Holmes, Wieman, & Bonn, 2015). This is the way in which people choose to use their skills or resources to achieve a better result (Halpern, 1998). Another explanation to this soft skill is carefully contemplating every step or idea to achieve a goal (Hitchcock, 2018).

Self-confidence

Self-confidence is defined as the realisation of someone's own capabilities or skills and the way to act in certain situations (Cheng and Furnham, 2002).

Self-confidence can be explained as the individual recognition, love and awareness of emotions of oneself. As well as the feeling of wellbeing that results from positive emotions. When someone is feeling well it can be explained as an agreement with one's self and people around him or her. The skill can be naturally from some people, however for most people it develops when growing up. The skill is considered as a key characteristic for self-valuation (Kukulu, Korukcu, Ozdemir, Bezci, & Calik, 2012).

Working under pressure

Working under pressure is the ability to cope with difficult situations and adapt. One of these situations is a high volume of work. Working under pressure means being able to develop leadership skills no matter in what position you work. It also means coping with a shortage of staff at busy periods, foreseeing work problems and being able to be flexible with the problems (Funk, 2016).

Integrity

Integrity consists of several elements, such as honesty, fairness, consistency to stick to a certain set of principles and responsibility to bear the consequences of the chosen morals (McFall, 1987).

Behavioral integrity is the observed pattern of alignment between a person's words and actions. It is the extent to which employees experience that others keep their promises. It is also the extent to which they accurately represent themselves and their values in communication. Integrity has a major impact on the organization's commitment,

citizenship behavior, performance and intention to quit (Kannan-Narasimhan & Lawrence, 2012).

Professionalism

There is a lot of confusion around the definition of professionalism. Ali & Bradburn (2018) say there is no clear, concise and relevant definition of professionalism. Nearly everyone has certain qualities or values in mind that exemplify the word professionalism. The term 'professionalism' is a construct of attribution, meaning it consists of various traits, characteristics, behaviors and qualities that are attributed to those that others hold in high esteem, especially colleagues in the same profession. The Merriam-Webster dictionary agrees on the definition. They define the term as "the conduct, aims, or qualities that characterize or mark a profession or a professional person" ("Professionalism," n.d.). In most literature on this subject, professionalism consists of different qualities, dependent on the profession ("Professionalism: Developing This Vital Characteristic," n.d.). The most numerous qualities are knowledge, altruism, accountability, competence, respect, integrity, lifelong learning, compassion, honesty, excellence, submission to an ethical code, self-regulation and service (Ali & Bradburn, 2018; "Professionalism: Developing This Vital Characteristic," n.d.)

Work ethic

"A commitment to the value and importance of hard work" (Miller, Woehr and Hudspeth, 2002). This definition explains the whole term, work ethic is the belief that hard work will pay off and will lead to the improvement of character and moral. Hard working, willing to work, loyal, initiative, self-motivated, on time and good attendance are terms that are linked with work ethic according to Robles (2012).

Courtesy

Robles (2012) describes courtesy as manners, etiquette, business etiquette, gracious, says please and thank you and respectful. Courtesy is the act of being polite towards others by behavior of an action ("Courtesy," n.d.)

2.4   Maritime job offers

The requirements for applicants in the maritime sector mostly constitutes out of hard skills, however soft skills are also required but to a lesser extent. Out of 25 job offers, two skills seem to stand out: communication and flexibility. Regarding communication, the ability to communicate in the English language is of major importance. Secondly, flexibility is also required as most jobs have irregular hours and trips abroad are very common.

Interpersonal and intercultural skills as well as teamwork are required to deal with the international nature of the sector, but are not a priority for the majority of the employers. This also applies to the organizational skills such as planning, self-management and working under pressure ("Maritieme vacatures", 2020).

3. Research objective

The research objective of this paper is the following: "What is the vision of the maritime sector on soft skills?". To answer this question, it is divided in three parts.

The first part deals with the opinion of the maritime industry. How do the companies interpret the term and which soft skills are they looking for in their possible future employees?

Secondly, how does the International Maritime Organization handle soft skills, are they acknowledged? This subject is dealt with in the STCW.
The STCW is the International Convention on Standards of Training, Certification and Watch keeping for Seafarers established in 1978 under the International Maritime Organization (IMO). The main concern of this convention is the safety of life at sea and the protection of the marine environment, and to ensure this a set of requirements has been developed. They describe minimum standards of training, certification and watchkeeping for seafarers on an international level (International Maritime Organization, 2011).
The Convention is divided into eight chapters:
1. General provisions;
2. Master and deck department;
3. Engine department;
4. Radio communications and radio personnel;
5. Special requirements for personnel on certain types of ships;
6. Emergency, occupational safety, medical care and survival functions;
7. Alternative certification
8. Watchkeeping

Each chapter contains the basic requirements for the different parts of the life at sea. Besides the convention, the IMO published the STCW Code that

explains the requirements of the Convention in detail. (International Maritime Organization, 2011).

The third and final part deals with the question "What is the vision of the maritime higher education in Belgium?". This part of the sector is represented by one institution, being the Antwerp Maritime Academy (AMA).

The AMA is located in Antwerp and offers training in nautical sciences and marine engineering. The basics for this training are provided by implementing the STCW competences. In addition, the AMA provides extra courses to prepare students as best as possible for the numerous functions available in the maritime industry.

The students that graduate at the AMA will have mastered the requirements set out in the STCW convention and will also possess the soft skills that are associated with it (Antwerp Maritime Academy, n.d).

4. Methodology

4.1. Explanation of research

To answer the research questions of this thesis, four studies have been made:

1. TEAMS symposium
2. Soft skills provided by the STCW
3. Soft skills present in the AMA curriculum
4. Gap analysis of soft skills

The first research was set up to gain better insight in the most important soft skills used today, particularly in the maritime sector.

The second study identifies the demands set out by the IMO by analysing the STCW and trying to link the listed requirements to soft skills. Thereafter, the same task was performed for the curriculum of the AMA.

And finally, the results of the previous studies were compared and analysed to determine the gap between the skills that are offered, and those that are required. In order to create a clear and equal layout for all our tables we will follow the classification used by Tiimiaktemia from now on(Annex 2).

4.2 Research design

First research: TEAMS symposium

The symposium was held to start the project TEAMS; which stands for Teaching Entrepreneurship, Advancing the Maritime Sector, this project is established to research how to improve entrepreneurship and design thinking and combining that with the current soft skills in the curriculum (TEAMS, 2019).

The information that was gained from this symposium was then compared to the results of the Artesis Plantijn University College to achieve a broad perspective of the relevant soft skills used today.

Second research: STCW

In order to define which soft skills are mentioned in the STCW, the competences set out in their requirements were examined. By carefully inspecting every single competence we were able to link some of them to a certain soft skill. This again resulted in a list of soft skills relevant for the STCW (Table 7).

Third research: Antwerp maritime academy

The soft skills present in the AMA curriculum were determined using the same method that was detailed for the STCW. The result was once again a list of soft skills. In order to establish what skills were deemed more important that others, they were classified from most mentioned to least (Figure 1). This was achieved by checking each skill and by counting in how many courses it is treated. For the scope of this thesis, only the curriculum of the nautical department was used as the one of the mechanical engineering department contains the same soft skills.

Final research: Gap analysis

The last research combines the acquired tables from the maritime industry, the STCW and the AMA and divides them according to the division of Tiimiakatemia in five clusters. Eventually, the skills of every different cluster were compared with the aim to determine if a gap was present, and if present, to what extent.

5. Results

5.1 Maritime industry

5.1.1 TEAMS symposium

In this first stage several representatives of the maritime sector were present to give their vision on soft skills and entrepreneurship, going from lecturers of several institutions to representatives of important maritime companies. At the start of the symposium the participants were asked to list what – in their opinion- soft skills are. Then a number of presentations were given whereupon people were asked if their vision on soft skills had changed (table 3). To end the symposium two focus groups were formed to further discuss soft skills. This resulted in a mind map where different soft skills are centred around entrepreneurship (figure 1).

