CHALMERS
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PSYCHOLOGICAL SAFETY AND ITS STRONG CORRELATION TO BOTH GROUP DEVELOPMENT AND SAFETY CULTURE

A quantitative study on behalf of the RE-DO 2.0 research project; analyzing Psychological Safety in the maritime domain.

ARMAN DEHANI
KASPER HÄGERSTRÖM

Master thesis for the Maritime Management Program

Department of Mechanics and Maritime Sciences
Division for Maritime Studies

DEPARTMENT OF MECHANICS AND MARITIME SCIENCES

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To begin with, all involved respondents of this research have been informed about the anonymity principles of this study, according to which they have accepted to anonymously contribute to the research.

This master thesis is the work of the two authors and fellow students A. Dehani & K. Hägerström. After having spent five years as students at *Chalmers University of Technology* (Gothenburg, Sweden) it has become evident that the two share common interests for a number of subject areas that are captivating to discuss and analyze. However, from such interest-provoking subject areas there is a set of three interconnected topics that resulted in the chosen research area; *What is the correlation between Psychological Safety at workplaces, within the maritime domain, and Group Development, respectively Safety Culture?* By shouldering this research project, the authors undertake the objective and purpose of sharing knowledge and to promote a debate about how Psychological Safety, Group Development, and Safety Culture all could be correlated and potentially affect safety within the maritime industry.

As this thesis project was carried out during the final semester (2023) of the authors' master studies, not only did this mark the end of the time that both authors had spent at Chalmers University of Technology - but also marking the beginning of a new chapter.

This thesis, its context and structure were developed alongside the supervision of Fredrik Forsman who is one of the designated instructors of the *Maritime Human Factors Group* at Chalmers University of Technology. Furthermore, he has previously held the position of Head of Training Development at The Swedish Sea Rescue Society. Not to mention, he is also the representative of Chalmers University in the research project group of *RE-DO 2.0 (Recruitment, Equality, Diversity & Opportunities)*, which this study was conducted on the behalf of.

Lastly, the authors wish to express their gratitude and thank everyone who has been a part of this project, including the respondents. Above all, we salute and give a special thanks to Fredrik Forsman for his engagement, professionalism, great knowledge and mindset. Forsman's participation and guidance has truly helped and inspired us to not only move further each day, but also to enjoy the journey and learn something new along the way regardless of the circumstances. In addition, Forsman has, with his knowledge and humble attitude, challenged us to facilitate learning that was far more extensive than expected. Likewise, the authors would like to thank the RE-DO 2.0 project team for inviting us to be a part of their research. This has been of great help and guidance to us in many ways, not to mention teaching us that this work is important.

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To conclude, with high hopes that this thesis will be valuable to the academic research discipline, as well as living up to the expectations of all involved parties.

Psychological Safety and its strong correlation to both Group Development and Safety Culture

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ABSTRACT

The world is evolving faster than ever before, and as Lauren Bacall once put it *"standing still is the fastest way of moving backwards in a rapidly changing world"*. Times have and will continue to change, and perhaps so must leadership.

Accidents have occurred at least as long as humans have been alive. There are several different types and magnitudes of accidents, likewise, are the causes of those and the affected occupational aspects as different. Despite decades going by, whilst procedures and protocols are followed, or even the fact that the evolution of civilization and technology continues - accidents still do and will occur. More often than not, these could potentially be related to G*roup Development*, S*afety Culture*, and especially, *Psychological Safety*. The latter is characterized by the fear of reprimands or being viewed as incompetent, thus choosing to remain silent rather than to speak up.

Within every single industry, accident occur, yet they often are a cause of the same elements. Whether that includes human factors or socio-technological systems - humans are humans and emotions control our behaviors and decisions to some extent regardless of occupational industries. Although the *Titanic* and *Costa Concordia* accidents were a century apart - the outcomes and causes of the accidents were yet relatively closely related.

Psychological safety is defined by Amy C. Edmondson as *"the shared belief that one will not be punished or humiliated for speaking up with ideas, questions, concerns, or mistakes, and the team is safe for interpersonal risk taking"*. Nonetheless, Edmondson acknowledges the fact that psychological safety is insufficient for organizations or companies to become successful or productive. Instead, there is also a need for a high level of commitment to excellence and psychological safety as necessary foundations to build successful groups or teams on, which is also confirmed by Susan Wheelan.

In this study, 75 respondents returned the survey that included the previously validated questionnaires of Psychological Safety, Group Development *(GDQs)*, and Safety Culture *(SCOPE-PC)*. Thereby, analyzing the correlation between the aforementioned within the maritime industry. The results indicate a statistical significance of Psychological Safety being, in fact, strongly correlated to Group Development (Multiple-R_{GD} = 0,852) and Safety Culture (Multiple-R_{SC} = 0,846). Meaning, teams with higher levels of psychological safety are not only more likely to find themselves in a more mature group-development stage, but they are also more likely to share higher qualities of safety culture. This shows an indication of psychological safety being in fact an important nominator in the equation that strongly affects whether teams become more successful or not. Correspondingly, a high level of psychological safety could not only facilitate better team dynamics and organizations, but also make the industry safer. Though, on the condition that people feel safe opening up, offering ideas, sharing knowledge, and having the possibility of speaking up without the risk of humiliation or punishment.

Psychological Safety, Group Development, and Safety Culture are all broad subjects and topics within themselves. Thus, making it practically impossible to go into detail for each, within the scope of one study alone. However, this research investigates the correlation between Psychological Safety, Group Development, and Safety Culture within the maritime industry - through a quantitative approach.

Keywords: *Psychological safety, group development, safety culture, leadership, SCOPE-PC, GDQ, GDQs, organizational safety, REDO2, maritime industry, Chalmers.*

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ABBREVIATIONS & ACRONYMS

AIS	Automatic Identification Systems
APA	American Psychological Association
ARPA	Automatic Radar Plotting Aids
BIMCO	The Baltic and International Maritime Council
CEO	Chief Executive Officer
(Item) Code	This refers to the title, list number or name of an item
ECDIS	Electronic Chart Display & Information Systems
GDQ(s)	Group Development Questionnaire (short)
GD / $_{GD}$ / (GD)	Short for Group Development - When in subscript and in combination with a unit/text such as R^2_{GD} – it shows that the
GPS	Global Positioning System
HSOPS	Hospital Survey on Patient Safety
ICS	International Chamber of Shipping
ICSI	Institute for an Industrial Safety Culture
ICBM	Intercontinental Ballistic Missile
ILO	International Labour Organization
IMGD	Integrated Model of Group Development
IMO	International Maritime Organization
(Inv)	This refers to using adapted* data in calculations, i.e., inverted ratings of negatively worded items
ISM	International Safety Management
ISO	International Organization for Standards
KPI	Key Performance Indicator(s)
M/S	Motor Ship
Mw	Moment magnitude
No. (Resp.)	Short for 'Number of …' and Respondent(s)
(Normal)	This refers to using original* data in calculations, i.e., **non-inverted** ratings of negatively worded items
PC	Primary Care
PS / $_{PS}$ / (PS)	Short for Psychological safety / When in subscript and in combination with a text – it shows that the subject is related
PTS	Propellant Transfer System
RE-DO (2.0)	Short for Recruitment, Equality, and diversity Opportunities; whilst 2.0 refers to the second time that the project is
SC / $_{SC}$ / (SC)	Short for Safety Culture - When in subscript and in combination with a unit/text such as R^2_{SC} – it shows that the
SDG / SDGs	Sustainable Development Goal(s)
SCOPE	Systematisch Cultuur Onderzoek Patiëntveiligheid Eerstelijn / Systematic Cultural Inquiry on Patient Safety
SCOPE-PC	Systematic Culture Inquiry on Patient Safety in Primary Care
SPSS	Statistical Package for the Social Sciences. (Statistical software tool)
USA	United States of America
USC	University of Southern California
WCU	West Chester University
WHO	World Health Organization
WWII	World War II

1. INTRODUCTION

In the early stage of 2020, the world changed in a way that could not have been foreseen by anyone. The COVID-19 pandemic hit and made an echo throughout the entire world and the global population. According to the World Health Organization (WHO) *(2023)* there were 761 402 282 confirmed and reported cases of the virus. Amongst which, approximately 6 887 000 people died *(WHO, 2023)*. The pandemic has created debates and controversy between leaders around the world. However, some leaders decided to take precautions which saved the lives of millions of people.

According to Edmondson & Chamorro-Premuzic *(2020)*, people in teams and organizations work a lot better once their leader is honest, smart and does everything necessary in order for the people to be safe. In fact, prior to the pandemic leaders were portrayed to be viewed as tough and confident. However, during the ongoing pandemic, the leaders who lived up to that image were not the ones who saved millions of lives. Such tough and confident leaders included the United States Of America´s former president, Donald Trump; the former prime minister of England, Boris Johnson; and the former president of Brazil, Jair Bolsonaro - who all dismissed the COVID-19 virus. These leaders, whilst serving and being responsible for the safety of hundreds of millions of people, underestimated the importance of social distancing and the use of facemasks. In contrast, however, leaders such as Angela Merkel, Jacinda Ardern, and Sanna Marin all had applied unconventional methods, yet, which turned out to be productive. To be specific, their methods resulted in saving thousands of people and mitigating the economic damages which Germany, New Zealand, and Finland suffered. The method that these leaders opted to was to alarm and act directly on the possible threats of the virus, thereby setting up rules and limits for people *(Edmondson & Chamorro-Premuzic, 2020)*.

Thereof, the need for a strong and confident leader might not be ideal at all times. Although, not saying it is not beneficial, there are however more attributes in regard to leadership that are affecting the organization for better or worse. Speaking of leadership and group development, or how to become a successful team, there are far more components to be considered than just strength and confidence. Rather, a leader can be unselfish, fearless of speaking up, admitting that he or she does not have the answers to all questions. Showing vulnerability as a leader could therefore perhaps strengthen the team. Likewise, encouraging the team members to share and discuss problems and solutions amongst each other, with the knowledge of not having anything held against them.

However, what Angela Merkel, Jacinda Ardern and Sanna Marin all had in common when countering the pandemic - was the commitment to excellence and the way of sharing a belief and acting on problems even with the lack of enough answers. Although they did not have the right answers, they shared their knowledge, alarmed, and alerted society of the potential risks and decided to act. This has become an example of successful leadership in the real world, as being lived today. As times change, so do business industries and economies. Therefore, it is

logical to expect leadership to adapt correspondingly to the changes, perhaps towards a more agile way of thinking and working.

This study is conducted in order to comprehend and form a deeper understanding of the importance of concepts such as Psychological Safety *(PS)* at workplaces, Group Development *(GD)*, and organizational Safety Culture *(SC)*. The goal is to find out if these factors can correlate to safety aspects. Perhaps this can also help understanding how we can suppress the probabilities of risks and avoidable magnitudes of accidents in the future. That is, with the help of better leadership, which leads to a higher level of PS and a greater awareness of risks in order to detect risks and safety shortcomings in time. Thus, creating a safer working environment within the maritime-, as well as other industries.

Throughout modern history there are countless major disasters and accidents that have occurred. However, aside from their negative impacts, some of these have actually resulted in various major milestones as learnings in human history. Since they have left distinct imprints in the history of large-scale organizations, as well as in the history of safety and technology. Such disastrous incidents include, amongst other, the *Damascus Titan II Missile* explosion (1980), the *Space Shuttle Challenger* accident (1986), as well as the Chernobyl, respectively the Fukushima Daiichi nuclear power plant disasters (1986; 2011). Not to mention the *M/S Costa Concordia* accident (2012).

Now, there is potential in the assumption that the underlying causal factors such as failures, shortcomings, and errors that caused these disasters - could in fact be related to aspects such as Psychological Safety in workplaces, Group Development, and organizational Safety Culture. Susan Wheelan *(2005)* acknowledges the importance of Psychological Safety within learning behavior. In which Wheelan suggests that Psychological Safety is *"-linked to performance through acknowledgements of mistakes, allowing of negative feedback and providing a supportive environment for considering alternatives" (Wheelan, p.113, 2005)*.

Therefore, the authors suggest that this topic is relevant and should be further studied in depth. That is, at least to identify and understand the potential interdependencies and correlations that might be present between the aforementioned three aspects. In turn, the results could potentially suggest whether Psychological Safety may, or may not, be utilized to a larger extent as a tool to provide the necessary psychological conditions for teams in order to prevent and mitigate accidents amongst organizations within the maritime industry.

Psychological Safety is defined as "*the belief that one can speak up without the risk of punishment or humiliation" (Edmondson & Mortenson, 2021).* On the other hand, what is not considered to be Psychological Safety, per definition, is mistaking it for another word for trust or viewing it as a personal attribute. Especially, including the most common misconceptions of Psychological Safety such as: A team member not giving vital critique, just to be viewed as friendly; or to lower the level of performance requirements. With that being said, Psychological Safety does not refer to everyone as being nice to each other, rather having the trust to express themselves freely within the organization. Furthermore, the expression does not mean that people who are quiet do not feel psychologically safe as a consequence of their

social skills - or that the level of detail within the work assessment should be lower *(Edmondson, 2018)*.

Today, one could argue that the world is evolving faster than ever before, as is technology rapidly adapting to advancing societies and vice-versa. Accordingly, the adaptation to rapid changes and agile ways of working are often considered to be fruitful. To begin with, however, the occurrence of COVID-19 pandemic made the entire world adapt to abrupt changes in an agile way. In fact, under the circumstances of the pandemic there are several factors that have had a major role in the tackling of the emerging complex problems. For instance, the promotion of technologically innovative developments occurs more rapidly than ever before, yet without compromising safety beyond what is acceptable. Or also, to realize the benefits of diversity and to adapt productively to changes. In turn, these changes in the world have later resulted in organizational components such as teamwork, safety, as well as safety culture to become more prominent and valuable aspects to both leaders and employees *(McKinsey & Company, 2021).*

Leadership and the presence of leaders can form and create psychological safety at workplaces or in teams *(Edmondson, 2018).* According to a study performed by McKinsey & Company in 2021, leaders can enhance psychological safety by facilitating appropriate climates, mindsets, and behaviors within a team. Moreover, their research suggests that the team that cares about others' opinions and values, also cares about the teams or other people's well-being. In turn, this is often related to how the team carries out their work. Usually, this is also what makes them become the teams with the highest levels of psychological safety *(McKinsey & Company, 2021).*

1.1 HYPOTHESIS

The hypothesis of this thesis is that a higher level of Psychological Safety at workplaces does in fact facilitate the necessary conditions for improved Group Development and dynamics. Thereby potentially promoting an improved organizational Safety Culture. Whereas a higher level of Psychological Safety at workplaces might be dependent on the nature of the organizational Safety Culture, in the first place.

1.2 BACKGROUND

The topics that are introduced in this chapter are of relevance in regard to the background of the research question, as well as including the main subjects such as PS, GD, and SC. However, to calibrate the focus area that is to be studied, this chapter introduces previous incidents in order to give practical examples - in which the aforementioned three aspects are believed to have played a role in.

