Leadership @ sea: Essential non-technical skills

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ABSTRACT: The aim of the paper is to suggest a taxonomy of the non-technical skills that are relevant for maritime leadership. The empirical basis is approximately fifty interviews with crewmembers on three different tankers. The theories of high reliability organizations (HROs) and of transformational leadership, in addition to similar work completed for the aviation industry provided input. The suggested taxonomy involves five categories: authority, cooperation, mindfulness, decision-making and communication. The categories are described using different elements. The categories and elements need further validation, and there is a need to explore how such skills can be strengthened and tested in a maritime setting.

Introduction

The captain is the commanding officer and operational leader at the frontline of a shipping company, responsible for the safe and efficient operation of the vessel. This is leadership at the "sharp end" of an organization (Flin et al. 2008), where the personnel are crucial for the value creation in the organization and are directly exposed to the dangers associated with work. Olsen and Eid (2015) define this kind of leadership as a process that involves influencing others in a group context to achieve certain goals in situations that are characterized by uncertainty and risk.

A lack of leadership qualities or abilities can have disastrous consequences. One example is the Costa Concordia disaster that took place on 13. January 2012. The cruise ship collided with rocks and sank off the Italian coast. The accident report (Ministry of Infrastructure and Transport Italy 2013) points to deficiencies in risk awareness, and poor decision-making, when the ship diverged from the planned route and sailed at an unsafe distance from the shore at night and at high speed. After the ship hit the rocks and the emergency was a fact, the situation came out of control, mainly due to the lack of clear orders from the responsible leaders. A total of 32 people died and 157 were injured.

Crew Resource Management (CRM) was developed in the 1970s as a response to the high number of fatal accidents in the aviation industry. The intention was to improve flight crews' skills in areas such as situation awareness, decision-making, teamwork and leadership (Kanki et al. 2010). Flin et al. (2008) use the term "non-technical CRM" and define it as "*the cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance*" (Flin et al. 2008:1).

The maritime industry adopted the CRM training philosophy after recognizing the need for non-technical skills in crews following a number of accidents in which human factors were identified as the main cause (Grech et al. 2008). The maritime industry is starting to enforce the undertaking of this kind of training. From January 2017, maritime legislation (STCW 2011) requires all ship's officers to undergo leadership and teamwork training and demonstrate knowledge of bridge and engine room resource management principles (BRM & ERM) in order to be certified or to renew their certificates. The STCW (2011: 101 and 143) states that this knowledge must include: the allocation, assignment, and prioritization of resources, effective communication, assertiveness and leadership, obtaining and maintaining situational awareness and consideration of the team's experience.

Research from healthcare (Parker et al. 2012) and the oil and gas industry (Flin et al. 2014) shows that it is necessary to develop and identify a taxonomy of non-technical skills relevant for the field in question. Using the original taxonomy identified in aviation for assessing pilots' CRM skills (Flin et al. 2003, Flin et al. 2008, Flin 2010) as a starting point, we map out a non-technical skill taxonomy for officers at sea. Thus, the problem to be explored is: *What essential non-technical skills can be identified for officers at sea that will support safe maritime operations?* The empirical foundation of the paper is fieldwork on three tankers, involving 50 formal interviews.

Theoretical Framework

Operational leadership is not explicitly addressed in most of the influential perspectives in safety science (Rosness et al. 2010). For example, in the classical work on "man-made disasters", Barry Turner (1976) does not include operational leadership in his discussion of the development of disasters. Jens Rasmussen (1997) points to "managerial issues" as part of his often-cited sociotechnical model, but

he is referring here to managers at a high level in the organization, "law and business school graduates", not the managers found at the "sharp end" (Le Coze 2015). The theory of high reliability organizations (HROs) is an exception. Weick (2001) demonstrates, in his analysis of the Mann Gulch disaster, the importance of operational leadership in building a resilient organization, and he points to factors such as wisdom, role system, respectful interaction and the ability to improvise. We have chosen to apply the HRO perspective in our study of the essential non-technical skills for maritime officers.

We also draw on traditional leadership theory, more precisely the model of transformational leadership (Bass & Avolio 1994). This has frequently been used in safety research, and Clarke (2013) and Glendon and Clarke (2016) give an overview of various studies. The model appears to be relevant and useful in relation to safety, and has been applied in research related to healthcare, the oil and gas industry and various manufacturing industries.