Table 3 Symposium soft skills
Source: Own work

Soft skills	Amount
Teamwork	6
Critical thinking	5
Communication	5
Leadership	3
Interpersonal skills	3
Emotional intelligence	2
People management	2
Creativity and innovation	2
Responsibility	1
Resilience	1
Just culture	1
Adaptation	1
Psychological safety	1
Initiative	1
Open-mindedness	1
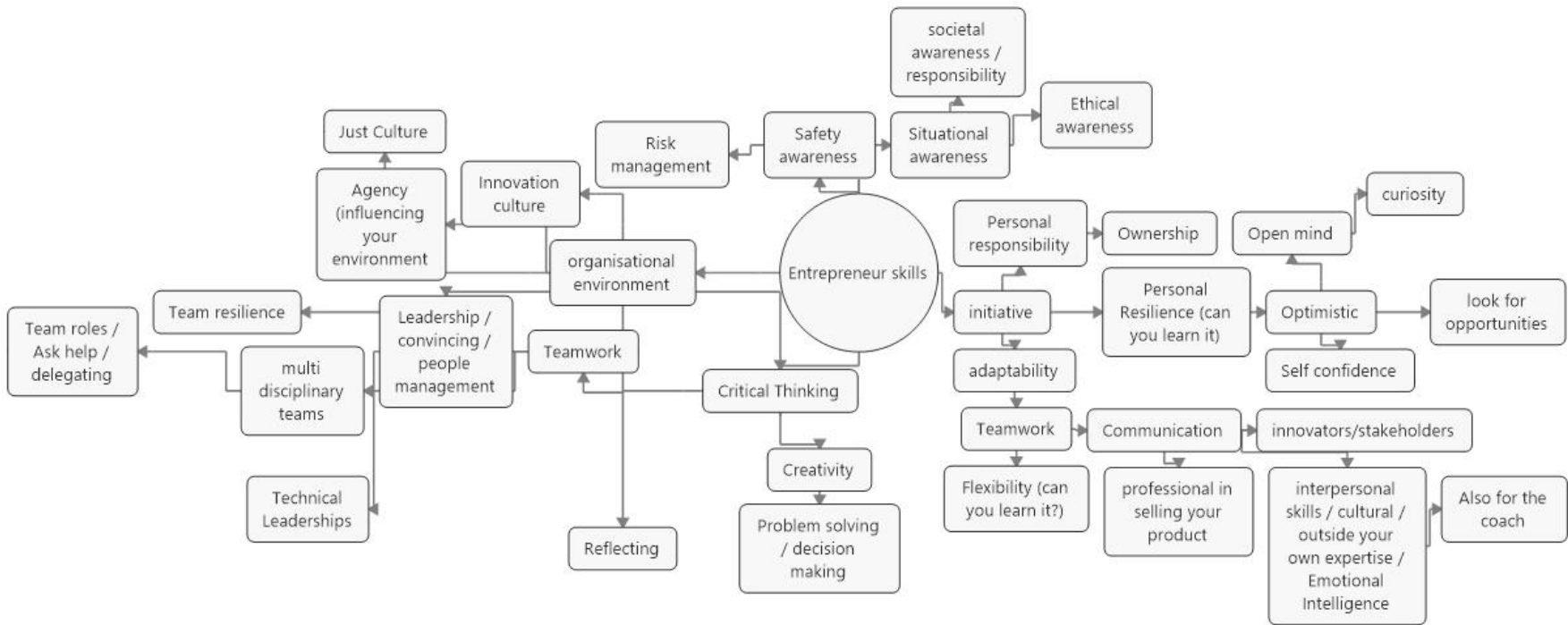
Figure 1   Mind map TEAMS symposium

Source: Own work

5.1.2 Artesis Plantijn University College

The Artesis Plantijn University College (AP) is an autonomous university of Applied Sciences and Arts consisting of 13 campuses ("AP Hogeschool Antwerpen," n.d.).

In 2018 they conducted research in soft skills, which resulted in a list created from existing models (table 4; Artesis Plantijn University College, n.d.).

They also set up the project Skills Navigator to investigate which soft skills are demanded and provided in the labour market of the port areas of the Flemish-Dutch delta. As a result of this research a model was established containing four clusters each containing a number of skills (Table 5; Van den Broeck, 2020).

Table 4 Results AP

Source: Artesis Plantijn University College (n.d.)

Soft skills	Amount	Soft skills	Amount
Communication	20	Stress resistance	7
Teamwork	20	Analysing	7
Creativity	18	Decision making	7
Self-development	14	Commercial insight	7
Flexibility	13	Personal appearance	5
Diversity	13	Coaching	5
Planning and organizing	13	Giving direction	5
Independence	12	Convincing	4
Initiative	11	Assertiveness	4
Result-oriented	9	Media literacy	4
Customer oriented	9	Digital thinking	4
Responsibility	8	Punctuality	3
Empathy	8	Carefulness	3
Critical thinking	8	Discipline	2
Reliability	7	Orderliness	0

When comparing the results of the symposium and the findings of the AP University College, similar conclusions can be drawn for the top soft skills needed today. The most common ones are teamwork and communication, which are present in the top three of both lists. There are a couple of remarkable points when comparing; in table 4 critical thinking scored quite low in comparison to the results of the symposium, where it is placed in the top three. Another point is that leadership is not mentioned in table 4 of AP. And when looking at all the skills mentioned in the two lists; we see that some of them such as: just culture, knowledge of media and persuasiveness, occur in only one of them.

When looking for the skills mentioned in both lists, we only find six of them: communication, teamwork, critical thinking, creativity, initiative and responsibility.

Table 5 Skills navigator

Source: Van den Broeck (2020)

Key competences	Learning ability
-Global awareness and safety	-Creative and innovative thinking
-Financial and economical awareness	-Critical thinking
-Environmental awareness and sustainability	-Problem solving skills
	-Willingness to learn
ICT skills	**Career skills**
-Basic ICT skills	-Communication skills
-Digital information skills and media literacy	-Intercultural skills
-Computational thinking	-Initiative and self-management
	-Inspiring and coaching others
	-Cooperation
	-Flexibility
	-Responsibility
	-Planning and organising
	-Result-oriented

Table 6 Soft skills in the maritime sector

Source: Own work

	Skills navigator	TEAMS symposium
Learning and Research	Initiative and self-management Flexibility Willingness to learn Result-oriented	Initiative Flexibility Curiosity Adaptability Personal resilience Optimistic Self confidence Open mind
Creativity and Innovation	Creative and innovative thinking Critical thinking Problem solving skills	Critical thinking Creativity Problem solving /decision making Innovation culture
Leadership and Management	Inspiring and coaching others Cooperation Planning and organising	Organisational environment Teamwork Leadership Convincing

		People management
		Multidisciplinary teams
		Team resilience
		Team roles
Marketing and sales		Professional in selling your product
		Innovators/stakeholders
Business competences	Global awareness and safety	Safety awareness
	Responsibility	Responsibility
	Environmental awareness and sustainability	
	Financial and economical awareness	
Communication	Communication skills	Communication
	Intercultural skills	Interpersonal skills
		Emotional intelligence
		Ethical awareness

Table 6 contains the skills found in both studies. The clusters contain mostly similar skills with the exception that the results of the symposium are more extensive. They provide a broader selection of skills for every cluster except for the business competences, which are more detailed by the AP study. Overall these results provide a clear idea of what the industry requires.

5.2 STCW

The analysis of the STCW resulted in a collection of 15 soft skills. These soft skills are further explained and linked to their respective requirements by practical examples. As these requirements were set out for future seafarers, the examples refer to experiences from on board ships.