1.2.1 Previous Incidents

Murphy's Law states *"Anything that can go wrong, will go wrong.",* which is an undeniably realistic way of looking at the nature of materialized accidents *(Shapin, 2014).*

This can be an interesting perception to keep in mind, as the following sections present historical examples of accidents. These are incidents that have left a sufficiently disastrous impact on modern history, to the extent where they have become milestones. Amongst which, we as humans have had to learn a lesson from each and thereby make changes in how we perceive safety, leadership, communication, and teamwork.

Moreover, one could hypothesize or assume that certain developments in these events could have taken a different turn - if the organizational safety culture, psychological safety, team development and dynamics would have been different.

I. Damascus Titan Missile II Accident (1980)

During the late Cold War between the United States of America (USA) and the Soviet Union, on the afternoon of the 19th of September 1980 in Damascus, Arkansas - the *Damascus Titan II Intercontinental Ballistic Missile* (ICBM) exploded. This was the consequence of a series of mistakes and human shortcomings.

At 6:30pm, Senior airman David F. Powell and airman Jeffrey L. Plumb entered the silo 374-7. The two workers were missile repairmen and were part of the *Propellant Transfer System (PTS)* team, stationed about one hour from the site. They had been called in as the pressure gauges for the oxidizer tank 2 were showing low values. The starting point of the accident itself was initially when one of the maintenance workers brought a different wrench tool than what was actually appropriate for the type of maintenance work that was intended to be carried out on the missile body. Regardless, as the worker was already wearing his safety suit as well as being tired after a long day of work, he decided to use the wrench that he had brought. Unluckily however, he accidentally dropped the wrench socket, sending it approximately 24m down to then bounce off the floor and hit the side of the rocket. As a result, the missile's housing layer was pierced and a fuel leakage occurred, gradually evolving to the point where the fuel was mixed with its oxidizer counterpart and finally caused an explosion *(Schlosser, 2013).*

Nevertheless, the following events from that point and on, would unfortunately lead to completely destroying the silo as well as directly claiming the life of a worker as well as severely injuring several others. Although the missile exploded, and ejected the nuclear warhead out of the silo to land outside - Miraculously neither did the warhead explode, nor was there any radioactivity emitted from it *(Schlosser, 2013).* On the other hand, when assessing the damage that this could have inflicted - it is necessary to understand that the *Titan II* nuclear warhead itself contained a megaton-yield of 9. Thus, making it approximately 600 times more powerful than the nuclear bomb 'Little Boy' that was dropped on Hiroshima during World War II (WWII). Or also, to put it into perspective, this equals to 3 times the

power of all bombs that were dropped during WWII, which also includes the atomic bombs *(Schlosser, 2013).*

However, the immediate communication, management, decision-making processes, and reporting across, as well as between all organizational hierarchy levels during this incident have been discussed as faulty. As it has been perceived and portrayed differently between the standpoints of parties such as family members and comrades of the victims, common citizens, executives, politicians, and the media. Thus, provoking this incident to become a topic of debate for years after. On the other hand, the common nominator between these varying perceptions is that the majority of the parties tend to agree on the fact that there were major flaws and shortcomings in the ways that this was managed *(Schlosser, 2013).*

In other words, as a consequence of the fears of reprimands, losing employment, etc. he stalled and was not immediately alerting and sufficiently informing the technicians about the situation. However, as the accident was still developing, not only were the Sergeants and technicians afraid to alert their superintendents, but even so were the leaders and politicians of the society *(Schlosser, 2013).*

II. Space Shuttle Challenger Accident (1986)

In the year 1986, just 74 seconds after take-off, the *Space Shuttle Challenger* exploded and instantly claimed the lives of the seven crew members. The primary and most tangible cause of this accident was due to a leakage in one of the starting engines as a result of corroded O-rings. In fact, this was known by the engineers as a potential risk that could cause fatal malfunctions, even prior to the accident itself. Yet, conscious decisions were made up to the point where the accident occurred *(Berner, 1996).*

The *Challenger* accident is a representation of an unlikely combination of risks that materialized into the failure of a socio-technological system.

III. Chernobyl nuclear disaster (1986)

In April of 1986, another major accident occurred. The nuclear accident at reactor 4 of the Chernobyl nuclear power plant was set off due to a poorly designed project. The power regulating systems and emergency systems were shut off.

However, the accidents of 1986, as they are being referred to, were not only caused by a systematic malfunction or errors that can be pinpointed exactly. Instead, the accident was caused by the gradual accumulation of organizational shortcomings and human errors. Thus, resulting in the deterioration of safety, layer by layer *(ICSI, 2017).*

IV. Fukushima Daiichi nuclear disaster (2011)

In 2011, March 11th, an estimated number of 18,000-20,000 lives were devastated during a trio of disasters materializing in under a week. The *Tohoku tsunami's* waves exceeding a height of 10 meters were the second, in a total of three disasters, that struck the North-Eastern Honshu-island of Japan. Whereas the first was an earthquake with a moment magnitude (Mw)

exceeding the scale of 9.0. Thus, marking it as the most severe earthquake of Japan's all previous history of recorded earthquakes *(Gulati, et al., 2014).*

Despite the tsunami defenses that the owners (TEPCO) of the nuclear power plant of Fukushima Daiichi had put in place as safety precautions, the tsunami proved these to be extremely inadequate. In fact, the owners had previously been warned about this by the government, three years prior to this disaster. However, according to TEPCO's officials, this was a matter that they were processing at the time when disaster struck. However, as the water entered the facilities, not only did it cause a total power outage, but it also destroyed the diesel back-up generators in the basement.

As a result, the technicians lost all control of the reactor core cooling, monitoring, and pressure ventilation system - thus marking the start of the third disaster. As the cooling systems collapsed, the internal pressure of the reactors rose as the heat from the fuel rods made any residual cooling water evaporate. Therefore, the options for the leaders of the plant to avert catastrophe were limited, thus leading them towards a total of three explosions related to reactors 1, 3 and 4.

Since the accident, Daiichi has been in the challenge of mitigating the radioactive water and debris that can be found there. However, only 10 km away there was a less known crisis concerning the nuclear power plant by the name of Fukushima Daini, which also was affected severely (*Gulati, et al., 2014).*

Nonetheless, Gulati, et al. *(2014)* suggest that the successful mitigation of the possible severe outcomes in Daini relied on the performances of the leadership. With Naohiro Masuda being the site's superintendent. Once the damages were caused by the tsunami, Masuda acted in order to engage the other 400 employees. Masuda understood that he had to persuade the employees and that giving directions would not be a beneficial motivational force to utilize. Instead, Masuda shared the doubt and burden of uncertainty. In turn, this type of leadership resulted in the workers becoming a team, sharing, and communicating their knowledge of what to do by iteration *(Gulati, et al., 2014).*

V. M/S Costa Concordia (2012)

On the 13th of January 2012, the Italian cruise ship *M/S Costa Concordia* sank after hitting rocks close to the coast of Giglio Islands in the Tyrrhenian Sea. The incident led to the rescue of a total of 4229 lives, amongst which 3206 were passengers, and 1023 crew members. Unfortunately, 32 of these lives were lost in this accident despite the efforts. Several of the crew members of the ship were accused of and charged with serious crimes, as a consequence of breaking multiple rules *(Tikkanen, 2023).*

The ship went off its route during the performance of a *"maritime salute"*, causing the ship to hit rocks close to shore. After investigation, it was determined from evidence from the *Automatic Identification System (AIS)* that the vessel had performed a similar maritime salute in August of 2011 *(Schröder-Hinrichs, et al., 2012)*. On numerous occasions the captain of the ship decided to understate and downplay the actual damage to the ship. The captain called

it a “blackout” and he had only allowed the crew to request tugboats from the coast guard *(Tikkanen, 2023).*

Furthermore, the captain left the bridge and disembarked the ship with a lifeboat and once being called by the coast guard and ordered to return to the ship, he refused and claimed he fell off the ship into a rescue boat. By doing so, i.e., he had ignored his main obligation and responsibility of staying put as the last member on the ship. Moreover, the Giglio Islands are located in a protected marine environment. As the leakage of 2000 tons of fuel oil had been removed, it became the largest salvage operation in history. Finally in July of 2014 the remains of *Costa Concordia* were towed to Genoa in Italy for scrapping *(Tikkanen, 2023)*.

1.2.2 Courageous Leadership

The biggest societal problems of the twenty-first century such as hunger, poverty, inequality, and corruption can all be solved with the help of *courageous leadership (Şen, et al. 2013).* Furthermore, leaders who possess courageous leadership are characterized by being “*brave, and they have a heart, spirit and exceptional intellectual and emotional capacity to make drastic changes” (Şen, et.al, p.92, 2013).*

According to Lindsay Trout (*2020*) there is a need for leaders to *“move beyond past experience and seasoned skill sets into the high levels of adaptability and openness necessary to advance the transformative agendas their organizations will require” (p.1, 2020)*. The latter is required in order to lead the organizations to transform and adapt according to the necessity of change. That is by activating, encouraging, and cultivating courageous leadership *(Trout, 2020).*

In turn, Trout has summarized one of Bill George’s (former Chief Executive Officer of Medtronic & Harvard professor) statements to explain the role of courage within the world of leadership. I.e., “*Courage is ‘the defining characteristic’ of great leaders today” (p.1, 2020).* The definition of courageous leadership is, in turn, characterized by the leaders who can motivate their employees to a shared belief. Furthermore, courageous leaders inspire their customers and bring their companies international recognition *(Trout, 2020).*

On the other hand, Asım Şen, et al., *(2013)* argue that courage is defined both by physical and social aspects, that include a wide variety of characteristics of leadership. Thus, defining courage as *“Courage is the crucial quality of leaders for determining the impressive vision and achieving the exceptional outcomes” (Şen, et.al, p.93, 2013).*

Trout *(2020)* points out three key components in order for a leader to create courageous leadership and set their organizations to receive a more courageous action for their organization or company. The first bullet point of doing so is by modeling adaptive leadership. In order to become a successful leader nowadays, the need for self-reflection, consciousness and awareness has become a staple of leadership. Thus, suggesting that leaders that move from fixed mindsets and derive from the mentality of the limits of such, tend to create a better place for openness and thinking. Organizations that have been working with creative solutions have gained from being open, bringing out the best in people and

encouraging them to think. Trout gives the example of Satya Nadella, who created and developed a culture at Microsoft that enabled the organization to better comprehend the mindset, in turn their results improved. The culture that Nadella introduced was the mindset of growth and that employees could all have goals, perhaps even out of reach at the very moment. However, if the culture of the company was set to a culture of dynamic learning, then everything is possible *(Trout, 2020).*

The second attribute is characterized by refusing to wait for things to happen. Therefore, acting on decisions and acting at the right time, before perhaps knowing what to do or having all the answers - is beneficial *(Trout, 2020).* Daring the unknown and showing vulnerability of actually not knowing and asking for help and engaging the organization to think, or being a part of the culture is a way of courageous leadership according to Trout.

The last attribute for creating courageous leadership is to instill authenticity. Trout is expressing that courageous leadership is not possible to fake, the leader must show the above attributes such as acting on decisions, showing vulnerability and listening when people within the organization speak. Whilst doing so, little by little, the organization is exposed to a leader who sets the prime example of courageous leadership. By doing so and fulfilling these requirements, the organization is more likely to become successful *(Trout, 2020).*

1.2.3 Integrated Model of Group Development

Susan Wheelan is the founder of the concept *Integrated Model of Group Development (IMGD)*. The concept has been developed on the basis of- and named after Wheelan's 30 years of experience from studies of groups. The concept in itself is based on evidence and research. Furthermore, the model is set to help leaders to identify when to interpret activities in their working group. Wheelan acknowledges the fact that a group can only reach a level of "maturity" with a high level of productivity and trust, if the group is working together. Moreover, there is a correlation between how long a group has been working together and the development within the group. The IMGD model has five (5) phases including the following *(Kristen, 2021; Wheelan, 2005):*

1. *Dependency and inclusion*
2. *Counter dependency and fight*
3. *Trust and structure*
4. *Work and productivity*
5. *Disclosure*

Furthermore, Wheelan built on Tuckman's model from 1965, which emphasized that every group goes through a linear model. The stages were forming, norming, storming and lastly performing *(WCU, 2022; Wheelan, 2005).* However, Wheelan *(2005)* argues that it does not have to do with a linear model, more so about groups maturing simply by working together. In fact, there is a correlation and a significant relationship between a group's behavior patterns and for how long the group has been working together. Wheelan describes this in a *four-stage model* which is based on a life-growth cycle *(Wheelan, 2005; Puscasu, 2022).*

a) *Maturity* - Performance improves once the team understands their different roles and objectives.
b) *Adulthood* - The roles and structure become more visible once the team is starting to form.
c) *Adolescence* - The authority of leadership is being challenged. Conflicts appear and values emerge. Disagreements occur and different subgroups can be seen and formed.
d) *Infancy* - Team members are more than ever dependent on a leader for their direction and support. The fear of rejection is higher and so is conformity.

1.2.4 Psychological Safety

Amy C. Edmondson is the Novartis Professor of Leadership and Management at Harvard Business School. According to Edmondson (*2021*), Psychological Safety is the key factor for any organization, company, or team to be fruitful and to be able to improve the group dynamic. Furthermore, to strengthen the relationship and to create a better service or product. Regardless of size, or construction of the company, Psychological Safety is important to be shared by the leaders of the organization *(Edmondson, 2021).*

Psychological Safety is usually visualized with four quadrants (See **Fig. 1**.). These are referred to as different zones where an organization possesses different levels of psychological safety. The four zones are apathy, comfort, anxiety, and high performance. These levels are valued for their extent of Psychological Safety but also the drive and willingness of the group or organization *(Edmondson, 2018).*

	Low Standards	**High Standards**
High Psychological Safety	*Comfort Zone*	*Learning & High-Performance Zone*
Low Psychological Safety	*Apathy Zone*	*Anxiety Zone*

Fig. 1. ***The Four Quadrants*** *- "The relationship between Psychological Safety and performance requirements". From The fearless organization, (p.38), by A. C. Edmondson, (2018).*

Within the apathy zone the group is neither willing to perform, nor do they have psychological safety. In which, most likely people will leave, and the group is unhappy. The comfort zone represents groups that have high psychological safety; however, they lack willingness to strive to succeed. Hence, most likely to feel safe where they are at. Next, the third stage is the anxiety zone where there is a low level of psychological safety; however, the willingness to succeed is high. In other words, team members can for example be faced with each other in order to perform the best sales targets. However, turnover rates of members could potentially be high *(Edmondson, 2018).*

Finally, the last zone is the high-performance zone, which according to Edmondson *(2018)* is the best zone, also referred to as ***"****the learning zone"*. Within the learning zone, the group has a high level of psychological safety in correlation to a high strive for success and curiosity.