The last part of this section will give an outline of what is meant by non-technical skills, using the work of Flin and her colleagues as a starting point (Flin et al. 2003).

High reliability organizations

In the late 1980s there was a significant increase in research into the relationship between organizational factors and safety. Investigations following several major accidents, both in the maritime sector and in the nuclear industry and the process industries served as a backdrop for this interest. The investigations identified factors such as leadership, communication and knowledge as the key root causes for many accidents (Hale and Hovden 1998). This spurred the development of new theoretical perspectives in the field of safety science. One of the most well-known is the theory of high reliability organizations (HROs) (e.g. Weick 1987, LaPorte & Consolini 1991, Weick & Sutcliffe 2007, Rosness et al. 2010). The starting point for the argument was that some industries seemed to avoid major accidents, despite the fact that they operated in high risk contexts and under complex technological and organizational conditions (e.g. military aircraft carriers, hospital emergency rooms and air traffic control centres). Some underlying organizational characteristics that enabled these organizations to be reliable have been formulated. Weick and Sutcliffe (2007) emphasize three particular characteristics for HROs. 1) The first is organizational redundancy, meaning that an organization is manned or structured so that errors can be caught through overlapping responsibilities and expertise. In a maritime context this could include the roles of captain and chief mate, and of chief engineer and second engineer. 2) HROs are also characterized by flexibility and the ability to adapt spontaneously under demanding circumstances. In potentially dangerous situations, expertise is valued more highly than formal rank. Those with experience and technical knowledge are given leeway to allow them to solve the problem and make decisions. In practice, this will often mean that decisions are taken by those closest to the hazards, at the "sharp end". 3) Mindfulness is another key factor. Weick and Sutcliffe (2007) emphasize that this involves close attention to all kinds of deviations from the normal situation, even smaller deviations, and the ability to assess whether these may be due to systemic weaknesses. They point to five elements that are required if an organization is to achieve this: preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience (ability to restore a normal state), and deference to expertise. Operational aspects and what is actually happening at the "sharp end" are considered central.

Leadership is addressed in the characteristics described above. Organizational redundancy involves more than a structural overlap. It also has a cultural dimension (Rosness et al. 2010) that implies that it is acceptable to question any decision. Implicitly, this means that leaders in HROs take objections from subordinates seriously, are open to suggestions, and create a climate where it is recognized that one should speak up. The ability to adapt spontaneously will also require officers to be willing and able to delegate and let people with expertise, rather than the highest rank, take decisions. The concept of "mindfulness" implies openness to criticism, taking input seriously and seeing the value of the expertise of all employees at the "sharp end".

Transformational and transactional leadership

The transformational leadership model describes three main forms of leadership (Bass & Riggio 2006): transformational, transactional and passive leadership. We will describe these in the following section, and relate them to the maritime safety domain.

Transformational leadership is created and described using four different components (Bass & Riggio 2006). 1) Idealized influence is achieved when an officer is a clear role model for safety and emphasizes a collective understanding of goals among the crew. He considers the moral and ethical implications of his decisions, and has confidence in, and respects, his people. 2) Inspirational motivation implies that an officer creates team spirit and inspires the team by setting high standards and stimulating enthusiasm and optimism on board. He communicates goals clearly. 3) Intellectual stimulation is achieved by encouraging the crew to assess existing practices and

established truths continuously in order to reduce risk. All are encouraged to make suggestions that can make the job safer and more efficient. Individuals are never criticized in public. 4) Individualized consideration involves delegating tasks and giving subordinates new challenges so that they can experience personal growth and develop their strengths. An officer spends time listening to individual needs, providing support and advice, and educating personnel.

A transactional leadership style is characterized by emphasizing compliance with rules, procedures and regulations (Bass & Riggio 2006). An officer will set clear objectives and state his expectations. He uses praise or material rewards to encourage safe and efficient work practices on board. By paying close attention to the work and taking proactive actions when weaknesses or deficiencies in the system are discovered, and before they escalate into serious incidents, he displays what is described by Bass and Riggio (2006) as "management by exception active". These authors use the term "management by exception passive" to describe an undesirable kind of leadership. An officer exercising this type of management will wait for discrepancies or errors to occur, or for someone to complain, before he takes action. An officer who avoids getting involved in the work and is unavailable to his men exhibits a more extreme form of passive behaviour that is labelled "laissez faire" leadership by Bass and Riggio (2006). He has no opinion on important issues, will not intervene in conflicts and takes decisions reluctantly or not at all. This leader will have a negative impact on safety on board.