5.2.1 Communication

This soft skill is an important value for future seafarers and on different levels. In the requirements seafarers are expected to master the English language in both oral and written form. With English being the main language on board of ships, this seems a logical demand. To avoid injuries and accidents language plays a significant role, especially in the communication between ships. Another requirement is to understand communication and how to communicate effectively in different situations. For example, a small repair on deck where both participants are close to and in sight of each other, communication can be established and maintained easy. On the other hand, when a confined space investigation has to be executed, good communication is crucial for the safety and the completion of the task. The person on the inside has to rely on the person at the entrance to get clear instructions about the situation, especially on the oxygen level inside. And the person on the outside has to listen carefully to everything the investigator says and does.

Maintain a safe navigational/engineering watch- Knowledge of bridge/engine-room resource management principles, including *effective communication* (STCW A-II/1-F1-C2-K8, A-III/1-F1-C1-K9).

Use the IMO Standard Marine Communication Phrases and use English in written and oral form-English language: Adequate knowledge of the English language to enable the officer to use charts and other nautical publications, to understand meteorological information and messages concerning ship's safety and operation, to communicate with other ships, coast stations and VTS centres and to perform the officers duties also with a multilingual crew, including the *ability to use and understand the IMO Standard Marine Communication Phrases* (IMO SMCP) (STCW A-II/1-F1-C7-K1).

Application of leadership and teamworking skills-Knowledge and ability to apply effective resource management: *effective communication onboard and ashore* (STCW A-II/1-F2-C7-K8, A-II/2-F3-C5-K8, A-III/1-F3-C7-K8, A-III/2-F4-C5-K8 & A-III/6-F3-C5-K7).

Use English in written and oral form: Adequate knowledge of the English language to enable the officer to use engineering publications and to perform engineering and the officer's duties (STCW A-III/1-F1-C2-K1, A-III/6-F1-C6-K1).

Establish and maintain effective communications:
- *Ability to establish and maintain effective communications,* including:
    - The importance of clear and concise instructions and reports (STCW A-V/2-C5 K1).

- The need to encourage an exchange of information with, and feedback from, passengers and other personnel (STCW A-V/2-C5-K2).
- Ability to provide relevant information to passengers and other personnel during an emergency situation, to keep them apprised of the overall situation and to communicate any action required of them, taking into account:
  - *The language or languages appropriate to the principal nationalities of passengers and other personnel carried on the particular route* (STCW A-V/2-C5-K3).
  - *The possible need to communicate during an emergency by some other means,* such as by demonstration, or by hand signals or calling attention to the location of instructions, muster stations, life-saving devices or evacuation routes, when oral communication is impractical (STCW A-V/2-C5-K4).
  - *The language in which emergency announcements may be broadcast during an emergency or drill to convey critical guidance to passengers and to facilitate crewmembers in assisting passengers* (STCW A-V/2-C5-K5).

Plan and monitor safe bunkering, stowage and securing of the fuel on board ships subject to the IGF Code: *Ability to establish clear and concise communications and between the ship and the terminal, truck or the bunker- supply ship* (STCW A-V/3-2-C4-K3).

Contribute effective communications on board ship:
- *Understand the principles of, and barriers to, effective communication between individuals and teams within the ship* (STCW A-VI/1-4-C4-K1).

- *Ability to establish and maintain effective communications* (STCW A-VI/1-4-C4-K2).

5.2.2 Teamwork

Teamwork is mentioned in the convention but still plays an important role in the productivity and operation of the vessel. The convention emphasizes the understanding of each team member's experience and strengths. For example, a fire drill is a difficult operation and when team members are not adjusted to each other a misunderstanding or mistake can occur, with possible fatal consequences.

Maintain a safe navigational watch-Bridge resource management Knowledge of bridge resource management principles, including *consideration of team experience* (STCW A-II/1-F1-C2-K11).

Application of leadership and teamworking skills
- Working knowledge of shipboard personnel management and training (STCW A-II/1-F2-C7-K1).
- A knowledge of related international maritime conventions and recommendations, and national legislation (STCW A-II/1-F2-C7-K2).
- Ability to apply task and workload management (STCW A-II/1-F2-C7-K3-K6).
- Knowledge and ability to apply effective resource management. (STCW A-II/1-F2-C7-K7 to K11).
- Knowledge and ability to apply decision-making techniques (STCW A-II/1-F2-C7-K12 to K15).

5.2.3 Leadership

Leadership is described by a number of abilities. Especially the feature of managing and directing people plays a big role in the requirements of the convention. A leader is also portrayed as a go to person for crew and passengers, someone who is looked to in need. Especially in emergency situations this skill is important. Let's look for example at the disaster of the Costa Concordia in 2012, when this vessel struck a rock off the coast of Tuscany which resulted in a deadly accident. During this event the master did not act the way a leader should, he abandoned the vessel in the middle of the evacuation (Giustiniano, Cunha & Clegg, 2016). The leadership skill is not only crucial for the master of the vessel; every officer and engineer should possess this skill.

Maintain a safe navigational watch-Bridge resource management Knowledge of bridge resource management principles, including *assertiveness and leadership* (STCW A-II/1-F1-C2-K9).

Application of leadership and teamworking skills:
- Working knowledge of shipboard personnel management and training (STCW A-II/1-F2-C7-K1).
- A knowledge of related international maritime conventions and recommendations, and national legislation (STCW A-II/1-F2-C7-K2).
- Ability to apply task and workload management (STCW A-II/1-F2-C7-K3 to K6).
- Knowledge and ability to apply effective resource management. (STCW A-II/1-F2-C7-K7 to K11).
- Knowledge and ability to apply decision-making techniques (STCW A-II/1-F2-C7-K12 to K15).
- Knowledge of shipboard personnel management and training (STCW A-II/2-F3-C5-K1).

Use of leadership and managerial skill

- A knowledge of related international maritime conventions and recommendations, and national legislation (STCW A-II/2-F3-C5-K2).
- Ability to apply task and workload management (STCW A-II/2-F3-C5-K3 to K6).
- Knowledge and ability to apply effective resource management (STCW A-II/2-F3-C5-K7 to K11).
- Knowledge and ability to apply decision-making techniques (A-II/2-F3-C5-K13 to K15).
- Development, implementation, and oversight of standard operating procedures (STCW A-II/2-F3-C5-K16).

Ability to safely perform and monitor all cargo operations-Loading, unloading, care and handling of cargo:

- *Ability to manage and supervise personnel with cargo-related responsibilities* (STCW A-V/1-1-2-C1-K31).
- *Proficiency to manage and supervise personnel with cargo-related responsibilities* (STCW A-V/1-2-2-C1-K13).

Control response to emergencies-Leadership skills: *Ability to lead and direct others in emergency situations*, including the need:

- To set an example during emergency situations (STCW A-V/2-C3-K2).
- To focus decision making, given the need to act quickly in an emergency (STCW A-V/2-C3-K3).
- To motivate, encourage and reassure passengers and other personnel (STCW A-V/2-C3-K4).

5.2.4   Interpersonal skills

On board of vessels the crew lives and works together for multiple consecutive weeks or months. Interpersonal skills can make the difference between a pleasant or unpleasant atmosphere. When someone on board has a bad attitude towards other people this could affect the entire crew. Or when someone is not included in the group this could lead to personal problems. On the other hand, a positive attitude enhances team spirit and productivity. The requirements explicitly identify these skills and highlight the importance of relationships on board vessels.

Contribute to effective human relationships on board ship:
- Importance of maintaining good human and working relationships aboard ship (STCW A-VI/1-4-C5-K1).
- Basic teamworking principles and practice, including conflict resolution (STCW A-VI/1-4-C5-K2).
- Social responsibilities; employment conditions; individual rights and obligations; dangers of drug and alcohol abuse (STCW A-VI/1-4-C5-K3).

5.2.5   Decision-making

Decision-making is not as simple as deciding between two options; it is a process of evaluating, deciding, discussing, etc. On board decisions should not be made fast and reckless as these vessels are basically floating buildings. For example, preparing a sea route: this needs careful preparation and thought, and every decision should be substantiated. The choice of ports, the speed of the ship and the route of the vessel are all important factors that cannot be decided without consideration of the pros and cons.