Furthermore, the commitment to excellence needs to be high in a group in order for it to succeed and receive the best possible results *(Edmonson, 2018).*

However, the concept of Psychological Safety has, according to Edmondson, led to improved Group Development, better interpersonal relationships, healthy group dynamics and greater innovations. Despite the fact of all positive aspects, Psychological Safety has still been difficult to establish. Since COVID-19 the hybrid workplace has become more utilized. The "non-work" conversations have since the pandemic been more important. This is due to the fact that managers have understood that a hybrid workplace is required at times. For example, in cases where employees might need to take care of their children, their setting towards risking health or comfort, etc. *(Edmondson & Mortenson, 2021).*

Furthermore, due to the pandemic it has been more difficult for people to comprehend what the ideal and normal workplace is. The reason for this has been the social and political climate in which employees are unsure of how the actual "normal" workplace nowadays looks like. As already mentioned previously, leaders have been forced to form work environments that are suitable for the organizations in terms of working and feeling safe whilst doing so. People are coming back to their workplaces, whilst others are doing their work from home indefinitely and this is putting pressure on leaders to adapt and strive towards creating a psychologically safe workplace, regardless of where you work. In addition, the leaders are required and expected to deliver a hybrid workplace that can communicate well and solve problems remotely *(Martin, 2021).*

Organizations nowadays are keener towards working interdisciplinary and including staff from several different backgrounds and levels of education. This structure is applied in order to detect and tackle problems from several different angles. In order for this to be successful, Vera Kristen (*2021*) suggests that the need for a strong leader is important. Furthermore, the leader is required to understand how to actually lead and to understand the dynamics of Group Development.

1.2.5 Safety Culture

According to Erik Hollnagel (*2014*), safety has traditionally been viewed and defined as *"a condition where nothing goes wrong" (Hollnagel, p.1, 2014).* Furthermore, safety has been viewed as a condition where the number of incidents are acceptably small. Nonetheless, Hollnagel mentions that this is paradoxical to its actual definition. Instead, Hollnagel *(2014)* suggests that safety is defined by the opposite, meaning that safety is defined and measured not by its quality and presence, but rather of the consequences of its absence.

On the other hand, Safety Culture is defined by the way that safety is perceived, valued, and prioritized in an organization *(Hollnagel, 2023).* Whereas other theoreticians and researchers have established alternative conceptual definitions of Safety Culture – where they rather depict it from (uniquely) different points of view. For instance, one of these figures is Najmedin Meshkati who is, amongst other titles, a tenured Professor of Civil/Environmental Engineering at the Viterbi School of Engineering, University of Southern California (USC). Meshkati's definition *(1997; Transportation Industry, US)* has been presented in Wiegmann

& Zhang's paper, as follows. I.e., *"Safety Culture is defined as that assembly of characteristics and attitudes in organizations and individuals that establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance." (Wiegmann & Zhang, p.122, 2004).*

Alternatively, organizations within the industry, such as the Institute for an Industrial Safety Culture *(ICSI, 2017)* characterize Safety Culture as certain ways of thinking, observing, reflecting, as well as working through a number of different methods and guidelines. For instance, including methods that are widely shared by the employees to such an extent where these act as a set of core values for the organizational culture. Moreover, the main objective is to be able to associate the most probable risks of the largest magnitudes, in context of their respective activities. In fact, Safety Culture is described as a reflection of *"the influence that the organizational culture has on matters relating to risk management" (ICSI, 2017).*

As Trout suggests *"Many of today's leaders have their business philosophy grounded in Michael Porter's Five Forces" (p.1, 2020).* These include the factors of competition, new entrants, negotiation leverage of suppliers and customers, as well as the threat of existing product/service substitutes within the business market. However, the rapidly increasing development of leadership, business, globalization, and technological innovation can be viewed from a postmodern perspective. For which, Trout *(2020)* suggests that times have changed, and nothing is the same as yesterday. In other words, including changed behaviors and circumstances within the business aspects and factors that Porter's model is mainly focused on. That is, for instance, predictability, relations, cognizance and perceptions of market forces, competitors, customers, and suppliers *(Trout, 2020).*

Therefore, the market positions and competitive capabilities of companies/ organizations are measured in several different dimensions. Including such as its performances in regard to quality levels of its products or services. Respective of its reputation, position, and influence in its business markets. The performance levels of an organization within these aspects are usually determined by its ability to adapt to changes, its risk capacities, respectively the attitude and appetite it asserts towards risks. On the other hand, this should not be misinterpreted as organizations being at their safest state when actually avoiding or even not taking risks *(ICSI, 2017).* Common misconceptions of this could likely include, to some extent, that the organization does not operate according to the characteristics of organizations with high level risk appetites. In turn, risk appetite in itself, is defined by the International Organization for Standards *(ISO)* as the *"amount and type of risk that an organization is willing to pursue or retain" (Hopkin, 2018; Manoukian, 2016; ISO, 2009).*

The above-mentioned scenario would most likely throw the organization in a revolving loop. In other words, the development of the organization would face troubles in keeping up with the advancements or fluctuations of its surrounding environment and business markets. Therefore, the most productive and persistent way of operating a company would be to understand and analyze the trade-offs between costs, lead times, quality, and safety management, to name a few. Organizations are exposed to manage several different risks. First and foremost, there are three categories of risks (*ICSI, 2017).*

1. Minor incidents
2. Serious or fatal occupational accidents
3. Major events that can cause serious effects on victims and the environment.

The different risks also correspond to a different level of probability, respectively severity, that are important to understand. For example, the cause of someone falling at work and fracturing their leg will have a lot less severity than a sunken vessel - although the probability is higher. Furthermore, there are three pillars of Safety Culture: technical aspects, safety management, human and organizational factors. Generally, the interpretation of human and organizational factors needs to be implemented at a larger extent in an organization *(ICSI, 2017*).

According to the Swedish Work Environment Authority *(2015)* there are some key components that are required for creating a safe and healthy workplace. When creating an environment where people thrive and develop, the workplace must enable technology and a physical environment that is adapted to the users. Furthermore, such must take human behavior into consideration. Leadership is strongly connected to the work environment, as the leader and how he or she organizes and leads the operation. Therefore, one could argue that having upper management who leads has an important role. According to the authority, an organization which is healthy and safe is also considered an efficient organization (*Swedish Work Environment Authority, 2015).*

1.2.6 Moral of the Story

The previous incidents have been presented with the purpose of giving real-life scenarios in which the main topic-components of this study have been present. Thus, enabling readers of this paper to understand the progression of the content better. Besides assisting readers in comprehending the background of this topic and to thereby get up to speed with what is actually being studied and discussed.

In other words, the previous incidents serve the purpose of giving the reader an introduction of relevant incidents, their causal factors, and severity of consequences. By that, to try to show the possible connection to the main topics of Psychological Safety, Group Development, and Safety Culture.

The relevance of courageous leadership in this thesis and its main topic area is that leadership is a common key ingredient in all three topics studied. The idea of courage as a part of leadership refers to a different perception of how leaders act under certain circumstances.

Consequently, leadership goes hand in hand with the three aspects that are the focus of this study. In fact, as the nature of these aspects are dynamic - viewing this from the perspective of certain scenarios may require different types of management and leadership approaches.

1.3 Aim of Study

The main objective of this master thesis is to determine whether there is a correlation between Psychological Safety, and Group Development, respectively Safety Culture - within the maritime industry. The idea is to analyze the aforementioned attributes of organizations to understand if these are connected and correlated. If so, is there a possibility to draw conclusions and suggest, for instance, that an organization should focus on their psychological safety in order to improve their safety culture. The objective is to form a sufficiently accurate perception of the three main aspects with the help of the three respective tools.

Moreover, as mentioned earlier the intended purpose of this study is to form a perception and/or deeper understanding of the three aspects, and whether these interact. However, if the results would be further applicable to debates regarding the importance of promoting a safer working environment within the maritime industry, as well as in other industries - then this project has definitely succeeded beyond its ultimate objective and goal.

This is an important area of research, especially with respect to the global efforts of making the world we live in more sustainably sound. Besides the importance of promoting improvements of the maritime industry from an occupational health and safety perspective - inviting other global industries to join the efforts towards promoting awareness and acknowledgement of this is as vital. Speaking of sustainability, however, the global sustainability-movement is being primarily piloted by the *United Nations' 17 Sustainable Development Goals (SDG)*, as part of the 2030 Agenda. Amongst which, there are some that are closely related to provoking debates and changes within topics such as improving occupational (mental and physical) health and safety related conditions for all. For instance, the following SDG sub-targets are such; Targets *3.9*, *8.8* and *16.6 (United Nations, 2023; ILO, 2023b).*

1.4 Research Question

Considering what has been presented about this topic in the sections above, the main research question that has been formed is stated below.

What is the correlation between Psychological Safety, Group Development, and Safety Culture – within the maritime domain?

1.5 Delimitations

The following limitations have been necessary to be set and defined. These decisions have been made to maintain the level of relevance and to keep a clear and informative red thread throughout this report by narrowing down the scope of research. Especially since the main objective has been to complete the project successfully and thoroughly within the timeframe, research area and appropriate level of clarity. Although, since most of the following

information has been further detailed in the methods (**3.**) and error margin (**0**) chapters, only the vitals will be mentioned here.

As mentioned earlier however, this thesis reviews the potential correlation between the main three aspects, with hopes of identifying any typicality that might exist in the maritime industry. However, as the chosen subject area, the aim of this study, as well as the research question have previously explained, this thesis is not intended to deep dive into every single one of the concepts. Especially as the three topics PS, GD and SC are very broad and complex subject areas in themselves. As a result, certain balanced compromises have been necessary to be made. Such decisions include for instance the following.

Primarily, the limited amount of time that had been assigned for a research question of this scale turned out to be one of the most evident constraints that were identified. This was the case even though the deadlines, forecasted and scheduled progress phases were met with success. To be specific, this project was carried out during a time period of less than six months. Thus, making it practically impossible to study each relevant side of the chosen aspects, the research area, or to review all potentially important sources of information.

Despite this, it was necessary to keep the demographic factors of the study widely inclusive regardless of gender, nationalities, ages, professional roles, or experience levels. On the other hand, this was only applicable and feasible to include by ultimately relying on the condition that the respondents had to be a part of the maritime industry. Additionally, by keeping the level of variety in the responses limited by adding close-ended responses to the design of the questionnaires with the option to provide alternative answers – if necessary.

However, the most important exclusions and limitations in this thesis include the fact that the study was neither specifically aimed towards, nor strictly limited to one or several teams, groups, organizations, occupational roles, or ethnic groups. Instead, these types of factors were viewed as valuable aspects to keep as widely included as possible. Especially considering how being open to collect these types of data could not only provide a more nuanced depiction, but most importantly, even potentially counter and compensate for the expected biases that are further discussed in the error margin (**3.5.1**) chapter.

2. LITERATURE REVIEW

In this chapter, all relevant and necessary research, theories, and similar collections of literature are reviewed in depth. These are what encompass the mentioned three topic areas that are to be studied. The purpose of this chapter is to review the previous work of researchers and experts in order to provide any type of knowledge that is, in turn, necessary to facilitate a deeper understanding of this subject area.

2.1 SAFETY CULTURE

Sidney Dekker has in his paper *Safety leadership - the role of executive in leading a safety culture (2014)* expressed the importance of safety leadership and distinguished its differences from safety management. Mainly, as safety leadership is primarily focused on empowering others. Whereas safety management, on the other hand, is rather focused on the management of things and people. In which, managing things often makes it more difficult for people to work *(Dekker, 2014).*

As opposed to safety leadership, safety management is more often than not, rather focused on directing, controlling, and telling the people within an organization what not to do - or, how to not handle a certain situation *(Dekker, 2014)*. Moreover, Dekker *(2014)* suggests that the management sectors of organizations are not always aware of how to properly handle a certain unsafe situation. Whereas, given that the management sector actually being in charge of managing an unsafe situation, would in that case require them to actually know at all times what "unsafe" actually is. Therefore, Dekker's somewhat controversial perception of safety management portrays it as limiting and constraining people in their own work *(Dekker, 2014).*

Good leadership is not about constraints and preventing people from working unsafely according to what the management presupposes would be unsafe for the employees. On the contrary, good leadership is about "*acknowledging that the work that your people do has evolved to cope with the inevitable hazards, complexities, gaps, trade-offs and dilemmas which your organization (and the nature of their work) helps create." (Dekker, p.2, 2014).*

Furthermore, safety should be handled by the ones performing the safety work, and not by the upper management. Since it is not a rarity that management adopts and implements renowned models and theories in hopes of mitigating constraints that, in reality, do not necessarily apply for the workers in the first place. Instead, Dekker *(2014)* suggests the *"emergent behavior"* by recommending a shift of focus from the above-mentioned mindset, to rather learning how to figure something out at the spot.

Within organizations, workers learn to cope and to set different goals simultaneously. Since management has expectations for the workers and sets certain goals, such as delivering a certain amount, delivering on time, or meeting production targets and Key performance indicators (*KPIs*). However, the workers are also expected to fill out requirements, forms, paperwork and follow procedures that are being set by management. Over time, workers learn to cope with the complexities of handling different procedures simultaneously. Within the

organization, there is a tremendous amount of data on procedures, technologies, tools, ways to operate as well as other activities that are critical to an organization in order for it to be successful *(Dekker, 2014).*

"Good safety leadership is about putting in place the conditions for your people to do things safely, more than about putting in place the constraints that prevent your people from doing things which are unsafe" (Dekker, p.2, 2014).

Dekker *(2014*) suggests that the safe organizations are the ones with leaders who cope with their workers' expertise and understand what it takes to get the job done - regardless of the messy details in the process. It means engaging the ones within the organization who possess expertise and who are trained to detect risks and anomalies. Organizations that can do so are being referred to as *"high reliability organizations"*. According to Dekker *(2014)* such organizations are the ones that have knowledge about the work that is being performed by the workers, as well as what it takes to perform it. Therefore, when there are limitations to the knowledge about what it takes to perform the work, similarly to when there are inaccuracies in the understanding of the ins-and-outs of what is really considered as "unsafe" - the measures taken to mitigate unsafe work rather leads to constraining the employees and the organization in itself *(Dekker, 2014)*.

2.1.1 The Distinction Between Safety Climate and Safety Culture

The very distinction between Safety Culture and Safety Climate has under a longer period of time been difficult to comprehend and understand *(Spielberger, 1966)*. These are defined by two main definitions of psychological states versus traits. This means that one person can be influenced by their personal behavior both with their traits and these are circumstantial factors and their characteristics within their personality. The circumstantial factors that could affect the person are for instance anger or anxiety, although the person could also be influenced by their characteristics such as being extraverted or introverted, social skills, etc. The aforementioned is referred to in literature as *"enduring personality characteristics" (Spielberger, 1966).* These have been hard to observe since it requires several observations since it is hard to measure his or her ability to react to different situations without observing them *(Spielberger, 1966)*.