Non-technical skills

The non-technical skills framework developed by Flin et al. (2003) to assess pilots' CRM skills consists of four primary categories: cooperation, leadership/management, situation awareness and decision-making (Table 1). The first two are regarded as social skills and the last two as cognitive skills. The social skills overlap to a certain degree, since both refer to group processes. Cooperation is concerned with mutual assistance and the team atmosphere during work, while leadership and managerial skills cover all aspects of initiative, coordination and goal setting. Situation awareness points to a person's ability to have a situational overview and to fit this knowledge into a mental model in order to trigger problem recognition. Decision-making is the process of reaching a judgment or choosing an option (Flin et al. 2003: 107).

Flin et al. (2003) considered using a fifth category, termed "personal awareness", to reflect on individuals' ability to cope with stress and fatigue. This was rejected because of the difficulties in observing this quality. They highlighted the fact that all elements described must be directly observable, and pointed to verbal and non-verbal communication as the main tool in the evaluation process.

Table 1. Overview of non-technical CRM skills for pilots, from Flin et al. (2003:100)

Category	**Elements**
Co	Team building & maintaining
Operation	Considering others
	Supporting others
	Conflict solving
Leadership/	Use of authority/assertiveness
Management	Providing & maintaining standards
	Planning & coordination
	Workload management
Situation	Awareness of aircraft systems
Awareness	Awareness of external environment
	Awareness of time
Decision-	Problem definition & diagnosis
Making	Option generation
	Risk assessment & option selection
	Outcome review

Context and method

Case description

The shipping company in this study is a global organization, with offices in fourteen countries. The storage, production and transport of oil and gas products is the core business. The company has several fleets, with more than 200 vessels and 7,000 employees.

This paper uses data from field studies on three different tankers in the company. Two of these vessels are shuttle tankers with the offshore tank fleet commissioned in the North Sea. The vessels offload oil from offshore installations and transport it to shore facilities or other tankers. The third vessel belongs to the conventional tanker fleet, transporting oil mainly between different onshore facilities. She was sailing in the South China Sea at the time of the visit. The number of people on board varies according to workload and tasks, but on these three vessels there were, respectively, 23, 26 and 27 people. The crew

were of different Asian and European nationalities, with a majority of Filipino seafarers.

The work on board a ship is hierarchically organized according to professional affiliation, and divided into three main departments: deck, engine room and catering. International regulations (STCW 2011) provide guidance on the roles and responsibilities of the crew.

There are four senior officers on a ship. The captain, as the highest-ranking officer, has the command and is responsible for the safe and efficient operation of the ship. The chief mate is the officer next in rank. These two are both navigators by profession and belong to the deck department. The chief engineer is the officer responsible for the mechanical propulsion, as well as the operation and maintenance of the mechanical and electrical installations, of the ship. The first engineer is the officer next in rank to the chief engineer. Both belong to the engine room department of the ship.

These officers constitute the management team, and are referred to on board as the "top four". Together they prioritize and coordinate the tasks and resources in order that the work is performed safely and efficiently, and they usually do this on a daily basis, within the limitations set by the shipping company with respect to safety management systems, company specific procedures, annual budget requirements and manning. The work is managed according to international and national legislation, which applies, for example, to preventive maintenance, the testing of safety critical systems and working hours requirements. The customers, here the oil companies, will have their say in planning and in the loading/discharging of the freight. The port authorities, oil terminals, pilots and tugs are other factors that affect the sailing schedule. In addition, the weather plays a major factor, with changes along the way.

Observations and semi-structured interviews

To get a general understanding of the company and the formal training practice for leadership, we observed the training of officers in different settings onshore. This included three different officer conferences as well as several sessions of classroom and simulator-based training provided by training centres in the Philippines and Norway.

The bulk of the empirical material is taken from fieldwork on the three different tankers. The time spent on board these boats was, respectively, eight, thirteen and fourteen days, and the fieldwork was completed during the second half of 2016. Observations of the daily work aboard, and informal conversations with everyone on board, were the most important data source. In all, 50 formal semi-structured interviews were carried out, most of them on board the vessels. The interviews with senior officers were more detailed, and lasted longer (45-60 minutes), than the interviews with the rest of the crew (15-30 minutes).

How seafarers see good leadership

Many of the interviews with the crew during the fieldwork were focused on what they considered to be good leadership, in terms of both characteristics and work practice. What they pointed to as crucial skills are described and commented on below.