Use of leadership and managerial skill-Knowledge and *ability to apply decision-making techniques:*

- Situation and risk assessment (STCW A-II/2-F3-C5-K12, A-II/1-F2-C7-K12, A-III/1-F3-C7-K12, A-III/2-F4-C5-K12, A-III/6-F3-C5-K11).

- Identify and generate options (STCW A-II/2-F3-C5-K13, A-II/1-F2-C7-K13, A-III/1-F3-C7-K13, A-III/2-F4-C5-K13, A-III/6-F3-C5-K12).

- Selecting course of action (STCW A-II/2-F3-C5-K14, A-II/1-F2-C7-K14, A-III/1-F3-C7-K14, A-III/2-F4-C5-K14, A-III/6-F3-C5-K13).

- Evaluation of outcome effectiveness (STCW A-II/2-F3-C5-K15, A-II/1-F2-C7-K15, A-III/1-F3-C7-K15, A-III/2-F4-C5-K15, A-III/6-F3-C5-K14).

Application of leadership and team working skills-Knowledge and ability to apply decision-making techniques*: identify and consider generated options* (STCW A-II/1-F2-C7-K13, A-II/2-F3-C5-K13, A-III/1-F3-C7-K13, A-III/2-F4-C5-K13, A-III/6-F3-C5-K12).

Control response to emergencies-Leadership skills: Ability to lead and direct others in emergency situations, including the need: *to focus decision making, given the need to act quickly in an emergency* (STCW A-V/2-C3-K3).

5.2.6   Self-management

Self-management on board is the skill of being personally organized and understanding own strengths. During the execution of job, such as steering the vessel, people need to realize what resources or supplies are available and what skills they possess to execute the job.

Maintain a safe navigational watch-Bridge resource management Knowledge of bridge resource management principles, including: *allocation, assignment, and prioritization of resources* (STCW A-II/1-F1-C2-K7, A-II/1-F2-C7-K7, A-II/2-F3-C5-K7, A-III/1-F1-C1-K8, A-III/1-F3-C7-K7, A-III/2-F4-C5-K7).

Application of leadership and teamworking skills-Ability to apply task and workload management, including: *time and resource constraints* (STCW A-II/1-F2-C7-K5, A-II/2-F3-C5-K5, A-III/1-F3-C7-K5, A-III/2-F4-C5-K5, A-III/6-F3-C5-K4).

5.2.7   Critical thinking

Critical thinking is a useful skill to work and think individually. People should not follow or accept every instruction that is given to them by their supervisors. They should first think for themselves, which is the safest and most efficient way to execute a job. It is dangerous to blindly follow checklists as they are only a tool to help carry out a task.
The executer should always be aware of possible consequences and should act accordingly.

Application of leadership and team working skills: *Ability to apply task and workload management, including prioritization* (STCW A-II/1-F2-C7-K6, A-II/2-F3-C5-K6, A-III/1-F3-C7-K6, A-III/2-F4-C5-K6, A-III/6-F3-C5-K5).

Application of leadership and team working skills-Knowledge and ability to apply decision-making techniques: *identify and consider generated options* (STCW A-II/1-F2-C7-K13, A-II/2-F3-C5-K13, A-III/1-F3-C7-K13, A-III/2-F4-C5-K13, A-III/6-F3-C5-K12).

Establish and maintain effective communications: *Ability to provide relevant information to passengers and other personnel during an emergency situation, to keep them apprised of the overall situation and to communicate any action required of them,* taking into account the possible need to communicate during an emergency by some other means, such as by demonstration, or by hand signals or calling attention to the location of instructions, muster stations, life-saving devices or evacuation routes, when oral communication is impractical (STCW A-V/2-C5-K4).

5.2.8   Situational awareness

This skill can be explained on two scales. On a large scale, this skill is important to realize what happens on and around the vessel. For instance, when divers are working nearby the vessel, it should not be possible to start the propellers or pumps. The crew should be constantly aware of everything that is happening.

This skill is also useful on a smaller scale, the crew should be aware that some tasks can be better executed another time. For example: using heavy tools close to the accommodation at night when everyone is sleeping or using a high crane in severe weather conditions and strong winds. The convention explains this skill rather implicitly; the need for this skill is recognized however the explanation and use remain vague.

Maintain a safe navigational watch-Bridge resource management Knowledge of bridge resource management principles, including *obtaining and maintaining situational awareness* (STCW A-II/1-F1-C2-K10, A-II/1-F2-C7-K11, A-II/2-F3-C5-K11, A-III/1-F1-C1-K11, A-III/1-F3-C7-K11, A-III/2-F4-C5-K11, A-III/6-F3-C5-K10).

Application of leadership and teamworking skills-Knowledge and ability to apply decision-making techniques: *situation and risk assessment* (STCW A-II/1-F2-C7-K12, A-III/1-F3-C7-K12).

5.2.9 Planning and organizing

Good preparation and organization is necessary to achieve a fast and correct completion of a job. Especially during cargo operations planning is essential, to be prepared for every step of the operation as well as every possible delay or mistake. Furthermore, is this skill useful in voyage planning, drill preparation and execution and basically every task on board.

Application of leadership and teamworking skills-Ability to apply task and workload management, including *planning and co-ordination* (STCW A-II/1-F2-C7-K3, A-II/2-F3-C5-K3, A-III/1-F3-C7-K3, A-III/2-F4-C5-K3, A-III/6-F3-C5-K2).

Use of leadership and managerial skill: *Development, implementation, and oversight of standard operating procedures* (STCW A-II/2-F3-C5-K16, A-III/2-F4-C5-K16).

5.2.10 Responsibility

When working on and with vessels, the crew holds a large responsibility at many levels. As safety is the main responsibility, every action needs to be taken with consideration and everyone should be aware of the possible consequences their action(s) can cause. If the captain orders a change of course, this could affect the estimated time of arrival, the fuel consumption, etc. And when these consequences have a negative impact, he should always take responsibility. Every crewmember should do this, even with the smallest incidents or choices.

Application of leadership and teamworking skills-Knowledge and ability to apply effective resource management: *decisions reflect consideration of team experiences* (STCW A-II/1-F2-C7-K9, A-II/2-F3-C5-K9, A-III/1-F3-C7-K9, A-III/2-F4-C5-K9, A-III/6-F3-C5-K8).

Use English in written and oral form-Adequate knowledge of the English language *to enable the officer to use engineering publications and to perform engineering duties* (STCW A-III/1-F1-C2-K1, A-III/6-F1-C6-K1).

Plan and monitor safe bunkering, stowage and securing of the fuel on board ships subject to the IGF Code: *Ability to establish clear and concise communications and between the ship and the terminal, truck or the bunker- supply ship* (STCW A-V/3-2-C4-K3).

Contribute effective communications on board ship-Understand the principles of, and barriers to, effective communication between individuals and teams within the ship (STCW A-VI/1-4-C4-K1).

5.2.11   Intercultural skills

Vessels are very multicultural environments and strong intercultural skills help people of different culture to communicate and interact with each other. In this respect people should understand and acknowledge the different cultures for a safe and pleasant environment. Announcements could be made in multiple languages, as well as placards and posters. Cultural traditions should be acknowledged, and utilities should be provided to honor these traditions.

Establish and maintain effective communications-Ability to provide relevant information to passengers and other personnel during an emergency situation, to keep them apprised of the overall situation

and to communicate any action required of them, taking into account:

- *The language or languages appropriate to the principal nationalities of passengers and other personnel carried on the particular route* (STCW A-V/2-C5-K3).
- *The language in which emergency announcements may be broadcast during an emergency or drill to convey critical guidance to passengers and to facilitate crew members in assisting passengers* (STCW A-V/2-C5-K5).

5.2.12   Risk management

As ships are dangerous environments, risk management is a vital skill to avoid accidents. Being able to determine risks and to handle accordingly. As well as situational awareness, this skill is important to evaluate the task before executing it.

Application of leadership and teamworking skills-Knowledge and ability to apply decision-making techniques: *situation and risk assessment* (STCW A-II/1-F2-C7-K12, A-III/1-F3-C7-K12).