Accordingly, the two definitions in the literature are defined differently. Safety Culture is commonly viewed as one of the enduring characteristics. To simplify, the ability of an organization to handle critical safety issues. Furthermore, the safety climate is viewed as a temporary state of the organization or company, subject to change and in regard to circumstances such as the economy *(Spielberger, 1966)*.

2.2 PSYCHOLOGICAL SAFETY

Edmondson, the Novartis professor from Harvard University has with her article *"Psychological safety and learning behavior in work teams*" *(1999)* introduced the construction of team Psychological Safety. Edmondson describes the above mentioned as *"a*

shared belief by members of a team that the team is safe for interpersonal risk taking - and team efficacy together in learning and performance in organizational work teams" (Edmondson, 1999).

Previous research and studies including work teams has shown that team effectiveness is correlated and enabled with or due to structural features. These could be summarized as appropriate team composition, appropriate team-task and the availability of resources, information, and rewards *(Hackman, 1987).* The most important artifacts for success and the enabling for a higher work team performance are structure and design. These include equipment, materials and physical environment and the use of pay systems. *(Goodman, Devadas, and Hughson, 1988; Campion, Medsker, and Higgs, 1993; Cohen and Led-Ford,1994).*

Edmondson's article focuses on how learning is naturally being achieved in working teams, and under what influences, conditions, or circumstances. Organizational work teams are defined as a group of members within a larger organization with clearly defined member-roles and possess a shared responsibility for a product or service *(Hackman, 1987; Lorsch & Alderfer, 1987).* The learning behavior of an organizational work team is the ability to perform activities and extract, process and understand data in order to learn and adapt to it accordingly. The learning behaviors do vary, however, some of them could be summarized as receiving feedback, sharing information, and cooperating within the group in order to help each other, talking about errors and also experimenting. According to Edmondson *(1999),* the aforementioned are the recipe for success and improvements for the working teams. The reasons being understanding customer requirements, improving the entire team's understanding of a certain situation, and mitigating the risks of making the same mistake of previous failure *(Edmondson, 1999).*

Quite frankly, and unfortunately, these outcomes are seldom seen in daylight within an organization. The reason being is that often, admitting a fault or error, or even asking for help is viewed as shattering the image of being competent at the workplace. Employees are therefore scared in order to at least believe that they are putting themselves at risk *(Edmondson, 1999).* According to Edmondson (*1999*), studies show that people are generally reluctant to admit errors and faults and ask for help, even though that would improve the team and organization severely. In addition, people who feel threatened in evoking or discussing problems within the organization, also limits, decreases, and strangles the willingness of an employee - also lowering the commitment and engagement to problem solving activities (*Dutton, 1993; MacDuffie, 1997).* Employees and people in general therefore impede and preclude learning if they are being exposed to potential threats and embarrassments *(Argyris, 1982).*

However, interpersonalization ways of handling things are viewed very differently around the industries and teams. In the year 1996, Edmondson did research at a hospital studying errors. One team member said that they would immediately tell the manager if there was a problem or error with giving medical or drugs to patients. On the other side, there was a separate team and its members who mentioned that telling the manager is nothing shy of a "last resort" kind of solution. *(Edmondson, 1996).*

Organizational learning is viewed differently both as an outcome and as a process. However, the definition by Chris Argyris & Donald Schön *(1978)* learning is stated as *"detecting and correcting error"*. Nonetheless, Argyris has in his work *"Teaching smart people how to learn" (1991),* stated the two different learning methods that he coined as the *"single-loop and double-loop learning"*. Argyris *(1991)* draws the characteristics of how a thermostat is set to turn on whenever the temperature in a room drops below 68 degrees Fahrenheit, as an example of single-loop learning. Whereas for double-loop learning, Argyris *(1991)* gives the example of a thermostat which could instead question itself by asking why it is set to 68 degrees - and rather identify the most economically optimized temperature for the given situation.

Argyris *(1991)* argues that highly skilled professionals nowadays are very good at single loop learning since they have been receiving different academic credentials during their entire lives, or at least a large proportion of their academic life. Not to mention the fact that mastering and empowering one- or several different intellectual disciplines, as well as using these in order to solve problems in reality *(Argyris, 1991).* Apparently, they are so good and successful at what they do, that they seldom fail. On the other hand, the downside of this is that the lack of failure keeps them in the single-loop learning, because they do not learn from their mistakes. In addition, eventually once the single-loop learning goes wrong, these people tend to put the blame on others, become defensive and/or screen out criticism. As a consequence, their ability to learn is impeded - at the very moment where they would gain from it the most *(Argyris, 1991).*

Furthermore, learning in a team is more than the interpersonal context of an individual's willingness to engage. Psychological safety in a group is the trust that one can speak up without the risk of being explicitly or implicitly humiliated, or exposed to offensive behaviors such as exclusion, discrimination, etc. *(Edmondson, 1999).* I.e., in group psychological safety, members of a group might not feel safe speaking up due to the fears of negative reactions, thus rather being silent instead of facing the threat of embarrassment or being seen as incompetent.

However, if the team possesses a higher level of psychological safety, it is more likely for the members to feel safe enough to speak up if they trust that errors will not be held against them for doing so. In that case, the benefits of addressing problems and errors will most likely result in the gain of knowledge and will benefit the group *(Edmondson, 1999).* This is supported by Argyris *(1991)* as he argues that organizational learning is not only about how people feel, but a reflection of how they think. In other words, the fact that even if the commitment of an individual is high, his or her defensive behavior towards criticism for instance, could very well be the potential constraint in organizational learning *(Argyris, 1991).*

Edmondson *(1999)* suggests a model for work team learning in four steps. The first step is antecedent conditions, which includes the team context and the coaching of team leaders. Furthermore, the second step is team beliefs, where it includes team safety and team efficacy. In addition, the third step is team learning behavior and sets the willingness for the team to progress in order to learn. Lastly, this includes, however, does not limit to seeking feedback,

asking for help and asking for customers' needs and desires. The last step is the outcome, Edmondson explains that if all steps are followed, the outcome will be team performance with satisfied customers *(Edmondson, 1999).*

The study that Edmondson performed showed how and if team learning and performance is correlated to Psychological Safety and team efficacy. After studying 51 different teams, Edmondson concluded that Psychological Safety was directly linked to team performance and learning behaviors, although team efficacy was not. The outcome of Edmondson's report showed that learning behavior interceded Psychological Safety and team performance. The results of Edmondson's study support the belief of an integrative perspective where several different factors and attributes are of interest. Mainly team context, team leader coaching and shared beliefs actually enable and shape the team's learning outcome *(Edmondson, 1999).*

With that being said, the main takeaway of this section is to shed light on organizational learning and the necessity of it being combined with positive Psychological Safety. Edmondson *(1999)* acknowledges the fact that Psychological Safety is not enough for a group or a team to be successful, because it also needs a high level of commitment to excellence. However, suggesting as earlier mentioned, that Psychological Safety is a key ingredient for a team or organization to let themselves become successful. As it enables the belief of being safe whilst speaking up, communicating and/or exchanging knowledge and information. On the other hand, this is supported by Argyris' *(1991)* argument, stating that no matter how strong the individual commitment is - if becoming defensive - there is no room for organizational learning. As a result, this could mean that the combination of commitment to excellence and successful learning behavior are two components that are strongly linked to Psychological Safety.

2.3 Integrated Model of Group Development

Wheelan has in her work *"The handbook of group research and practice" (2005)* mentioned the fact that researchers were slow to study human behavior. According to her review, the reasons for the delay of investigations within the given topic, potentially was the result of two things. Firstly, the historical roots mentioned the fact that data collection of human behavior was misguided. It meant that some things should be kept undisturbed, whereof human behavior was one of those things. However, others meant that it was too complex to study scientifically, not to mention the fact that during the era where psychologists were struggling to find the relationship between the acquisition of conditioned reflexes, the functions of the nervous system and the correlation between motor sport and mental states. Others meant that psychological studies of the individual mind were enough in order to understand the group-level ideas, social ideas, and collective minds *(Wheelan, 2005).*

However, the interest of study groups came forward with the help of intellectual, social, and political factors. The researchers understood that the studies of organizational behavior, sociology, psychology, and communication would be incomplete and rather useless if not including and understanding group behavior *(Wheelan, 2005).*

Wheelan *(2005*) argues that groups are open and should be viewed as open systems that are embedded in multiple and different contexts upon interaction. However, this is rarely acknowledged. Instead, the group's influence on the context and vice versa, is often ignored. Thereby, making research difficult to perform as it is more complicated to draw any contextual parameters and conclusions over different groups. Furthermore, Wheelan *(2005)* suggests that groups are complex, since they contain several different individuals with different skills and flaws *(Wheelan, 2005)*.

Wheelan refers to Robert R. Dies *(1994)* who concluded his findings through 135 studies, stating that groups actually benefited from leaders who had a positive attitude and mindset. In addition to key components such as showing genuine interests, warmth, and support. Furthermore, Wheelan promotes Dies' *(1994)* idea which states that if leaders become more actively negative, there is an increased probability that the group members will not only be dissatisfied, but also harmed by the experience of being in the group. In addition, leaders who can show and express warmth, support and are less controlling, actually benefit the group to a larger extent. In addition, the above-mentioned attributes of leadership enable cohesive groups, which has been proven in numerous research studies that cohesiveness is positively related to group treatment outcomes *(Wheelan, 2005).*

2.3.1 Psychological Safety from an IMGD Perspective

Wheelan *(2005)* mentions that recent research results indicate that teams which possess a higher level of psychological safety tend to demonstrate improved performances. This comes partially as a result of their learning behaviors and adaptability to rapid changes. As opposed to teams with a lower level of psychological safety *(Edmondson, 1999).*

Furthermore, according to Wheelan *(2005)* groups need more than just diverse perspectives in order to become efficient. In fact, the groups need an encouraging environment, which encourages the members to open up and share their opinions, thoughts, and ideas within the group. What is required for positive Psychological Safety to be facilitated in a group - as well as to be advantageous - groups need to understand, recognize, and perform agile adaptations according to changes whenever necessary. In addition, Psychological Safety is a crucial component for individuals who are interdependent, as a high level of psychological safety enables the possibility that individuals share deeper beliefs and information with each other *(Wheelan, 2005).*

2.4 Occupational Health and Safety

As mentioned earlier, there are underlying factors that are potential causes of accidents. However, likewise there are also underlying factors that could potentially determine how occupational health and safety becomes defined as an outcome. Such factors, or rather factor categories, include for instance socio-economics, national economics, ethnicity, equality, and culture.

2.4.1 Social Inequality and Technological Factors

During recent years the severe problems of human trafficking and forced labor within the fisheries and maritime sector have been known through numerous reports. These reports suggest that fishers, especially those that are migrant workers on board UK fishing ships, have been abused and exploited of their human rights. The problem arises as brokers and recruitment agencies are forcing the migrants to work under threat or force by the means of salvage or debt *(ILO, 2023)*.

The victims of these terrible conditions have, according to the International Labour Organization *(ILO)* described *illness*, physical injury, psychological as well as sexual abuse, the deaths of fellow crew mates and their vulnerability at sea. Often, they are being exposed to working on board several months or even years at a time, in remote areas as they are being on-board of the vessels. Furthermore, the work performed is often dangerous, hazardous, without safety equipment and at a very low pay rate. According to ILO *(2023)*, the capture of fisheries is one of the jobs that possesses the highest occupational fatality rates in the world.

In the middle and low-income countries, illegal fishing is ramping up, creating jobs under terrible conditions for workers, often migrants, to perform without any practice, safety equipment or general understanding of the actual harm of their work. Generally speaking, these workers have no other source of income and are dependent on it, creating no choice but to work under forced labor *(ILO, 2023)*.

Furthermore, the illegal fisheries are linked and correlated to human trafficking and other crimes committed by transnational organizations. Not to mention the fact that forced labor and human trafficking is hurting the people living under it. In addition, the effects of illegal fisheries create problems for the environmental aspects as well *(ILO, 2023)*.

2.4.2 Mental Health (Crew On-Board)

Undoubtedly, seafarers and the nature of their occupation consists of working in challenging conditions on-board ships for extended periods of time. Thus, making them, more often than not, relevant in discussions that include topics such as challenging working conditions. In other words, such conditions not only put strain on, but also lead to, issues that are related to one's physical health. As a result, during recent decades this problem has been noticed globally and efforts have been made to not only prevent it - but also to gain control over it. On the other hand, however, the mental side of seafarers' occupation and health has rarely received the same level of attention *(Jonglertmontree, et al., 2022)*

However, Woraluk Jonglertmontree's, et al. report *'Mental health problems and their related factors among seafarers: a scoping review' (2022)* which reviews 24 previous research studies has resulted in two major findings. Firstly, the main findings in regard to mental health issues were the prevalence of stress, symptoms of depression and burnout. Nonetheless, all of the above-mentioned aspects have been a prominent topic of discussion for decades. Additionally, the study shows categorizations of factors that indicate potential correlations between mental health and psychological issues. These were categorized as

individual, respectively work-environment related factors. The first mentioned individual factors included professional experience, age, and health status such as BMI, diseases, diabetes, and other factors including poor sleep *(Jonglertmontree, et al., 2022).*

The second category was the work-environment-related factors that were divided into two parts, with the first division referring to the pressure of job demands. This division includes, but is not limited to, the pressure from contractors, customers, time, working hours and noise. The second division refers to factors related to job resources. In other words, this division addresses instrumental support, team cohesion, shipboard caring, and the imbalances of effort - in respect to rewards *(Jonglertmontree, et al., 2022).*

2.5 Safety, Culture & Technology

This chapter intends to merge together safety, its organizational culture, and the idea of socio-technological systems. Meaning, to give a deeper understanding of the concepts, linking them together in order to understand the correlation of safety, its systems and also the way technology and humans interfere with each other.