Harmony in the family

Many associate good leadership skills with the ability to provide and maintain good harmony among the people on the vessel. One of the crewmembers stated that *harmony ensures safety*. Most respondents highlight the importance of being polite and treating each other with respect. This is important in order to achieve a good working environment. The behaviour of the senior officers sets the standard for how the crew in general treat each other. If a captain has a very commanding style, talking loudly or yelling at people, this will have a very negative effect on the work environment and the safety on board. People will be reluctant to speak up and will not dare to speak if something is wrong.

In addition, many describe the vessel as their second home. Caring and tolerance for others is as important here as in a family. A petty officer expressed this in the following way: *This ship is our second home. You should behave as you would have behaved towards your family.* This applies to both leaders and subordinates. A good leader is seen as someone who not only focuses on the work to be done, but also shows an interest and care for the people on board. Words like "father" and "the old man" are used for the captain, and indicate how he is regarded as the head of the family. Regardless of rank, most people mention care as the most important leadership skill of an officer.

Most people say there are few conflicts on board, and that any conflicts are better described as disagreements. Most people are reluctant to voice strong opinions, and try to avoid topics that may cause conflicts. One of the reasons for this is the fact that they have to work closely with each other for a long period in a very confined space. Many note that there seem to be fewer conflicts on ships with a mix of several nationalities. They point to a strong awareness of cultural differences among seafarers in general, and say that most people try to avoid issues such as religion, politics and family in their conversations.

There are some negative aspects to this constant need for harmony. Several of the senior officers say they are reluctant to give negative feedback to subordinates when the subordinates have done a poor job. Performance appraisal talks are mentioned as a challenging setting. The senior officers are concerned that negative feedback may lead to dissatisfaction that will influence the ability to cooperate. With only a handful of men in the crew, one dissatisfied member may create a negative atmosphere and, eventually, a dysfunctional team that threatens safety.

Teamwork & redundancy

In a small community such as a crew, it is important that everyone takes responsibility and contributes to the work. The workload is at times high and there is a limited number of hands available to do the work. Close cooperation in and between the different departments is necessary in order to perform the work safely and efficiently. A senior officer stated that *good leadership is teamwork*.

Being supportive and delegating work to the juniors when possible is emphasized by everyone, but especially by the junior officers, the first engineer and the chief mate. They regard delegation as an important learning opportunity, preparing them for promotion and the tasks and responsibility that will eventually come with higher rank. A junior officer expresses it as follows: *A good leader is inclusive, he sees the potential in each individual and dares to let others take more responsibility. He challenges his subordinates and gives them opportunities to develop their competence.*

The training of those with a lower rank is described as an important part of maritime leaders' responsibilities. Making sure that your chief mate has the necessary competence if the captain is not available creates the necessary redundancy to maintain the safe operation of the ship. There is also a clear expectation that the captain should maintain his navigational knowledge and have a general understanding of the responsibilities of his officers in order to step in and do their jobs if needed. This flexibility in roles and work performance is regarded as crucial in all departments and at all levels of the hierarchy, and is reflected in how the work is organized, particularly during critical operations requiring a high-level knowledge of the technical systems and related work procedures.

Communication & listening

Many highlight listening as an important leadership skill with respect to building and maintaining the team, and say that a good leader is a good listener. One of the senior officers explains: *I try to share the responsibility with the others, even if it eventually is on my shoulders. I listen to them all; we are talking to each other. If there is a doubt about how to do a job, we will discuss. I have everyone present their idea, then pick the one that will work the best, independent of rank.*

Everyone underlines the importance of understanding the national differences in how people communicate. Conflicts arise from misunderstandings and poor communication, so the communication skills of the leaders are vital. It is emphasized that one should avoid shouting, and instead talk to people in a calm and non-emotional manner. Communication during critical operations is expected to be short and concise, and allows for a more commanding style of addressing people.

Professional expertise & awareness

Technical knowledge as an engineer or as a navigator is a necessity for becoming a senior officer in the first place, but is also seen as the basis for becoming a good leader. A junior officer stated that *weak leaders lack technical knowledge*. Professional knowledge is needed in order to give guidance to the crew in safe work practice. It is critical in order to uncover risky behaviour and identify the need for corrective action.

Professional knowledge and experience form a solid base for a constant alertness and attention to all kinds of deviations from what is considered normal. This is an awareness built on a combination of different sensory inputs together with a profound system understanding that give a maritime officer the valuable skill of being able to assess a risky situation and make decisions.