Take precautions to prevent hazards: *Ability to elaborate and develop risks analysis related to risks* on board ships subject to the IGF Code (STCW A-V/3-2-C7-K14).

Assess security risk, threat and vulnerability: *Knowledge of risk assessment and assessment tools* (STCW A-VI/5-C2-K1).

5.2.13   Inspiring and coaching

Inspiring and coaching crewmembers can help them grow and develop their skills. Especially in the beginning of their career, they should be corrected when a task is performed wrongly. Initiative and good work

should be recognized and stimulated. This skill is especially important for supervising officers.

Control response to emergencies:
- Leadership skills: Ability to lead and direct others in emergency situations, including the need *to motivate, encourage and reassure passengers and other personnel* (STCW A-V/2-C3-K4).
- Stress handling*: Ability to identify the development of symptoms of excessive personal stress and those of other members of the ship's emergency team* (STCW A-V/2-C3-K5).

Establish and maintain effective communications-Ability to establish and maintain effective communications, including *the need to encourage an exchange of information with, and feedback from, passengers and other personnel* (STCW A-V/2-C5-K2).

Application of leadership and teamworking skills: *Working knowledge of shipboard personnel management and training* (STCW A-II/1-F2-C7-K1, A-II/2-F3-C5-K1, A-III/1-F3-C7-K1, A-III/2-F4-C5-K1).

Ability to safely perform and monitor all cargo operations-Loading, unloading, care and handling of cargo:
- *Ability to manage and supervise personnel with cargo-related responsibilities* (STCW A-V/1-1-2-C1-K31).
- *Proficiency to manage and supervise personnel with cargo-related responsibilities* (STCW A-V/1-2-2-C1-K13).

Control response to emergencies-Leadership skills: *Ability to lead and direct others in emergency situations, including the need*:

- To set an example during emergency situations (STCW A-V/2-C3-K2).
- To focus decision making, given the need to act quickly in an emergency (STCW A-V/2-C3-K3).
- To motivate, encourage and reassure passengers and other personnel (STCW A-V/2-C3-K4).

5.2.14   Safety awareness

When working aboard vessels, safety has to be the number one priority of everyone. A ship is a dangerous environment and (fatal) accidents can happen in a split second. Being aware starts with wearing the correct clothing and inspecting everything that happens. For example, when someone walks on deck, they need to watch where they step or where they put their hands. Basically, to have good safety awareness you need to be focused at all times and be aware of what happens around you.

Respond to emergencies-Emergency procedures: *Precautions for the protection and safety of passengers in emergency situations* (STCW A-II/1-F1-C5-K1).

Contribute to the safety of personnel and ship (STCW A-II/1-F2-C8-K1 to K4, A-III/1-F3-C8-K1 to K4, A-III/6-F3-C6-K1 to K4).

Observe safe working practices
- Importance of adhering to safe working practices at all times (STCW A-VI/1-4-C3-K1).
- Safety and protective devices available to protect against potential hazards aboard ship (STCW A-VI/1-4-C3-K2)
- Precautions to be taken prior to entering enclosed spaces (STCW A-VI/1-4-C3-K3).

- Familiarization with international measures concerning accident prevention and occupational (STCW A-VI/1-4-C3-K4).

5.2.15 Reflection

Reflection is necessary after every finished job and can give information for future tasks. During reflection, shortcomings and strengths of the operation are revealed and crewmembers can act accordingly. This applies to every job that is carried out, from repairing a pipe to maneuvering the vessel.

Application of leadership and team working skills-Knowledge and ability to apply decision-making techniques: *evaluation of outcome effectiveness* (STCW A-II/1-F2-C7-K15, A-II/2-F3-C5-K15, A-III/1-F3-C7-K15, A-III/2-F4-C5-K15).

Control response to emergencies-Stress handling: *Understanding that stress generated by emergency situations can affect the performance of individuals and their ability to act on instructions and follow procedures* (STCW A-V/2-C3-K6).

Table 7 STCW soft skills

Source: Own work

Clusters	STCW
Learning and Research	Self-management Reflecting
Creativity and Innovation	Critical thinking
Leadership and Management	Teamwork Leadership Decision making Planning and organization Inspiring and coaching
Marketing and sales	Situational awareness
Business competences	Responsibility Risk management Safety management
Communication	Communication Interpersonal skills Intercultural skills

5.3   Antwerp Maritime Academy

The study of the AMA curriculum led to 17 soft skills. Every soft skill is again explained and linked to the appropriate course with examples. This time, the examples explain how these skills come forward in these courses.

Figure 2   Soft skills count in AMA courses
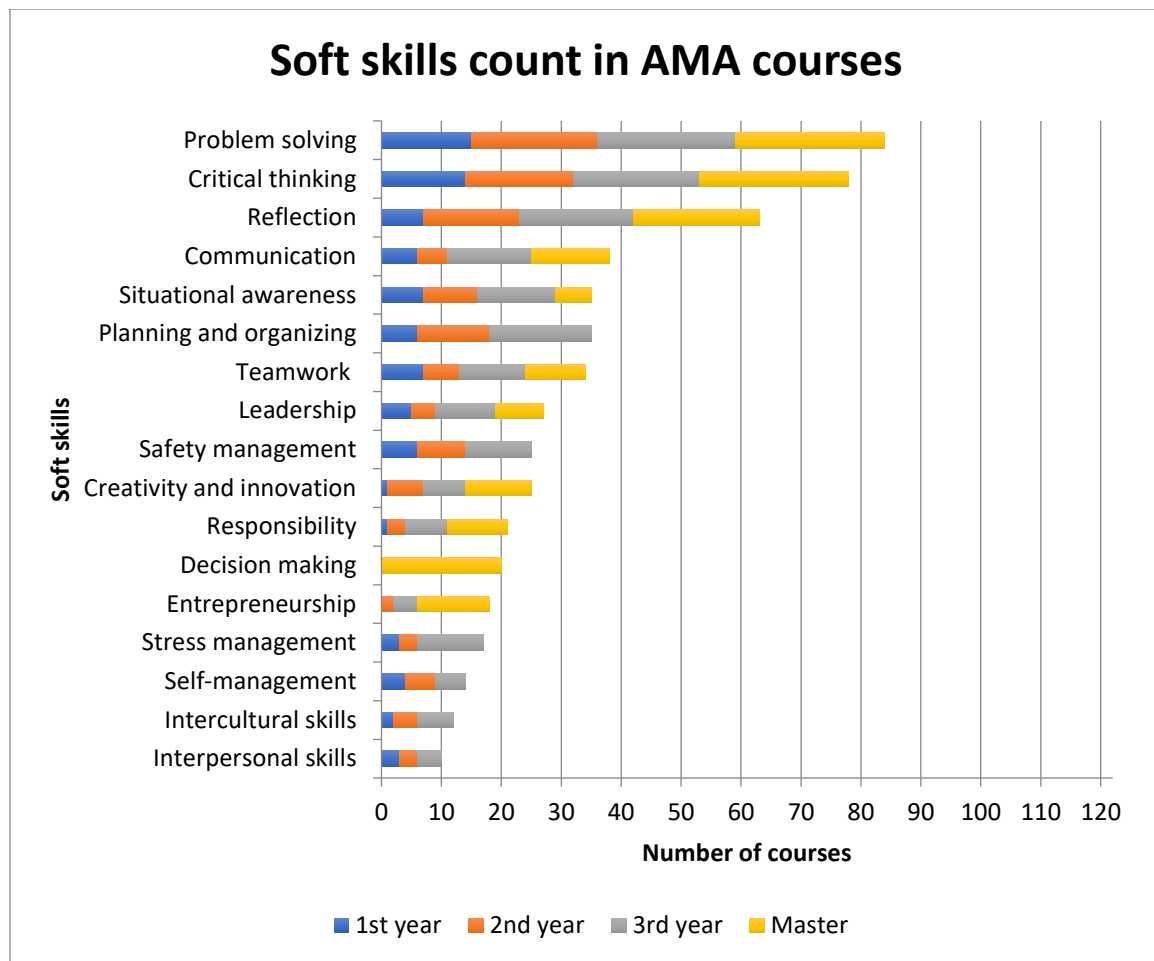
Source: Own work

It is apparent from this graph that three skills stand out from the rest and can be found in more than half of the courses. **Problem solving** and **critical thinking** are the top skills and are present in every year of the education. This is not an unexpected result as the majority of the courses challenge the students in finding solutions and thinking further.