2.5.1 Socio-Technological Systems

Just a few months after the 100-years anniversary of the *Titanic* accident, the *Costa Concordia* saw a similar fate. Despite it being a century apart and both of the vessels were state of the art of their time - the accident shows that even though technology and maritime safety has evolved over 100 years, accidents still occur *Schröder-Hinrichs, et al., 2012).*

The report *"From Titanic to Costa Concordia - A century of lessons not learned" (Schröder-Hinrichs, et al., 2012)* suggests that there is a large proportion of underlying causal factors that have a crucial role in the occurrence of the accident. Such that are however not as directly linked, concretely distinct or as easily detectable as the primary, explicit, and most tangible factors. To be specific, according to Schröder-Hinrichs, et al. *(2012)* these types of factors arise, amongst others, as a consequence of socio-technological systems failing. Such factors are referred to as *blunt end factors*. Meaning, that the combination of proximal factors (working here and now), respectively distal factors (working there and then), collide and could potentially lead to the risk of an accident materializing *(Schröder-Hinrichs, et al., 2012).*

Despite the fact that maritime technology has been updated, refined, and even moved beyond recognition during the last 100 years between these accidents. The authors propose however, that the psychological and organizational factors have not undergone the same level of refinement. At Least when it comes to organizations' attitude of thinking and handling risks affecting the operational safety. Despite the fact of the checklists, precautions and all safety regulations, some underlying conditions are still the same as when the *Titanic* sank over 100 years ago *(Schröder-Hinrichs, et al., 2012).*

Costa Concordia had all the top-of-the-range communication tools and instruments necessary to sail safely. To be specific they had *Global positioning system (GPS), Automatic Radar Plotting Aid (ARPA)* and *Electronic Chart Display and Information System (ECDIS)* at their disposal. *Titanic* had none of these, however at the time they did have enough communication and the best at the very time to communicate with the shipping company. In addition, both the captains of *Titanic* and *Costa Concordia* had no record of accidents prior and spent most of their lives at sea. Nonetheless, there is no record of the staff disagreeing or trying to prevent the master's maritime salute from *Costa Concordia (Schröder-Hinrichs, et al., 2012).*

As previously mentioned, blunt end factors materialize where there is a combination between this type of factor, respectively the sharp end factors. The theory behind this combination refers to the people, in this case, those of the accidents who were on the bridge and were responsible for the on-hands control. Whereas the blunt end instead refers to the ones that have been separated from the activity, by time or space. These include for example engineers, designers, builders, administrators, on-shore personnel, shipping companies, etc. *(Schröder-Hinrichs, et al., 2012).*

Today, the management side in regard to maritime accidents have been influenced by the International Safety Management *(ISM)* code within the International Maritime Organization *(IMO)*. However, Schröder-Hichins, et. al *(2012)* argue that specific human factors are yet not targeted or even considered sufficiently. Furthermore, once these human factors are addressed, they are usually not easily detectable as, more often than not, they are in combination with other factors. Thus, making them complex socio-technological systems *(Schröder-Hinrichs, et al., 2012).*

2.5.2 Organizational Culture as a Concept

The general concept of organizational culture is one of the main notions that Safety Culture and its definitions are based on. On the other hand, organizational culture as a concept is applicable to a broad range of academic disciplines, as a result of its core qualities. Correspondingly, there are a variety of conceptualizations, definitions, as well as methods and approaches for studying the concept; depending on what discipline's perspective the concept is being viewed from *(Helmreich & Merritt, 1998).* As a result of this multidisciplinary nature, Wiegmann & Zhang *(2004)* mainly suggest two broad perspectives that the aforementioned can be categorized in, i.e., the socio-anthropological and organizational psychological perspectives *(Wiegmann & Zhang, 2004).*

I. Socio-anthropological perspective

The socio-anthropological perspective is per definition assuming that the organizational culture is a derivative reflection of the organization's history, historical values, and renowned members *(Smircich, 1983*). To be specific, organizational culture is *"*more than what meets the eye*"*, i.e., deeper than what can be understood by analytical methods in which one seeks to reverse-engineer and review its individual components. Instead, it should be accounted for

the entire nature or activity of what is being studied *(Creswell, 1998; Glaser & Strauss, 1967; Suchman, 1987).*

II. Organizational psychology perspective

Aside from the socio-anthropological perspective, there is the organizational psychology perspective. These two are related by the sense of viewing organizational culture through the following artefacts. For instance, the fact that values and beliefs are commonly shared by the organization's members by relating these to symbolizations of myths, rituals, legends, behavioral patterns/mannerisms, and specialized language. In other words, organizational culture and the aforementioned symbolizations result in second-hand phenomenon that can be taken advantage of, as further explained later in this text.

Nevertheless, these symbolizations in an organizational culture result in the formation of an identity and a set of characteristics that the community of members in an organization relate and commit to, both individually but also as a unique community. Not to mention, this is something that the members view as being part of what Wiegmann and Zhang describe as *"something larger than the self" (p.120, 2004).* In turn, this also includes the establishment of the social balance that entails social system stability and behavioral unity *(Smircich, 1983).*

However, organizational psychology differs from the socio-anthropological perspective through its focus on the functional significance of organizational psychology, respectively the potential of it being manipulated for beneficial purposes. In other words, the potential productivity-related advantages and benefits that can be achieved through the manipulation of organizational psychology *(Deal & Kennedy, 1982; Peters & Waterman, 1982; Schein 1991)*. Since, if these factors are viewed and utilized as potentially resources, capabilities, and tools for improving productivity, such benefits can in fact be achieved through strategically taking advantage of the aforementioned factors, symbolizations, and psychological attachments. Consequently, the results could result in increased personnel motivation, organizational commitment, and to convey a philosophy of management. Correspondingly, Wiegmann & Zhang describe this as follows; *"The organizational psychology perspective, therefore, provides a conceptual bridge between organizational behavior and strategic management interests' (p.121, 2004).*

However, as opposed to the views of the socio-anthropological perspective, the organizational psychology perspective rather leans towards traditional analytical methods, such as assuming that organizational culture, in fact, can be reverse-engineered and be analyzed as its smaller components. To be specific, the components that organizational culture researchers commonly have suggested including amongst other safety culture, motivation culture, creativity culture, and service culture *(Geller, 1994; Zohar, 1980).* This is mainly based on the fact that organizational psychology often views organizational culture from the angles of how it can be utilized strategically to affect performance, such as productivity *(Schein, 1991).*

III. Organizational commitment to safety

Organizational commitment is a term that is used to define the depths of which organizational Safety Culture is adopted, embodied, and implemented by the upper-level management. Meaning, the extent to which such activities and principles are recognized and utilized as core business values by the organization. Not to mention the attitude it asserts towards these, including the efforts and investments made to consistently promote and provide necessary assets for maintaining safety related endeavors *(Wiegmann & Zhangl, 2004; Eiff, 1999)*. In other words, as Wiegmann et. al describe it, *"An organization's commitment to safety is therefore ultimately reflected by the efforts put forth to ensure that every aspect of its operations, such as equipment, procedures, selection, training, and work schedules, are routinely evaluated and, if necessary, modified to improve safety" (p.126, 2004)*.

3. METHOD

The main approach for this study includes the combination of three surveys that act as measuring tools for their specific subject areas. In other words, a combined version has been made by having integrated three surveys into one questionnaire.

By using this combination, the study aimed towards investigating and identifying how Psychological Safety in workplaces might be correlated to Group Development and organizational Safety Culture. The questionnaire was sent to companies, organizations, students, and employees that are a part of the maritime industry. The extensive academic work and research of the three main peers (see 1-3 below) were applied in this study as a source of guidance and as a reliable steppingstone. To be specific, the following list includes these specific subject areas, theories, and scientific models that these experts have developed and/or advocate for:

1. Psychological Safety (A. C. Edmondson)
2. Safety Culture (S. Dekker)
3. Integrated Model of Group Development (S. Wheelan)

Respectively, the validated surveys that were used as measuring tools for each of the subject areas are the following:

a) *Group Development Questionnaire Short (GDQs)*
b) A set of questionnaire items developed by Psych Safety *(2020)* for measuring Psychological Safety.
c) Finally, in addition to the Dutch *Systematic Culture Inquiry on Patient Safety in Primary Care (SCOPE-PC).*

Correspondingly, there was a process of determining and filtering to which method is considered as most appropriate for this study. Whilst doing so, several data gathering approaches were considered and (unofficially) cross-examined and evaluated.

As for the research method, the chosen approach was determined to be the most appropriate, not only to this study itself, but especially to the area of subject and research question. To be specific, this is a quantitative study, with the anticipation of gathering large quantities of data. Again, to identify patterns and understand the potential correlations between the earlier mentioned studied aspects. However, there are differences in these three subject areas that might require specific measuring approaches. The appropriate methods for each aspect, as well as their characteristics, will be addressed in the subsections of this chapter.

3.1 QUESTIONNAIRES

The main body of the questionnaire, which is a combination of the three previously mentioned frameworks (GDQs, SCOPE-PC, and Psychological Safety Questionnaire items) consists of close-ended questions *(Denscombe, 2014)*. Whereas the answers are, as in the original surveys, multiple-choice answers that follow the 5-point Likert scale standard. In

which the ranges and polarities of answers amongst the various questions mainly range from such as point 1 corresponding to *'Never'/'Rarely' or 'Strongly disagree'*, respectively point 5 corresponding to *'Always'/'Frequently' or 'Strongly agree'*.

However, aside from the main items borrowed from the original surveys, a set of demographic questions were defined and included. The purpose of this was to collect data, if needed, that would enable the authors to categorize identified response-patterns by typical respondent-groups. For instance, imagine a hypothetical scenario where the mean-value of responses for a GDQs item would indicate that people mostly feel that their ideas are welcomed/neglected in their teams. If that were the case, the demographic data would be a crucial factor as it would provide certain categories in which the authors would be able to identify (again, hypothetically speaking) certain patterns. For example, the age data retrieved from the demographic items could be the determining factor in whether the authors would be able to detect a pattern - Such as how the majority of respondents that felt this way, were apparently under the age of 20. *Therefore, with the demographic features included, such potential matters and typical patterns of interest and relevance could eventually be identified, distinguished, and discussed by the authors. *(See ***Note II**)*

To be specific however, it was necessary to ensure that the demographic chapter of the survey included question/answer-types that were relevant to the nature of what each item was questioning. The reason for this was to keep the quality and integrity aspects of the questions intact, whilst simultaneously leaving enough clearance for respondents to give as accurate answers as relatively possible. Additionally, with respect to the discussion regarding the outcome of limitations in the demographic questions (**5.1**), efforts were made to achieve an ideal equilibrium by attempting to balance the estimated risk of quality-loss (in too limited response-options), in relation to the risk of information overflow or irrelevant response quality (in too open answers).

Consequently, the demographic section of the survey included for instance, close-ended questions, with multiple-choice answers designed as checkboxes. However, whilst some of these would allow respondents to choose a multiple number of response options. Whereas some others only allowed for a single choice to be made amongst a given number of response options. On the other hand, aside from the previously mentioned, some of these questions were designed to allow respondents to choose alternative answers – whenever necessary. Such questions either included one, two or all three of the following alternative answer-types: *'Prefer to not share'*, *'Other'*-option, and/or an open text-box option where respondents could type personalized inputs. Again, these were added to specific questions in accordance with, not only the question/answer types, but also based on what was being questioned. Lastly, the table of demographic items can be viewed in the Appendices. ***(Attachment 1. P.1(1))*.**

3.1.1 Negatively Worded Items

During the early phases of this study there was a detail of differences regarding the items' homogeneity that was realized and discussed between the authors. This was the fact that a fair share of the items from SCOPE-PC and GDQs were worded with an ambiguous or negative

connotation, as opposed to the other majority. To be specific, most of the items were consistently expressed with a positive or neutral connotation, such as GDQs' item *3-III; "Trust is high in this group".* As opposed to such, amongst the negatively connotated items there is for instance GDQs' item *0-II; "There is quite a bit of tension in the group at this time".* Thus, negatively expressing the question, yet remaining to be scored with the same 1-5 Likert-scale. In other words, if such items were scored as high it would imply that their groups are amongst the weaker development stages. Whereas, if rated as low it would instead mean that people do in fact get along well in the group and express themselves openly - therefore representing the characteristics of a more mature group. The main detail to pay attention to in this example is the fact that high scores such as 4-5 on the Likert-scale are linked to positively worded items – for the most part of these questionnaires. Whilst these negatively worded items instead disrupt the consistency of the item structures – thus also having the effect of skewing the data analysis calculations.

Consequently, it was necessary for the authors to identify GDQs' five negative items manually and carefully. However, for SCOPE-PC, such items were already highlighted in Natasha Verbakel's *(2015)* study. To be specific, by the addition of the letter 'n' at the end of the negatively worded items' codes. Subsequently, Excel's 'VLOOKUP' formula was used to create a function that would invert the scoring numbers of all negatively worded items, simply by switching the rated scores around. I.e., a score of 5 would be inverted into a 1; 4 into 2; 1 into 5; whereas the score 3 remained the same.

Nevertheless, this adaptation of the scores was made with caution - to avoid accidental manipulation of data. This was made to make sure that the ratings of such items would be coherent with the rest of the normal scores. Besides, it is worth noting that any graphs or tables that are the results of the adapted data have been marked with *"(Inv)"* - as in *Inverted scores*.

3.1.2 Group Development Questionnaire Short

In order to collect data on Group Development, Wheelan's *Group Development questionnaire (GDQ)* was deemed as the most reliable and validated measuring tool for the topic area. Primarily because it is sufficient for the scale of this project, but also because it is supported by extensive research as backup. Secondly, because it meets the circumstances of this project better. To be specific, it does not require the attendance or supervision of a certified consultant as opposed to GDQ. This questionnaire is based on the same core principles as the IMGD. Nevertheless, the short version of this survey was utilized, namely the *GDQs.* This version consists of 13 items, divided into four scales (See **Table 1.** & ***Attachment 2. P.1(1)***).

Table 1. *GDQ Scales & Development Stages*

GDQ Scales	Stages of Group Development		No. items	Items
I	1	*Dependency and Inclusion*	*4*	*1, 5, 9 & 13*

II	2	*Counter-dependency and Fight*	*3*	*2, 6 & 10*
III	3	*Trust and Structure*	*3*	*3, 7 & 11*
IV	4	*Work and Productivity*	*3*	*4, 8 & 12*

Since this study combines the three different aspects and their respective measuring tools - it was realized that feeding the data into the three tools was not applicable. This was especially a constraint in the case of the analysis method of GDQs, which preferably requires the data to contain information on joint group participation as well as data that enables the authors to backtrack what group each individual was a part of. That is at least the type of approach from which the tool is actually intended and designed to be properly used. I.e., in order to gather data that defines the development stage in which a certain group finds itself within. With that being said, when considering the fact that this study was intended to respect the respondents' integrity and anonymity, any demographic items that could potentially compromise their integrity or establish traceability in the data were therefore excluded.

As a consequence, the chosen approach did not allow the authors to analyze the data and determine the development stages for groups - at least not without compromising the level of reliability, validity and exceeding the acceptable error margin. On the other hand, after consulting with Christian Jacobsson (the Head of Research at GDQ Associates, Sweden) the authors were advised that the data was yet sufficiently appropriate for being combined with GDQ after all. However, for depicting respondents' individual perceptions and experiences in regard to their group's development phase instead.

3.1.3 SCOPE-PC Questionnaire

SCOPE-PC is a tool that is designed to measure Safety Culture in hospital organizations' primary care division. Although SCOPE-PC is originally intended for evaluating patient safety in primary care, it was deemed sufficiently relevant to be used in this project after careful considerations. Of course, in addition to certain adaptations and adjustments. ***(Attachment 3. P.1(1))***. However, this is actually a modified version of its original counterpart '*Systematisch Cultuur Onderzoek Patientveiligheid Eerstelijn' (SCOPE)*, which is designed to assess Safety Culture in hospital organizations' general practice division. Additionally, SCOPE itself is, in turn, a modified version of the original Dutch survey called *'Hospital Survey on Patient* Safety' (HSOPS), *(Verbakel, 2015).*

Nevertheless, as mentioned above, it was decided that SCOPE-PC was a sufficiently appropriate option to utilize for this study. Primarily, because this study's subject area is related to practical aspects of working environments, which this measuring tool actually considers. Moreover, the few necessary adaptations that have been made to SCOPE-PC by the authors of this study include, for instance, streamlining the items' codes according to the codes of their own questionnaire's items. This was done with consideration to improving ease

of use for respondents and avoiding exposing them to unnecessary distractions. However, the order of the items has not been changed.