Providing and maintaining standards

A good leader needs to know what is going on with the technical systems in the vessel, but also what is going on at a social level. Active participation in the different tasks on board makes it easier for an officer to monitor and control the activities, and makes him more visible and accessible as a leader. The crew finds it easier to talk with a higher-ranking officer when he is doing a job than to seek him out in his office. A low threshold for approaching the captain is regarded as important for overall safety. To be a visible leader is considered to be important when it comes to being a role model. Many mention that to be a good leader one must lead by example, by, for example, using the correct personal protective equipment or following procedures. A senior officer who does not comply with the management system will undermine the safety of the vessel, and the rest of the crew will copy his behaviour. The senior officers on board are seen as mentors for the younger and less experienced crew. Their responsibility to show and teach newcomers safe working practices is an important part of the learning system.

The reluctance to speak up for fear of disturbing the harmony on board does not apply to obvious deviations from safe working practice procedures. To give a warning about unsafe acts is perceived as being caring. Everybody wants to leave the ship unharmed, and behaviour that may expose individuals or the entire crew to unnecessary danger is thus expected to be corrected immediately. There is a clear expectation from the subordinates that any correction given by the senior officers is based on the need to maintain safety. One of the petty officers says that a good leader is someone who makes sure that everyone on board is safe. In this statement lies a clear anticipation that the senior officers and, in particular, the captain will always prioritize safety over efficiency.

Balancing authority

Rank is clearly outlined in the organizational chart. It shows who the leaders are on board, and who has formal authority. This clear hierarchical division mean that there is little doubt regarding duties, responsibilities and who takes final decisions about the vessel. Still, to express sufficient authority and assertiveness in different situations is described as difficult. One of the junior officers said: *You cannot be too friendly as a leader, someone who does not dare to speak up or take decisions. There needs to be some authority, clear orders – but still room for discussion*. Also, the need for authority depends on the situation. In critical situations or emergencies, the captain is expected to take command, to act confidently and slightly authoritatively, and to dare to take independent decisions. During normal operations, the ideal captain is someone who listens to others, invites them to dialogue, but at the same time does not appear insecure or unknowledgeable.

There is a saying among seafarers that the captain has to balance a number of different roles. He is supposed to be a doctor, a priest, a police officer, a judge, a navigator, a friend and a mentor. To be a police officer and a judge indicates an expectation that he will detect, correct and give fair feedback to people violating procedures or doing unsafe acts. At the same time, he is expected to care for his men, taking the role of a priest or a doctor, helping with health issues and showing concern and understanding if anyone has personal problems.

Discussion

There seems to be a unified view among our respondents on what is meant by good leadership skills in a maritime context. The officers need to stimulate a harmonious working environment by showing respect and care for others. Trust is the basis for building the team; delegating work and listening to the men are important tools. Professional expertise is a fundamental skill, and is vital in building a redundant organization. Visible and accessible leaders who actively participate in the work and have the ability to adjust their authority to the situation are seen as exhibiting central skills. An officer who seldom or never participates in the work, or who is reluctant to state his opinion or correct dangerous acts, is not welcome to the crew and would fit the description of a laissez faire leader put forward by Bass and Riggio (2006).

In the following discussion, we aim to map the essential non-technical skills for maritime officers, and suggest five different categories and the elements that belong to each. The taxonomy includes many of the elements identified by Flin et al. (2003), although some of these are moved to other categories.

The categories indicated below all relate to leadership skills. In the work by Flin et al. (2003), leadership is presented as one of the categories of the model (Table 1). In our taxonomy we seek to identify factors that relate to leadership; leadership is therefore not one of the categories but is, rather, the overarching subject for the taxonomy.

Authority

Thus, our first category is leadership but we label it authority. The empirical material highlights technical knowledge as an important skill for a maritime officer. Maintaining competency as a navigator or as an engineer can be regarded as an important element in establishing a basic level of authority with the crew.

The elements of planning and coordinating tasks and providing and maintaining standards are in line with a transactional leadership style that focuses on work tasks and emphasizes compliance with rules, procedures and regulations. Clarke (2013) shows in her study that an active transactional leadership style has a positive impact on the safety environment and on employees' compliance with rules and procedures, but she also points to the advantages of transformational leadership in encouraging active participation in safety by the employees.