The mathematics and physics cluster of the first and second year contains courses like spherical trigonometry, differential and integral calculus, hydromechanics, etc. Here students have to solve a problem that prepares them for more complex problems of future courses like stability and navigation. The skill **reflection** completes the top three and is yet another unsurprising result, since it is coherent to the top two skills.

Reflection is the best way for students to discover their strengths and weaknesses and will help them improve and prepare themselves for future difficulties.

The lowest scoring skills in this graph are the more human soft skills: *interpersonal* skills and *intercultural* skills. This is a remarkable finding as most students aspire a job in the maritime sector where there is a lot of diversity, especially on board vessels. This makes these skills very important for a future professional life and interaction with other people. Another interesting result is that the four lowest scoring skills cannot be found in the master year.

When comparing these results to table 2, **a difference in priority of skills is noticed**. Leadership and teamwork are present in the chart but at a lower position of importance. Nevertheless, communication remains at a high spot, highlighting the importance of this skill.

5.3.1   Communication

The competences mentioned below can be linked to the soft skill communication and - with 38 courses containing at least one of them - is a well-represented skill throughout the curriculum. The competences show that the student is trained in multiple aspects of communication. The student is required to have an extensive knowledge of the English language and the course maritime English is the main source for developing that knowledge. The course is present in the three years of the

bachelor and trains the student in reading, speaking and writing. In the first and second year the student is gradually trained by tests, reports and presentations resulting in a portfolio as the final test of knowledge in the third year.

The portfolio consists of summaries of texts that prove the student's understanding of the English language; self-written reports to test his or her knowledge of vocabulary and grammar and finally a presentation is given to demonstrate the verbal communication skill.

In the courses general and intercultural communication of the third year and communication strategies of the master, the theoretical aspect of communication is addressed with methods to improve the skill, as well as how to apply it in different situations. For example, how to communicate in an emergency situation or how to communicate with people of another culture.

> The student develops ability to communicate information, ideas, problems and solutions to both specialists and laymen (BA-NW-AC1-6).

> The student is capable of communicating in a goal-oriented and effective way (both verbally and written: oral language proficiency, to rapport correctly...) (BA-NW-AC2-2).

> The student is capable of communicating a nautical important foreign language in a fluent and professionally correct way (BA-NW-AB2-2).

> The student develops the ability to communicate own research and problem solutions to colleagues and laymen (MA-NW-AC1-4).

Communicate effectively and professionally correctly in the English language in all kinds of maritime conditions (LR-BA-NW-7).

5.3.2 Teamwork

Teamwork is an important skill on board ships and in companies. And the curriculum provides a good basis; in the first year the students depart on a four-week journey on board the sailing vessel *Dar Mlodziezy*. There the basics of teamwork are first experienced as they are placed in a permanent team for the entire trip and tasks like preparing sails; maintenance of and navigating the vessel require the team to cooperate.
The firefighting courses are another excellent example where students are required to work together. They experience different scenarios where teamwork is crucial to finish the simulation. During these simulations they get to experience the real dangers of fire and how to handle them.

In the practical courses of the third year like radar simulator and manoeuvring simulator; teamwork is further stimulated and trained, in particular in the maritime context. The students are required to navigate a simulated vessel, where teamwork is key in order to successfully finish the simulation.

The student develops a sense for working in a team-oriented way (BA-NW-AB1-1).

The student develops the ability to cooperate creatively and productively with industrial developments and innovative activities (MA-NW-AB1-3).

The student develops the ability to – based on sufficient insight in business related aspects – cooperate optimal with direct employees as well as the management (MA-NW-AB1-4).

5.3.3   Leadership

Leadership, just like teamwork, is more important in the practical third year courses. During the simulations one student is appointed as captain and is in charge of making the decisions and justifying them. They need to make good use of their teammates and the resources and knowledge available.

Another course that treats this subject is maritime resource management in the third year. Here the theoretical side of leadership and other managerial tasks is explained, and students get a better insight in the aspects of good or bad leadership.

As shown in graph 1, teamwork is not as well represented as expected; this is due to the fact that the skill is only trained in the later years of the education.

> The student is capable of executing managerial duties (convincing, negotiating, motivating, delegating, creating an efficient time management) (BA-NW-AC2-6).

> The student is capable of coordinating the acts and activities of 'first interventions' (BA-NW-AB2-3).

> The student develops the ability to vouch for the daily management and the safe and economical operation of the ship (MA-NW-AB1-5).

5.3.4   Interpersonal skills

In the curriculum this skill is only found in the first three years and not in the master. And with only ten courses containing the skill, it is the lowest represented skill (graph 1).

Courses like maritime English and psychology cover the basic principles of how to communicate and interact with other people while the first year on board training takes care of the practical aspect of the skill.

As discussed before the students are divided in permanent teams for the entire four-week lasting trip and this results in teams representing the four departments of the AMA:

- Dutch speaking nautical science students
- Dutch speaking marine engineering students
- French speaking nautical science students
- French speaking marine engineering students

The combination of these different groups forces people to interact with other people.

> The student is capable of displaying the appropriate social skills during interpersonal contacts (incl. acting respectfully) (BA-NW-AC2-5).

5.3.5   Decision-making

Decision-making is the only skill that is represented in just one year, being in the master year. The skills is taught in many courses, as more than half contain at least one of the competences of the skill.

> The student develops the capacity for (motivated) judgment in an uncertain context (MA-NW-AC1-5).

The student develops the ability to propose responsible strategic decisions, implement them, manage them and make responsible adjustments (MA-NW-AC1-6).

5.3.6 Self–management

This is a more implicit skill. It is not trained in the courses; the students acquire the skill by succeeding each year. As in many other university or other higher education courses, students need to instil a strong discipline and management in order to pass their intermediate tests and final exams. Success is not handed to them; they have work hard throughout the year in order to improve and succeed.

Have sufficient basic knowledge and skills in the field of human sciences (for example, psychology, maritime medicine) and economically and legally (maritime economics, maritime law) to ensure that the duties of the officer on board the ship and in relation to the maritime partners are carried out smoothly (LR-BA-NW-8).

5.3.7 Critical thinking

Together with problem solving this skill is the most taught skill. The competences appear in 78 of the courses, which equals 64% of the entire curriculum. As students face challenges and problems throughout the entire education, they develop this skill and learn how to approach subjects from a different perspective. Especially the courses such as stability, mathematics and physics challenge the student to try different methods and tactics to solve the diverse range of problems.

The student develops thinking and reasoning skills (a sense for problem-based thinking and acting in a problem-solving way) (BA-NW-AC1-1).

The student develops a sense of critical thinking and reflection on one's own scientific research (BA-NW-AW1-6).

The student develops the ability to deal with complex problems (MA-NW-AC1-2).

5.3.8   Situational awareness

Situational awareness is difficult to assign to soft skills however for the scope of this thesis we will categorize it as such. The student develops this skill as his or her knowledge of the industry grows and is again a more implicit skill. Students learn to pay attention to what happens around them at different levels. One of them being the safety level, especially on board ships it is important to realize everything that happens around them. Another aspect is to know what happens in the world and how this can affect the work and living environment.

The student develops insight in general societal developments (cf. Globalization, sustainable development, social inequality…) (BA-NW-AC1-9).

The student develops insight in – and awareness of – the interaction between social-cultural changes and the functioning of nautical and maritime-economical organizations (BA-NW-AB1-6).

The student develops the ability to critically reflect on developments in a globalizing economy from an ethical, humane and global perspective (MA-NW-AB1-8).