To conclude, these modifications are practically similarly negligible modifications as those that were made to adapt SCOPE for the primary care sector. Considering the fact that the questionnaire, as a measuring tool, has been kept entirely intact in regard to its operability. Obviously, aside from modifying the subject-related connotations in the items, such as *"In the health care practice …"* being replaced with *"In the maritime industry …"*.

Nevertheless, SCOPE originally consisted of 43 questionnaire items, of which two items had been deleted in SCOPE-PC and one item had been split into two – thus making a total of 42. However, in the case of this study, a total of 41 items were used. Because item *A15n* was not appropriately adaptable enough for this subject area, therefore it was excluded. Moreover, the questionnaire items in SCOPE-PC cover the following seven topic dimensions (See **Table 2.**).

Table 2. *SCOPE-PC Dimensions*

SCOPE Dimensions	Topic area	No. Items	Excluded (Item code)
1	*Handover and teamwork*	*8*	
2	*Support and fellowship*	*8*	
3	*Communication openness*	*(8)7*	*- A15n*
4	*Feedback about and learning from error*	*4*	
5	*Intention to report events*	*3*	
6	*Adequate procedures and adequate staffing*	*7*	
7	*Overall perceptions of patient safety management*	*4*	

**Values in parentheses indicate the original number of items in SCOPE-PC, whilst the value without parentheses is the number of items that were included in this study's questionnaire.*

3.1.4 Psychological Safety Questionnaire

There are various methods and tools to measure Psychological Safety that have been developed and/or revised by different researchers. However, the tool for analyzing Psychological Safety in this study consists of eleven questionnaire items that have been further developed by Psych Safety *(2020)*. These items were originally defined by Edmondson in her two papers *'Psychological Safety and Learning Behavior in Work Teams' (1999)*; *'The Fearless Organization: Creating Psychological Safety in the Workplace for Learning, Innovation, and Growth' (2018)*. Moreover, the decision to utilize this tool was made early in the research process, considering the fact that Edmondson's academic work in this field has been widely renowned and validated. ***(Attachment 4. P.1(1))***

3.2 SELECTION OF RESPONDENTS

As for the selection process of respondents, it was necessary to ensure that the collection of data would provide as qualitatively appropriate and relevant information as practically possible. Therefore, the criteria for respondents to be evaluated as sufficiently relevant required that potential participants had to be professionally linked to the maritime industry. The range in which any occupational roles were anticipated to be appropriately relevant was, for instance, in the form of students/interns, and any roles that could either be generally categorized as crew on-board or crew on-land. On the other hand, there were some additional related factors that were rather considered to be interesting, relevant, and informative to include, rather than to limit or exclude. For instance, such factors were the respondents' professional experience levels and position in the organizational hierarchy. Lastly, one aspect which was disregarded was to include the period of time in which the respondents had developed their experience within the maritime domain as part of the selection criteria.

3.2.1 Selection Processes

The selection of respondents that has been mentioned previously can be described as a two-step process. This is described in detail below.

I. Step 1 – Targeted selection

The first phase of the selection process was to minimize the risk of collecting data from irrelevant respondents. Primarily, this included for instance a disclaimer in the questionnaire's introduction which requested participation from people with relevant experience and professional backgrounds related to the maritime domain. Secondly, the authors would target either specific individuals or organizations when distributing the questionnaire. These were individuals or organizations within relevant business and market areas - in which the likelihood was higher of finding suitable respondents.

II. Step 2 – Demographic questions

Whereas the second phase of the selection process was designed to be integrated within the survey. Meaning that the questionnaire had certain demographic items included which would ask for information about the respondents' occupation/professional role, experience level, etc. In other words, these were not only designed to facilitate the possibility of identifying and categorizing patterns amongst the responses. Instead, these also enabled the authors to identify whether or not a respondent's background coincides with the relevance criteria that were required to be met. Thus, being able to filter out any responses from irrelevant respondents – if there would be any, despite these efforts.

3.3 ETHICAL ASPECT OF THE RESEARCH

Measures have been taken and efforts have been made by the authors to act within the traditional academic norms and codes of conduct. Specially to provide verifiable facts that

assure that this study and its findings live up to the global standards and principles for academic research. As well as meeting the principles of academic integrity, honesty, scientific validity, and reliability. These decisions and principles have been held as main guidelines in this study, thus acting and making decisions accordingly. For instance, these guidelines have been actively utilized when defining the methodology aspects such as designing the questionnaire, delimitations, data collection approach, as well as for any data and/or respondent selection procedures. Finally, the authors have invested all available time and attention as well as making their utmost efforts to ensure that this project lives up to the standards of the academic community. For instance, by reviewing and reflecting upon every step of this project as thoroughly and critically as possible, within the limits of their knowledge and experiences.

I. Honesty

As mentioned earlier, this study serves the purpose of providing a realistic depiction of the truth and reality, based on factual data. Additionally, accounting for the crucial importance of interpreting data as accurately and precisely as possible, that is, with respect to honesty. In fact, this is fairly logical when realizing that the truth and reality stay intact, regardless of whether the gathered data appears to reject, or support the hypothesis of this study.

II. Responsibility, Respect & Fairness

All collections of material that have been used for this project as a foundation have been included in the reference list. Whether those are scientific papers, previous research projects/studies, or sources of simple facts and information. Above all, however, the authors of this thesis have intended to interpret and treat any work of others as responsibly, respectfully, and appropriately as practically possible. Nonetheless, the authors take responsibility for any eventual misconceptions or misinterpretations and intend to fairly rectify such issues if identified.

As for the reference standard, the American Psychological Association's *(APA)* 7th edition of the globally standardized APA referencing system has been used *(APA, 2023; Chalmers library, 2023).*

III. Anonymity & Integrity

The participants are anonymous at all times, and this is stated on the first page. Furthermore, the individuals partaking in the questionnaire have been informed that the answers to their returned surveys remain anonymous and cannot be traced to a certain individual, company, ship, or organization. In addition, the participants are kindly asked not to add any names. This is performed in order to ensure the anonymity of the user and to respect the integrity of all involved parties.

3.3.1 Reliability & Validity

The research has been conducted within the mentioned guidelines and principles in order to guarantee its authenticity, validity, and reliability. Primarily, the study is conducted with the help of three tools that have been peer reviewed and used within research prior to this project. Combining these three enables a perception to be shaped, though from an updated point of view of how the three phenomena within the maritime industry might be linked and correlated.

The purpose of this report is, as stated earlier, to mainly contribute intel and results to this research area. As for the reliability aspect of this project, in regard to all processes of conducting this study, the authors have aimed to construct an approach that can easily be repeated in the future. Firstly, by using an approach that, for most researchers/students, is accessible and possible to repeat and reiterate without any uncommon constraints. In fact, this goes both for the retrieval and access of sources and data, as well as for the procedures and steps of conducting the research itself. Moreover, also by providing the most relevant information, as well as instructions, that might be required and necessary for this study to be identically repeated in the future.

3.4 Collection of Data

The information and the research which has been carried out have been the results of close research into scientific sources, papers, books and with the Chalmers library database of scientific materials. Previous research and literature review has been conducted with the help of scientific sources which have been peer reviewed and validated. Respectively, efforts have been made to prioritize scientific and peer-reviewed sources above others. However, there are some instances in which compromises have been necessarily made by opting for reliable sources that might though not live up to the previously mentioned standards. Or, at least not for some aspects of these standards, such as lacking the peer-reviewed assurance of validity. This was made in order to, yet again, ensure that the level of reliability and validity of the research would be of a high quality. Not to mention that the individuals that have contributed data to this study through the survey, actually represent the maritime industry.

3.5 Implementation

As mentioned in chapter **3.3 Ethical aspect of the research**, this study has been conducted and written with respect and attention to the code of academic integrity, ethics, and responsibility. However, the following sections will describe the various measures that were taken in order to direct the work accordingly - or to adjust methods of conducting the study as well as the construction of the questionnaire to be appropriately adapted.

Sources for information that were primarily aimed towards preferably using scientific papers, as well as making sure that such would be peer-reviewed sources, if possible. However, the sources were evaluated in regard to being reliable enough to be used. Furthermore, all sources

in this thesis are referenced according to the APA7 reference system, which is globally acknowledged.

In regard to the survey, as previously mentioned, it was clear on several occasions that the survey is completely anonymous. The data from the surveys were summarized and correlated between the three aforementioned topics with the help of the following statistical calculation tools and methods. Primarily, the general processing of data, as well as the primary correlation (in twos) and regression analysis was carried out with Microsoft's Excel software. Whereas the joint-correlation analysis between all three aspects was carried out with the help of the SPSS *(Statistical Package of the Social Sciences)* software.

3.5.1 Error Margin

Naturally, as a part of conducting research, there are countless certain factors that act as possible sources of errors and biases, thus potentially affecting and determining the final results and outcomes of a study. Also, certain types of such errors - as well as their probabilities of affecting results - vary depending on the type of study, research method, subject area, and similar factors. In other words, the results/take-aways of a study can potentially be exposed to the risks of inaccuracies in data/result interpretation. Or even (unconsciously) biased data-analysis/collection, to name a few.

Having explained the aforementioned risks, the following sections describe the error margin that has been defined and drawn. The errors and biases that are addressed within this error margin are those that have been deemed as either relevant, probable, and/or uncontrollable (yet tolerable) risks for the outcome of this study. Respectively, the description also includes any measures that have been taken to minimize and prevent the respective errors' potential impacts on the research data and the study as a whole.

I. Unconscious bias

It is a given fact that we as humans, including the authors of this study, all have our individual and unique backgrounds - with respect to the certain experiences, cultures and social origins that define us as people. This is in turn reflected in the distinct ways that we individually form opinions, perceptions, or even react to things and situations - if at all, to begin with. According to Joseph Shaules *(2015)* this is a result of our unconscious minds internalizing patterns of habits. Thus, making it increasingly difficult for our own eyes to see or react to things that are normal to ourselves. Likewise, the increased difficulties in being self-aware or conscious of our behavioral or decision-making processes' reliance on such normality patterns *(Shaules, 2015).*

Therefore, it is crucial to account for the fact that the authors of this study are individuals of different social-, educational-, and ethnic backgrounds - hence their different cultures. Likewise, this implies that the authors' individual ways of processing, perceiving, and reacting to their surroundings - or information in this case - could vary significantly when compared. As mentioned earlier, because this is a part of human behavior that has its roots deeply embedded in the unconscious state of mind. In other words, the behaviors, decisions,

or perceptions that we unconsciously react to - are such that we are unaware of, thus practically hindering us from controlling these. Shaules *(2015)* addresses this type of bias as the so-called unconscious bias, or also, implicit bias.

As a core principle of academic research, it is necessary for researchers to be as unbiased, unprejudiced, and as neutral as practically and humanly possible when conducting studies. However, unconscious bias has been identified to interfere with such efforts *(Shaules, 2015)*. However, the specific level of impact that this type of bias could potentially inflict towards studies is strongly dependent on the subject area that is being studied, respectively the chosen type of research method. For instance, this could impose a greater risk of skewing research outcomes in observations of social or behavioral studies *(Shaules, 2015)*.

Now, in the case of this study, this type of bias could potentially affect the decisions made regarding the design of the survey, selection criteria of respondents, and similar areas of this study. Or more importantly, the risk of it causing significant differences between the authors' individual abilities when observing and analyzing data. For instance, this could include the difference between each of the authors either detecting, or instead, not even noticing certain response patterns. Alternatively, performing unbiased/unprejudiced result-discussions, as well as interpreting the findings and potential correlations between results with high accuracy and precision *(Shaules, 2015).*

Therefore, as efforts to rule out or at least mitigate the risks of misconceptions or misinterpretations from the authors' end, the following decisions have been made. Firstly, the construction and question design of the questionnaire, as well as the items that it includes, have been borrowed from academically peer-reviewed and validated questionnaires.

Secondly, the use of simple statistical analysis methods has been chosen to detect certain patterns in the collected data. Additionally, as for identifying implicit yet existing response patterns and correlations - the questionnaire items and their topics of questions have continuously been broadly discussed between the authors and the supervisor. The purpose of this has been to not let the authors' limited knowledge become a constraint in the determining of what implicit correlations to try to identify. Hence including the supervisor's knowledge in the discussions to ensure the inclusion of any relevant and remarkable correlations that the authors could have missed otherwise.

Finally, to prevent the risk of unconscious bias affecting the selection of potential respondents, a list of relevant and topic-related criteria has been defined. Meaning this set of criteria has been designed to include people from the maritime domain. Although not limiting them by their occupational roles in the industry, or their organization. Thus including, for instance, students, trainees/interns, as well as all employees regardless of their positions in the organizational hierarchy. Similarly, including both employees working on-land, and/or on-board. Moreover, as for the importance of the respondents' backgrounds, other characteristics that have been considered are further mentioned below (See **II. Sampling bias**).

II. Sampling bias

Generally, there is a type of selection bias that is vital to keep in mind when carrying out research. That is, namely, the so-called *sampling bias* which becomes a relevant factor usually when research is carried out with interviewees or survey respondents. To be specific, the definition of sampling bias is simply whenever a certain type/group of individuals in a population are *"systematically more likely to be selected in a sample"*, as opposed to certain other groups of people *(Bhandari, 2020)*. For this example and in the case of this study, the relevant type of sampling bias that has been identified is primarily the probability of the following group types to be more likely to be selected as respondents.

Firstly, it is expected that the majority of respondents will most likely be of Swedish nationality/Nordic ethnicity - including people of other origins, though of Swedish nationalities. Thus, imposing the risk of potentially including response data that portrays the views, perceptions, and experiences of respondents from different cultures or international backgrounds relatively insufficiently. The potential source of this error is believed to be partially caused by the backgrounds of the authors themselves, who are based in Gothenburg, Sweden. As a consequence of this, it is possible that their personal social networks, knowledge, and awareness act as a constraint in their primary abilities to invite people from other countries/continents than their own. However, to counter this, equal efforts have been made to reach out to respondents within Sweden/Scandinavia, as for reaching out to companies in other countries/continents. On the other hand, it is expected that these efforts will most likely still not even out the imbalance. For instance, because not every individual that has been invited to partake in the survey, will actually do so.

Similarly, to the aforementioned error, given that the maritime domain has historically been and still is a male-dominated industry *(ICS & BIMCO, 2023)*, it is expected that the balance between the respondent genders will very likely not be even near equal. Unfortunately, the possibilities of a selectively gender-balanced outreach to respondents has been even more constrained to fulfill. Primarily because the shares of each certain gender amongst employees at each company invited to take part - is beyond the authors' control. Hence the reason for this being addressed, though accepted. Because it does after all reflect the reality of this aspect in this industry as it is at the time of this study.