Our respondents also highlight the importance of care. This implies that the officers not only focus on the task at hand but also value people and listen to and consider their needs, providing support and giving feedback. These are all highlighted as valuable leadership skills, and correspond to transformational leadership as described by Bass and Riggio (2006).

The data emphasize the need to balance different roles. Many say that this poses something of a challenge, with a constant tuning of authority and assertiveness according to the situation at hand. This points to a need to combine

transactional and transformational leadership. The work of Clarke (2013) shows that a successful outcome of this balancing act may be beneficial for safety.

Cooperation

The second category is cooperation. Close cooperation in and between departments, and coordination in the performance of tasks, are necessary to get work done efficiently and safely. The top four officers spend considerable time planning, prioritizing and delegating work. Delegating tasks is emphasized as giving learning opportunities, and is in line with the concept of individualized consideration in transformational leadership (Bass & Riggio 2006). It gives the subordinates new challenges in order for them to experience personal growth and develop the professional know-how that is critical in maintaining a redundant organization.

The respondents describe building and maintaining the team as crucial. They point to how the senior officers are instrumental in establishing team spirit and creating harmony. This requires the skills described as inspirational motivation by Bass and Riggio (2006), which include setting high standards and clear goals. This also embraces a more transactional leadership style, where good work practices are encouraged using incentives and where unwanted behaviour or conflicts are addressed in a direct and proactive manner.

Mindfulness

The third category is labelled "mindfulness". This corresponds to the category of "situation awareness" identified by Flin et al. (2003). We changed the name of this category to include the element of social awareness. The data show how important it is for a leader to know his crew and discover disruptions of the harmony on board that may indicate a dysfunctional team. Combining this information with an awareness of the ship's systems and external factors enables a constant attention to all kinds of deviations.

Together with risk awareness, these elements form the core of "mindfulness" as described by Weick and Sutcliffe (2007). Originally presented as one of the characteristics of an HRO and explained at an organizational level, it may also be applied at an individual level to point to certain skills important for ensuring safety. Preoccupation with failure, reluctance to simplify information and sensitivity to operations are important individual skills that will help build and maintain a resilient organization.

Decision-making

The fourth category is decision-making. Taking objections from the crew seriously, being open to suggestions and creating a climate where it is recognized as important to speak up are all factors highlighted by our respondents. This corresponds with what Weick and Sutcliffe (2007) call "deferring to expertise". Those with experience and technical knowledge are encouraged and expected to share their opinions. This is a central element for identifying and assessing options and for making correct decisions. Reviewing the outcomes serves as an opportunity to learn, and is essential in order to build a redundant organization.

Communication

We have chosen to expand the taxonomy with a fifth category, labelled communication. Flin et al. (2003) note that communication skills are integrated in all of the four categories they proposed for the non-technical skills system for pilots. On the basis of our findings we saw the need to underline the importance of maritime leaders' communication skills, and we do so by adding a fifth category.

The respondents clearly express their wish to have officers who listen, ask questions and respond to their concerns. This is the core of transformational leadership. Communicating clear goals, being concise and emphasizing a collective understanding are important factors described by Bass and Riggio (2006).

Conclusion

This paper has suggested a taxonomy of non-technical skills for maritime leaders, based on empirical findings and the theoretical perspectives of HRO and transformational leadership. There is a need for further validation of the taxonomy. In accordance with the method described by Flin et al. (2003), the model should include examples of both good and poor practices related to each element. It is also necessary to establish a set of operational principles to ensure objective and fair feedback to maritime officers on their leadership skills.

Further studies could involve both quantitative and qualitative approaches and the use of expert groups from the maritime industry. It is also necessary to expand knowledge of how maritime officers can learn non-technical skills. Bridge and engine room simulators are frequently used to learn and assess technical skills, and it would be valuable to suggest how non-technical skills can be taught and tested in a simulator setting.

Table 2. Suggested essential non-technical skills for maritime leaders

Category	Elements
Authority	Maintaining professional expertise
	Planning & coordinating
	Providing & maintaining standards
	Giving fair feedback
	Caring for the crew
Cooperation	Building and maintaining the team
	Considering individuals
	Delegating tasks
	Resolving conflicts
Mindfulness	Awareness of risk
	Awareness of ship's systems
	Awareness of external environment
	Awareness of social conditions
Decision-making	Identifying & assessing options
	Making & sharing decisions
	Deferring to expertise
	Reviewing outcome
Communication	Responding to concerns
	Asking questions
	Being concise
	Setting clear goals

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