The student develops the awareness of societal responsibility coherent with professional life (cf. environmental awareness, safety on board and in port...) (BA-NW-AB1-3).

5.3.9   Planning and organizing

This is also a more implicit skill; each year students have minimal two exam periods and their goal is passing every single exam. To achieve that success, planning and organizing plays a significant role and students have to learn how to apply that skill.

The student is capable of working results-oriented (efficient planning and acting accurately) (BA-NW-AC2-1).

5.3.10   Responsibility

Responsibility is an important feature of future seafarers as we have discussed in the STCW section. In this context the term is described as the responsibility of working independently and taking responsibility for the work produced. In the course Propulsion, the student is expected to work independently in a simulator and to try out several approaches to a given problem. Every mistake that is made is the responsibility of the student. In the radar and maneuvering simulator, the student takes responsibility of the vessel and every action that is taken inside the simulation.

The student is capable of executing tasks independent with his ability in studying new – maritime and economic – processes (BA-NW-AB2-6).

The student develops the ability to vouch for the daily management and the safe and economical operation of the ship (MA-NW-AB1-5).

The student develops the ability to vouch for prospection, feasibility studies, planning and development in specific maritime situations (MA-NW-AB1-6).

5.3.11   Intercultural skills

As we have mentioned before students will meet many different people on board ship with different cultural backgrounds. It is important to realise how to interact with these people to gain a good working relationship. The on-board training helps to develop these skills as the students are placed in groups where they potentially don't know anybody. And as the Antwerp Maritime Academy is the only school in Belgium of its kind, the students form a collection of different people from all across the country, as well as students from the Netherlands and France.

The student develops an international set, multicultural attitude (BA-NW-AC1-8).

5.3.12   Safety management

Safety is one of the main priorities of the maritime industry and this is made clear to the students in almost every course. Although this skill is not explicitly represented in a lot of courses many lecturers implicitly mention it. And knowledge of the Safety Of Life At Sea (SOLAS) by the IMO is very important.

The student develops the awareness of societal responsibility coherent with professional life (cf. environmental awareness, safety on board and in port ...) (BA-NW-AB1-3).

5.3.13 Reflection

Reflection is the best way for someone to make progress, and students need to be aware of this skill. Some courses require the student to reflect on their work and report this to the teacher, for example while writing the bachelor term paper and scientific research methodology. Nevertheless, students have to be able to reflect independently to gain better insight on improvement.

The student develops the ability of critical reflection (sense of independent and critical attitude) (BA-NW-AC1-3).

The student develops a sense of critical thinking and reflection on one's own scientific research (BA-NW-AW1-6).

The student develops the ability to reflect on their own thinking and work and to translate this reflection into more adequate solutions (MA-NW-AC1-3).

5.3.14 Creativity and innovation

This skill can be linked to problem solving and critical thinking as the student is required to find solutions for problems a sense of creativity is required to think outside of the box.

The student develops creativity; a sense of thinking and acting innovatively (BA-NW-AC1-4).

The student develops the ability to cooperate creatively and productively with industrial developments and innovative activities (MA-NW-AB1-3).

The student develops the capacity for original and creative thinking and acting with a view to continuously expanding knowledge and insights (MA-NW-AW1-4).

5.3.15   Problem solving and conflict resolution

As we have previously established, this skill is the most represented in the curriculum and together with critical thinking helps the student in advancing trough the different courses that require complex problems to be solved.

The student develops thinking and reasoning skills (a sense for problem-based thinking and acting in a problem-solving way) (BA-NW-AC1-1).

The student develops the ability to work solution oriented in the sense of independently defining and analysing complex problematic situations in the professional life and the ability to develop and apply useful solution strategies (BA-NW-AB1-2).

The student develops the ability to deal with complex problems (MA-NW-AC1-2).

Independently analyse complex problem situations in professional life and develop and implement meaningful solution strategies in international environments (LR-BA-NW-12).

5.3.16 Stress management

The ability to act under stress in an important skill in many different sectors, and people will experience this first as a student. With the main source of experiencing stress being the exam periods. During these periods students come under a lot of stress and here they learn how to cope with this. However, they get to experience stress during several courses where they need to remain calm and productive to finish the exercises such as simulator radar.

> The student is capable of continuing to act efficiently under stress (stress management) (BA-NW-AC2-4).

> The student is capable of acting conscientiously and functioning stress-resistant in several – maritime – crisis situations (BA-NW-AB2-5).

5.3.17 Entrepreneurship

Entrepreneurship is the biggest surprise in this list of soft skills and is more the skill to invent solutions or tools to facilitate a situation.

> The student develops the ability of executing (simple) management tasks and the necessary entrepreneurial spirit to achieve a certain goal (BA-NW-AC1-5).

> The student develops the ability to act enterprising in several maritime situations including emergency and crisis situations (cf. sense of initiative, entrepreneurship in critical situations) (MA-NW-AB1-2).

Table 8 Results AMA

Source: Own work

Clusters	AMA
Learning and research	Self-management Reflection
Creativity and innovation	Critical thinking Creativity and innovation Problem solving and conflict resolution
Leadership and management	Teamwork Leadership Decision making Planning and organization
Marketing and sales	Situational awareness
Business competences	Responsibility Safety management Stress management Entrepreneurship
Communication	Communication Interpersonal skills Intercultural skills

5.4 GAP analysis

The most important and desired soft skills in the industry have now been established as well as the ones required by the STCW and taught at the Antwerp Maritime Academy. To determine the scope of the gap, these different skills will now be compared to verify if there is a gap, and if present, to what extent (large or small). The results of the previous studies will now be discussed cluster by cluster.

5.4.1 First cluster: Learning and research

Table 9 Learning and research skills

Source: Own work

Industry	STCW	AMA
Willingness to learn	Self-management	Self-management
Initiative and self-management	Reflecting	Reflecting
Flexibility		
Result-oriented		
Adaptability		
Personal resilience		
Optimistic		
Self confidence		
Open mind		
Curiosity		

The first cluster is learning and research where we found that the Maritime Academy does not contain extra skills outside of the STCW skills. But the industry requires a wider range of soft skills; initiative and flexibility appear to be important aspects as well as someone who is motivated, has a positive attitude about them and about the company.

We can clearly see a gap here; the student is taught to work independently and reflect on the work that is produced but in the industry this has to go further. Not only work and results are important but also attitude and mind-set during the completion of a task. These are more dependent of one's personality but can be taught when they are pointed out. The industry requires people who show they want to achieve progress and want to promote. Plus, they need to show initiative to learn more about their area of expertise.

Students of the AMA are being taught throughout their career at school to reflect on everything they do and achieve, which leads to skills such as being result-oriented and self-confident. But a bigger emphasis may lie on other skills that are required by the industry.

5.4.2   Second cluster: creativity and innovation

Table 10 Creativity and innovation skills

Source: Own work

Industry	STCW	AMA
Creative and innovative thinking Critical thinking Problem solving skills Decision making	Critical thinking	Critical thinking Creativity and innovation Problem solving and conflict resolution Decision making

Here we do not notice a gap; the maritime academy prepares the students sufficiently when comparing the required skills. This cluster even contains the most represented skills in the curriculum, with the problem-solving skills appearing in 84 of the 122 courses of the nautical science degree, which equals 69%. The same thing counts for critical thinking, which appears in 78 courses or 64%. But problem solving cannot be

treated as a general skill, which depends on numerous other skills and also on the area of expertise. For example; in mathematics the idea of problem solving is different than with navigation related problems but as the students are facing all these different problems for all these different sectors, they are very well prepared.