Finally, another sampling bias that could potentially impact the collected data is the following. Whenever companies are contacted in attempts to share the questionnaire amongst their employees, it could be far more difficult to reach individual employees than coming in contact with leaders and similar superiors instead. Therefore, it should be expected that if such leaders do not forward the invitation to their employees but partake in it themselves - it will potentially skew the perception that the collected data illustrates. Again, given that this is a difficult dilemma to mitigate with respect to the capacities of the authors, efforts have still been made to prevent this. Primarily, by attempting to not only contact companies, or being satisfied when coming in contact with leaders only. Instead, continuing to spread the invitation to individuals, as well as within personal social networks, in addition to social media platforms such as LinkedIn.

4. RESULTS

The collected survey data was analyzed with the help of statistical data-analysis tools in Microsoft Excel and SPSS. This was done in order to evaluate the answers, run them through analysis procedures and testing correlation patterns between Psychological Safety, Group Development, respectively Safety Culture.

4.1 DEMOGRAPHICS

In the following subsections, the collected demographic data and its analysis results will be presented. Firstly, however, the number of returned surveys from respondents was limited by the fact that this study was conducted under a limited time span. As a result, the final number that was deemed to be sufficiently satisfying by the time of the deadline was at the total of 75 returned surveys. Primarily, because it was thought to be a sufficiently large number to draw statistical results from, as well as an even number to divide into three, if necessary. In other words, once time was due and this number was reached, the authors decided to close the survey. At this point, the data preparation and processing phase was initiated, therefore no further answers would be accepted or included.

Whilst reaching out to potential respondents, the authors used their network of fellow students, their previous working experiences, and social platforms such as LinkedIn. Furthermore, the authors made their utmost efforts and spent an extensive amount of time, energy, and dedication to get in contact with potential respondents of relevance, such as from various ports around Sweden. As a result, the ports of Gothenburg, Uddevalla, Visby, and Ystad all distributed the survey to their workforces. Moreover, the questionnaire managed to reach relevant respondents as far as in Africa.

I. Age, Gender & Nationality

The respondents' ages showed the following percentages as categorized in the respective age-intervals of 16-19 (1%); 20-29 (33%); 30-39 (39%); 40-49 (13%); 50-59 (9%); lastly 60-69 which accounted for 4% and 0% for +70 (See **Fig. 2.**).

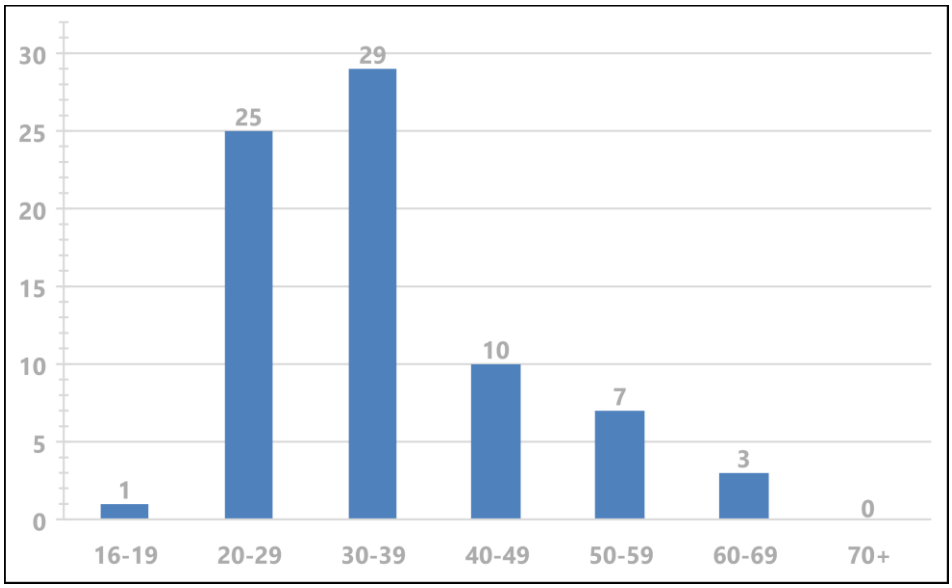

Fig. 2. ***Age-Group Chart*** *- Visualization of the number of respondents in each age-group interval.*

Amongst the respondents, the shares for each of the gender-groups consisted of 63% representing males, 36% for females, respectively 1% for non-binary, and 0% for the alternative of 'Other' (See **Table 3**.).

Table 3. *Genders*		
Gender-group	**No. Resp.**	**Percentage**
Male	*47*	*63%*
Female	*27*	*36%*
Non-binary	*1*	*1%*
Other	*0*	*0%*

The majority of respondents (79%) viewed themselves as not being a part of a minority that might put them at risk of being exposed to any kind of discrimination related to them being a minority. On the other hand, 13% confirmed that they are part of a minority, whereas the rest (8%) expressed that they might be part of such a minority.

Sweden was by far the most common nationality by 80%, Africa represented 5,3%, followed by Scandinavia and the Middle-East with 4,7% each, Asia at 2,7%, whilst Europe and those who preferred to not share accounted for 1,3% each. However, as presented in **Table 4.**, the number of respondents for Scandinavia and the Middle-East are counted as 3,5. The reason for this is because some respondents checked boxes for two different nationalities/origins,

therefore their contribution was evenly divided between each of two selected nationalities. This applies to a total of eight individuals, who were all of Swedish nationality, thus adding four to the total number of Swedes.

Table 4. *Nationalities*		
Nationality	**No. Resp.**	**Percentage**
Sweden	*(56)* 60*	*80%*
Africa	*4*	*5,3%*
Scandinavia	*(1)* 3,5*	*4,7%*
Middle-East	*(2)* 3,5*	*4,7%*
Asia	*2*	*2,7%*
Europe	*(0)* 1*	*1,3%*
Prefer to not share	*1*	*1,3%*
**Values in parenthesis represent the original number of individuals that claim a single nationality/origin, excluding the number of individuals with dual nationalities/origins.*		

Amongst these eight, three were Middle-Easterners (adding 1,5 to the total number of Middle-Easterners); three from Scandinavia (adding 1,5 to the total number of Scandinavians); and two from Europe (adding 1 to the original number of zero Europeans). Hence the values in parentheses as shown in the table represent the original number of respondents, excluding the added numbers.

II. Professional Experience, Occupational Roles & Teamwork

In regard to experience, the respondents with 1 year or less accounted for 16%, 2-5 years were 25,3%, 5-10 (22,7%), 11-15 (20%), 16-20 (5,3%), 20-30 (6,7%), and lastly 30 years or more were 4% of the total respondents. In addition, on-land crew was the most represented profession at 63% followed by 22% within the on-board segment. 7,5% were students and lastly 5% preferred to not share their profession (See **Table 5**).

Table 5. *Professional Experience & Roles*							
Professions & Occupational Roles							
ROLES >	***Crew (On-land)***		***Crew (On-board)***		***Students***	***N/A***	
No. Resp.	*47*		*12,5*		*16,5*	*2*	
Percentage	*63%*		*22%*		*7,5%*	*5%*	
Professional Experience							
YEARS OF EXPERIENCE >	**≤ 1**	**2-5**	**5-10**	**11-15**	**16-20**	**20-30**	**30+**
No. Resp.	*12*	*19*	*17*	*15*	*4*	*5*	*3*
Percentage	*16,0%*	*25,3%*	*22,7%*	*20,0%*	*5,3%*	*6,7%*	*4,0%*
**Values with decimals include divided values from respondents with multiple roles.*							

In general, 56% of the respondents worked more or less only in teams, whilst 22% did it 3-5 times a week, 17% 1-2 times a week and 3% did it 1-3 every month. Lastly, 3% had some other sort of team composition (See **Table 6.**).

Table 6. *Teamwork*						
Frequency of Teamwork Opportunities						
TEAMWORK FREQUENCY >	**Only team-work (+/-)**		**1-2/ week**	**3-5/ week**	**1-3/ month**	**Other**
No. Resp.	*42*		*12,5*	*16,5*	*2*	*2*
Percentage	*56%*		*17%*	*22%*	*3%*	*3%*
Group/Team Sizes						
TEAM SIZES >	**3-5**	**6-8**	**9-12**	**13-20**	**20-30**	**Other**
No. Resp.	*17*	*14,5**	*19,5**	*15*	*7*	*2*
Percentage	*23%*	*19%*	*26%*	*20%*	*9%*	*3%*
**Values with decimals include divided values from respondents with multiple roles.*						

4.2 CORRELATION

As can be seen in **Table 7.**, for the correlation between Psychological Safety and Group Development; the analysis returned the results showing a Multiple-R_{GD} = 0,852, and a value of R^2_{GD} = 0,725. Thus, indicating a high correlation between the two. Additionally, a *regression analysis was made which resulted in a P-value for GD of 3,061E-22, i.e., greatly lower than the reference line of $P \leq 0.05$. *(*See **The tables** below show the returned statistics summary from the regression analysis that was carried out for each of the two variables GD and SC. For the GD regression statistics, see **Table 9.** and for the SC regression statistics, see **Table 10**.

Note I.)

(Units joined by either $_{GD}$ or $_{SC}$ in subscript – Denote the specific aspect which they are referring to; Group Development (GD), respectively Safety Culture (SC)).

	Table 7. *Correlation Statistics Summary*	
	Group Development	**Safety Culture**
R^2	*0,725*	*0,716*
Multiple-R	*0,852*	*0,846*
P-Value	*3,061E-22*	*1,205E-21*

Correspondingly, the analysis for Safety Culture showed nearly identical results for its

correlation with Psychological Safety. To be specific, the Multiple-R_{SC} = 0,846, whilst R^2_{SC} = 0,716. In other words, indicating almost a correlation as high as the correlation between GD and PS. Again, a *regression analysis was made which resulted in a P-value for SC of 1,205E-21, i.e., greatly lower than the reference line of *P≤0.05*. *(See*

Note I)

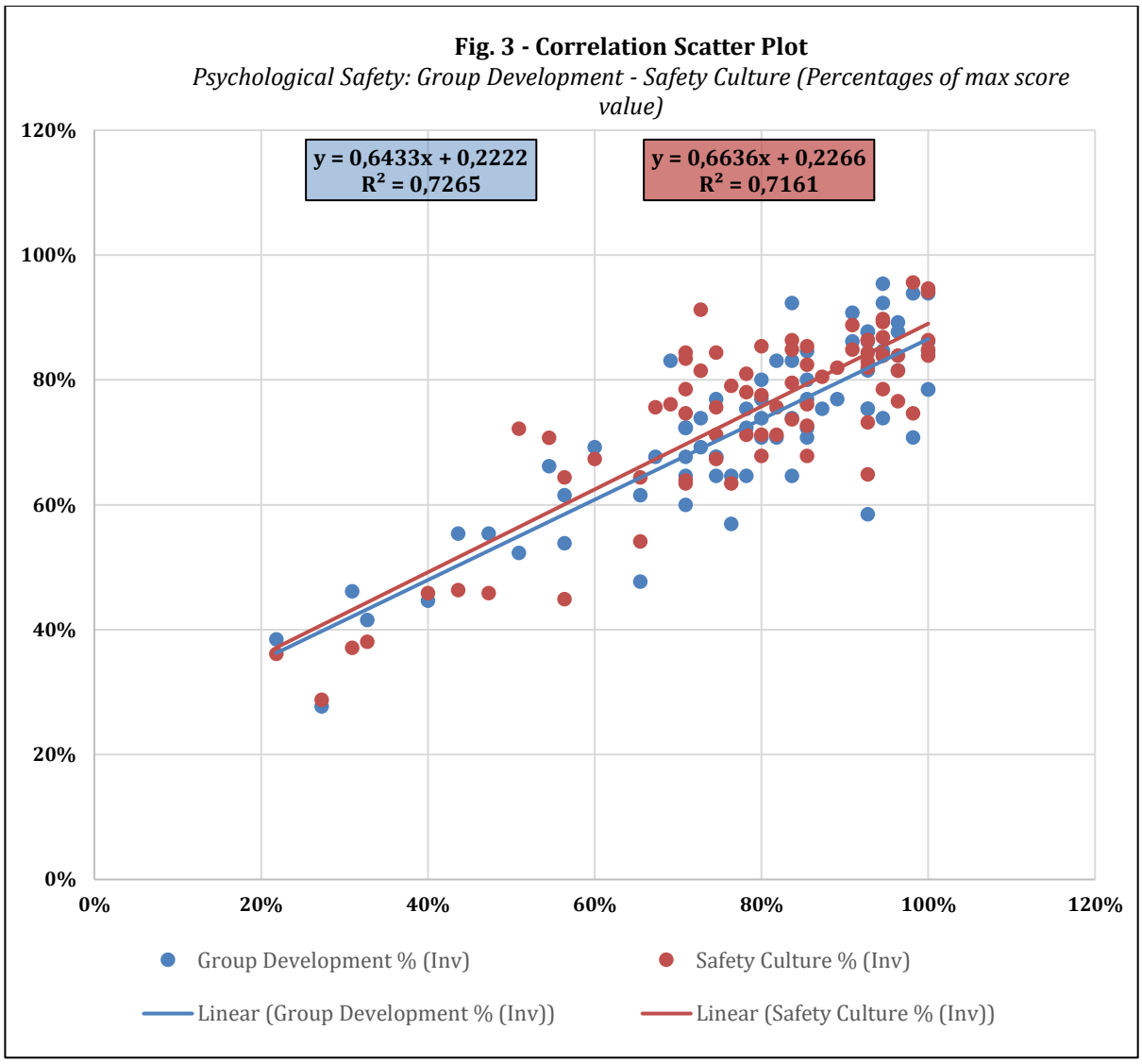

Fig. 3. ***Scatter Plot*** *– Psychological Safety: Group Development – Safety Culture (Percentages of max score values)*

Moreover, the correlation between PS and GD, respectively PS and SC, is visualized above (See **Fig. 3**) as a correlation scatter plot. The scatter plot marks are based on the percentages that have been achieved through dividing the sum of returned scores from each respondent by the maximum number of scores. (***Attachment 6. P.1-2(2)***). Which for PS was 55, GDQs (65), respectively for SCOPE-PC (205). In turn, the scatter plot has been created by comparing the achieved percentages from these calculations, with the corresponding percentages of the Psychological Safety items.

4.2.1 Pearson's Correlation Analysis (SPSS)

The table below shows the returned statistics summary from the correlation analysis that was carried out with SPSS for PS, GD, and SC simultaneously. (See **Table 8.**)

Table 8. *Correlations between PS-GD-SC (SPSS)*

		PS	GD	SC
PS	***Pearson's Correlation***	1	.855**	.850**
	Sig. (2-tailed)		<.001	<.001
	N	75	75	75
GD	***Pearson's Correlation***	.855**	1	.839**
	Sig. (2-tailed)	<.001		<.001
	N	75	75	75
SC	***Pearson's Correlation***	.850**	.839**	1
	Sig. (2-tailed)	<.001	<.001	
	N	75	75	75

. Correlation is significant at the 0.01 level (2-tailed)

4.2.2 Regression Analysis

The tables below show the returned statistics summary from the regression analysis that was carried out for each of the two variables GD and SC. For the GD regression statistics, see **Table 9.** and for the SC regression statistics, see **Table 10**.