5.4.3 Third cluster: Leadership and management

Table 11 Leadership and management skills

Source: Own work

Industry	STCW	AMA
Teamwork	Teamwork	Teamwork
Leadership	Leadership	Leadership
Planning and organizing	Decision making	Decision making
Inspiring and coaching others	Planning and organization	Planning and organization
Cooperation	Inspiring and coaching	Inspiring and coaching
Convincing		
People management		
Multidisciplinary teams		
Team resilience		
Team roles		

In this cluster we notice a small difference; the majority of the demanded soft skills are present in the curriculum, except the more social skills like convincing and people management. These skills a very handy tool in the professional world, especially when working in teams or when managing teams. The coaching skill is harder to learn at school, as the students require coaching especially in the first and second year, so that skill will probably develop further as people advance on board of in a company to a higher managerial level.

Teamwork is a well-trained skill, as students are challenged to work properly as a team in several courses throughout their educational career. Leadership is a harder skill to master, as students experience the more theoretical part, and the practical side is not easy to train because the students can only practise on their colleagues, which undermines the seriousness of the subject.

5.4.4 Fourth cluster: Marketing and sales

Table 12 Marketing and sales skills

Source: Own work

Industry	STCW	AMA
Professional in selling your product Innovators/stakeholders	Situational awareness	Situational awareness

This is the hardest cluster to apply to the curriculum and the industry. We notice that situational awareness is important for the STCW and the AMA, but it is a hard term to assign to a cluster. In this cluster, the skill is applicable, because in marketing a good knowledge of what happens around people is important. When looking at the maritime industry it is an important skill especially on-board vessel. Seafarers work in a dangerous environment; accidents are an unfortunate but common event and they need to be aware of that fact. They also travel to a lot of different countries, which differ in safety and crime. So, a good knowledge and understanding of their environment is a crucial skill.

So, the gap here is hard to define, as this cluster is only partly relevant and not for the entire maritime industry.

5.4.5   Fifth cluster: Business competences

Table 13 Soft skills business competences

Source: Own work

Industry	STCW	AMA
Responsibility	Responsibility	Responsibility
Safety awareness	Safety management	Safety management
Environmental awareness and sustainability	Risk management	Risk management
Global awareness and safety		Stress management
Financial and economical awareness		Entrepreneurship

This cluster contains a couple important skills and there is no particular gap. The skills provided match largely the ones that are requested. Safety and environment have become one of the pillars of the maritime environment and goals are set higher each year. Even in the curriculum, these already are important subjects and the student is well aware that these topics are not to be neglected.

5.4.6   Sixth cluster: Communication

Table 14 Communication skills

Source: Own work

Industry	STCW	AMA
Communication skills	Communication	Communication
Intercultural skills	Interpersonal skills	Interpersonal skills
Interpersonal skills	Intercultural skills	Intercultural skills
Emotional intelligence		
Ethical awareness		

This cluster has absolutely no gap, these skills are taught to the students in every year of the education and the importance is made very clear. The maritime industry is probably one of the most diverse sectors in the world with nationalities working together all over the world. So, the awareness of these others cultures must be taken into account by everyone that wishes to work in this industry. Interpersonal skills are also an essential skill at every branch in the industry, at every level people will have to cooperate and that is where these skills are most valuable. Together with communication this skill forms a perfect duo for working in a team.

6. Discussion

This study was carried out to answer the question "Is there a gap between the soft skills present in the curriculum of the maritime academy and the soft skills sought for by the maritime industry?". The analysis performed in this thesis confirms the presence of a gap, however it differs within each cluster. Both the clusters communication and creativity and innovation do not contain a gap and appear to be well represented by the AMA curriculum. The other clusters are less represented and do need an upgrade to meet the demands of the maritime industry.

One of the most unexpected results was that the demanded soft skills of the maritime industry do not agree with the requirements in maritime job offers. This trend is also seen in other sectors, with research showing an increased importance in soft skills however employers not paying enough attention to them and employees not including them in their skillset. This proves that hard skills still take the upper hand in how employees are rated nowadays. Therefore, this study emphasizes that soft skills have to be trained and forms the introduction of the TEAMS project. The aim of this project is to eventually add courses to the maritime curriculum that put more emphasis on soft skills.

The generalizability of the results is limited by the interpretation of the soft skills. The ones explained in this thesis are obtained from the STCW requirements and the AMA curriculum but can be interpreted differently. Especially the soft skill problem solving can be susceptible to another perspective. In the AMA curriculum this skill is dependent of the course and subject it is taught in. For example, in scientific courses such as mathematics students are required to solve problems related to that subject however when they are faced with problems of another course the approach to solve it will differ.

Another limitation is the implicit nature of the soft skills found in the STCW requirements; they can be interpreted differently depending on the context. Despite these limitations the results remain valid for answering the questions that were formulated in this thesis.

Future research is needed to establish how employers rate their colleagues based on soft skills and which soft skills they consider important, all of this to enhance the recruitment process (with the right people on the right place), implement adequate training of these skills on the job market and hence, to seek after the optimal execution of employees' jobs.

7. Conclusion

This study was carried out to answer the question "*What is the vision of the maritime sector on soft skills*?", which was approached by three subquestions.

The first question was the following: "*What is the opinion of the maritime industry*?". Companies and employers consider soft skills more and more important and the maritime sector follows this trend (table 5 & figure 1). However, the current demand of soft skills does not run parallel with the ones considered important. Only two skills are present in over half of the investigated job offers, **which proves that the awareness needs to increase.**

"*How does the International Maritime Organization (IMO) deal with soft skills*?" is the second question. **The IMO does recognize soft skills in the STCW, however too often they were mentioned implicitly**. The gap between the skills required by the maritime industry and those required by the STCW do not align and contain some remarkable differences.

Finally, this tried investigated the following question: "*Which soft skills are currently present in Antwerp Maritime Academy curriculum*?". **The AMA follows the requirements of the STCW and added extra skills to the curriculum** to prepare the student even more for a maritime career.

The information that resulted from the answering of these questions made us able to answer the main question, being "*Is there a **gap** between the soft skills present in the curriculum of the maritime academy and the soft skills sought for by the maritime industry*?". This study has shown that a **gap does exist between the soft skills of the AMA and the soft skills required by the maritime industry**. Therefore, recruiters need to

be more **aware** of the different existing soft skills and should pay more attention to them during job interviews. Applicants on the other hand, should also be aware of the skills they possess and should made this clear on their application form.

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9. List of annexes

Annex A

Method table 2

The sources used for the creation of table 2 were chosen based on their stance on soft skills. Eventually 18 sources were included in the table; six of them are websites.

Twelve of these sources are papers and studies that try to capture the meaning or definition of soft skills. In these studies many examples were given of soft skills, both implicit and explicit. Most of the time they were explicit and could easily be added to the table. However some of them contained implicit skills, which were added based on their description.
For example; "the ability to think strategically, to understand the big picture, and to carry out decisions to advance the overall goals of the organization " (Matteson, Anderson and Boyden, 2016); this can interpreted differently and does not explicitly mention a particular skill. In this study this description was classified as critical thinking and decision-making.

The other sources used to create the table are websites. They were mostly vacancy websites and described a number of skills that were important for applicants, which is also the reason they were chosen. Applicants consult these websites to prepare themselves for job interviews and will use that information to gain better insight in their own soft skills.

Annex B

Tiimiakatemia taxonomy

This taxonomy uses seven clusters to divide the different soft skills; below this are listed with the most important skills to get a better understanding of what each part of the taxonomy represents. For this research we will not use the seventh cluster digital technology, as we do not deem this relevant. (Ruuska, 2020)

-Learning and research:
- Reflection
- Take initiative
- Adaptability
- Self confidence
- Self management
- Productivity
- Efficiency
- Media Literacy

-Creativity and innovation:
- Critical thinking
- Problem solving
- Take initiative
- Curiosity

Leadership and management:
- Decision making
- Organisational environment
- Agency influencing the environment
- Culture
- Teamwork
- Team resilience
- Team roles
- Multidisciplinary teams

- Technical lead
- Psychological safety

-Marketing and sales:
- Customer centric
- Stakeholders

-Business competences:
- Ethics
- Responsibility
- Risk management
- Financial and economical awareness skills

-Communication:
- Reflection
- Interpersonal skills
- Culture
- Emotional intelligence
- Social skills

(Ruuska, 2020)