Note I - The regression analysis is not a part of this study, although it has been carried out in order to achieve the P-values *only*.

Table 9. *GD - Regression Statistics Summary*

ANOVA	Coefficient	St. Error	t-Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,038	0,06	-0,628	0,532	-0,157	0,082	-0,157	0,082
GD	1,129	0,081	13,925	3,06E-22	0,968	1,291	0,968	1,291

	df	SS	MS	F	Significance F
Regression	1	1,847	1,847	193,895	3,06E-22
Residual	73	0,696	0,01		
Total	74	2,543			

Multiple-R	0,852
R-Square	0,726
Standard Error	0,098
Adjusted R-Square	0,723

Table 10. *SC - Regression Statistics Summary*

ANOVA	Coefficient	St. Error	t-Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,023	0,060	-0,381	0,704	-0,143	0,097	-0,143	0,097
SC	1,079	0,080	13,569	1,21E-21	0,921	1,238	0,921	1,238

	df	SS	MS	F	Significance F
Regression	1	1,821	1,821	184,107	1,21E-21
Residual	73	0,722	0,01		
Total	74	2,543			

Multiple-R	0,846
R-Square	0,716
Standard Error	0,712
Adjusted R-Square	0,099

*(See Residual plots in Appendices - **Attachment 5. P1(1)**)*

5. DISCUSSION OF RESULTS

Is the need for a strong leader important? Is it not possible for a group to be successful without a leader? In today's society there are several interpretations of self-organizing teams. Nonetheless, the idea of a leader is perhaps not the ideal that is thought of. Despite this, the role of someone taking charge could be profitable, however this is, according to Wheelan *(2005)*, dependent on what development stage the group is in. In regard to this research and the lessons taught, the authors would like to argue that leadership depends on the given situation. Meaning, that certain types of leadership are required at specific occasions, based on the ruling circumstances, and urgencies. A group of people is dependent on far more than having just a strong leader. Nonetheless, a strong leader could very well be beneficial at times. On the other hand, so could also the courageous leader that expresses and facilitates vulnerability. This is by Wheelan *(2005)* defined as situational leadership.

As for the analysis of results, it is important to keep in mind that the results solely represent the experiences of the sample group of 75 respondents. However, the results showed that there were more respondents that worked on land as opposed to on-board. This could potentially be the result of the authors' social networks and backgrounds, as their education and professions are based on land. Correspondingly, efforts were made to reach out to people who had occupational roles on-board. However, this group seemed to be more difficult to reach, again, potentially due to the aforementioned circumstances and factors. Although this study was designed to be inclusive for those that represent the maritime industry as a whole, it was never intended to investigate only the ones stationed on-board. Nevertheless, the authors do acknowledge the fact that this is something that could have been done more sufficiently and is worth noting. In contrast, the survey returned the questionnaire from women that represented 36% of the population. This result is quite substantial, as opposed to the reality of the maritime industry. Because women in the maritime industry only account for a very small percentage in reality. Furthermore, the results indicate and advocate for a strong correlation between Psychological Safety, Group Development and Safety Culture. The results of the correlation analysis strengthen the authors statements once analyzing the results. That, in addition the P-values extracted from the regression analysis.

The results from the statistical analysis indicate that the correlation is high. Since multiple-R is equal to approximately 0.85 for both the correlation between PS and GD, as well as for PS and SC. Furthermore, the low P-value (below 0.05) is an indication that the null hypothesis can be rejected. For instance, the null hypothesis for this research would have been that *"There is no correlation between the PS, GD and SC".* However, the P-value indicates the probability that can reject the null hypothesis and evoke that the alternative hypothesis is in fact correct, meaning that there is a correlation. The results are clearly stated in this report that they actually do correlate, meaning that there is a reason for the authors to suggest that - A group, team, company, or organization is benefitting from working on the three aspects in order to create a better and more safe working environment. A group with a higher level of psychological safety will most likely score a higher level of group development and thereby also a higher level of safety culture.

Nonetheless, it is important to note that this is a sample of the entire population, therefore it is hard to predict the outcome if more respondents were studied. Although the correlation is significant, it is disturbing that the maritime industry is reflecting the results that it does. In fact, the highs are high, the lows are low. In accordance with Jonglertmontree, et. al. *(2022),* mental health on board is something that is a problem within the maritime industry. Even though this research does not investigate the on-board perspective as such, conclusions can be drawn that the industry is also lacking in its psychological safety on many occasions. There is no secret that people from underdeveloped countries are taken advantage of within the maritime industry, being paid less and often performing dangerous work while lacking safety equipment or precautions. Even though, yet again, this research does not investigate the differences between sex, gender, ethnicity, nationality, etc., the results show that 80% were Swedish natives. The question the authors conclude is if the psychological safety is this low at times, would it be safe to assume that for foreign countries such as the worker from the Philippines (who are overrepresented amongst workers that are taken advantage of in the maritime industry), would the results be even worse? Well, it is impossible to state a guaranteed answer. However, and most likely - yes, that would be the case.

The authors were very clear with their instructions once sending out the survey, that it would benefit the research if the questionnaire was distributed throughout the entire organization and across all levels. Nonetheless, at times, the survey was only received by and filled in by the upper management levels - who said they would take their time to fill out the questionnaire with great care. Nonetheless, one could only speculate what it would look like if more people were involved, of different nationalities, or those with different occupational positions and how their psychological safety for instance would have been perceptualized.

Both Wheelan *(2005)* and Edmondson *(2018)* acknowledge the fact that Psychological Safety is important. Wheelan mentioned the fact in her work, that Psychological Safety is a steppingstone in the process of facilitating a more mature Group Development stage and thereby also improved group dynamics. Simultaneously, Edmondson argues that Psychological Safety is not enough, it actually needs commitment to excellence in order to be within the zone of high performance. Argyris *(1991)* also mentions that individuals who do not make any mistakes, do not learn from them and once becoming defensive, they are stuck in the single-loop of learning. Furthermore, Argyris *(1991)* expresses that learning is about correcting and detecting errors. This statement is supported by Sidney Dekker *(2014)* as he argues that Safety Culture and its work should be created by the ones performing the daily tasks of safety related work - and not by upper management putting constraints on unsafe work.

5.1 Discussion of Methods and Delimitations

First of all, in order to utilize a composition of methods that would provide appropriate levels of suitability and accuracy in gathered data when evaluating Psychological Safety - a multi-functional method could have been used. This has been recommended by the peer of the discussion around Psychological Safety, Edmondson. The ideal approach to carrying out such

research would have been to not only carry out interviews and questionnaires, but also conduct observations on-site as well as interviewing employees across all organizational levels, stakeholders, and clients. That would generate both qualitative and quantitative data, as well as depict the aspects more precisely. Especially, in the case of analyzing Safety Culture. *(CER, 2022).* Although, this study does not focus on analyzing the aspects in depth within themselves, but rather reviewing the correlation between them. Moreover, since this has been conducted as part of a master thesis, it has been inevitable to avoid the pressure of time. Hence the authors' decision to focus on gathering data through surveys. This would make it possible to collect large datasets, with the least amount of time away from the project itself, as well as increasing the potential reach to a much wider and global range of respondents.

However, despite deciding that surveys were the most appropriate method to use shortcomings, limitations, constraints, and bottlenecks of surveys have been identified. First and foremost, there is no guarantee of receiving answers, as the best one can do is to distribute the survey and ask people to partake. Nonetheless, being difficult at times. I.e., excessively time-consuming to not only design or construct, but also to distribute.

Whilst preparing the questionnaire, it was clear to the authors that it needed to be appropriate from several different aspects. For instance, the items had to balance out two key factors. The first one being that the survey had to have a high resolution, meaning it had to provide data that would live up to a high level of detail. This was needed in order to collect as nuanced answers as practically possible. On the other hand, the survey and its items could not be too difficult, and they had to be compact, in order to not lose the interest or accuracy of the respondents' inputs. As in such cases, the respondents' fatigue or loss of interest could potentially cause them to make random inputs as responses by ticking any of the response options.

However, the authors tried to mitigate this by designing an easy and comprehensive survey. The questionnaire had visible graphics attached that were somewhat nicer to look at, with simple, yet important instructions. Furthermore, the survey was not sent directly to people in organizations within the industry. Instead, the potential respondents were contacted and informed about the study. Thereby inviting them to be a part of the survey. This was performed in order to inform the respondents of the cause of the project, background, purpose and explain the integrity aspects such as anonymous participation. In addition, this would aid the prevention of uninterested individuals participating. Or especially, those who were irrelevant subjects in respect to the selection criteria and requirements of participation. Instead, the approach would improve the likelihood of coming up as an opportunity to people who could not only be relevant subjects, but also genuinely interested in the study to answer.

Despite being aware of and understanding these shortcomings and difficulties, the chosen method was still evaluated as the most suitable one to conduct the study by, given the circumstances and limits such as time.

The use of the questionnaires was a different decision that had to be made. First and foremost, the GDQs, SCOPE-PC, and Psychological Safety Questionnaire were all shorter versions of

their original counterparts. Nonetheless, the SCOPE-PC is, as stated in this thesis, an edited version of SCOPE which, in turn, is a modified version of the original *(HSOPS)*. At first, it was not clear to the authors which one to use, hence they all served different purposes. Nonetheless, the SCOPE-PC was determined to be the most useful, regardless of its modifications. In fact, SCOPE-PC has been verified and peer-reviewed, meaning that the questionnaire is validated to use. In addition, the simplicity of this tool and the fact that it has been edited to patient care, meaning it is for people who are at risk and people handling them are under stress. These examples made the decision easier for the authors to select this tool in order to investigate Safety Culture within the maritime industry. On the other hand, whilst reviewing the decision to include items for the Psychological Safety aspect that were developed further from Edmondson's original items – the decision was considered and reflected upon from a critical standpoint. Especially in regard to the included items not being exactly those that Edmondson has defined. Despite this, however, these were compared and realized to be sufficiently similar to the original ones after all. In addition to the fact that these questions were appropriately relevant to the topic of this study, the decision was made to proceed with these items.

Furthermore, it was crucial for this study to invert the scores, if this adjustment had not been made, the correlation and results would not nearly be the same. The authors did in fact calculate the scores as they were, without inverting them. Even though it is not relevant for this study to include, the differences were astonishing, and no real correlation could be seen. Therefore, the authors are keen to discuss this manner and address the necessity of inverting scores. Especially, if the questionnaire is not taking the inversion into consideration in the first place. To be specific, there were concerns regarding whether the creators of the questionnaires had accounted for the potential consequences in analysis results that such negatively worded items might entail.

Note II **-** The authors reserved the right to decide whether the analysis of the demographic data would be carried out or not upon completing the main analysis of results. In other words, the possibility of conducting this part of analysis would be entirely dependent on the availability of time. Afterall, the main purpose and priority of this study was to use the dedicated time to primarily conduct the correlation analysis first.

5.1.1 Reliability & Validity

The reliability aspect critically reviews the research and the likeliness of its authenticity to be relevant enough to be studied, hence deciding whether the answer to the research question is valid or not. To be specific, it also addresses the methods used, as well as the research approach in order to determine whether the results were reliable or not. Efforts have been made in this study in order to strengthen the reliability of the research. First and foremost, the methods included already validated and peer-reviewed questionnaires, which sets the foundation of reliability. In addition, efforts were made to distribute the survey to the most relevant individuals and organizations that represent the industry.

Consequently, validity was another important aspect of this research that was continuously accounted for. Since the study was carried out through a quantitative approach - it was of extreme importance to the authors to guarantee its authenticity by using validated tools. Furthermore, the authors have made their utmost efforts to act according to the core principles of being as transparent as practically possible. Thus, welcoming criticism as a part of the learning objective. The results of these principles led to keeping a routine of frequent meetings on a weekly basis, in order to discuss the ways of working and seeking guidance throughout every step of the entire study. By this way of working, the authors feel safe to state that this has at least resulted in a further improved level of reliability and validity in this study. Moreover, this was accompanied by, though not limited to, the following.

Mainly, the purpose of the weekly meetings was to report progress, discuss the decisions made, and plan for the next step with the supervisor. In addition, as these topics are broad, the authors and the supervisor had planned to study these three aspects well in advance. Correspondingly, the processing of collected GDQs data was discussed with the Head of research at GDQ Associates of Sweden. This turned out to guide and help the authors to analyze the data appropriately, as well as to understand the results. In other respects, the data that was analyzed with the help of statistical tools in excel, was also reviewed, and discussed with Anders Isaksson - who is an Excel-expert. Correspondingly, a meeting was held with Martin Schreuder who is an instructor of statistics at Chalmers University. Yet again, in order to confirm that data had been appropriately analyzed and that the results were correctly understood.

Lastly, the authors have been clear that no research is perfect and nor is this one. Nonetheless, every aspect that had its smallest level of uncertainty was documented and invoked, meaning that nothing was progressed before understanding certain shortcomings and analyzing the possible error margins of proceeding with such deficiency. Nevertheless, the authors of this study guarantee that every possible effort of their understanding was put into this research in regard to maintaining its reliability and validity.

7. CONCLUSION

Given that the correlation is significant between the three aspects, one could suggest that Psychological Safety does in fact create the foundation for better Group Development and a higher quality of Safety Culture. In other words, the authors´ hypothesis can be accepted. Furthermore, the methods used were deemed to be appropriate and applicable for this study and its topic areas. Nonetheless, as mentioned in **5.1 Discussion of Methods and Delimitations**, there are certain shortcomings - however, no method is perfect. On the other hand, the methods turned out to be productive in regard to the circumstances in which this study was carried out, such as the limitations of available time.

By definition, Psychological Safety does neither mean that people should be nice, not confront each other, nor does it suggest not challenging one another. On the contrary, it is about facilitating the freedom and rights to question things, to express and exchange knowledge, experience, and expertise within groups. The previously presented incidents were all scenarios in which Psychological Safety, Group Development, and Safety Culture could have been involved. For instance, what would have happened with *Costa Concordia* if the crew decided that the maritime salute was a high risk and therefore denied the captain his wish? As for the *Titan II Missile*, what would have happened if the airman had directly alerted the control room and admitted his mistake? Or what would the fate of the other power plant have been in Fukushima - which actually managed significantly better than Daichi - if the plant manager did not act the way he did? Lastly, how would the pandemic have been managed if Sanna Marin, Angela Merkel and Jacinda Ardern had not acted with courageous leadership under the circumstances of uncertainty with the lives of thousands at stake?

This research cannot answer the above-mentioned questions with confidence or with certainty that the incidents would not have occurred if there was a higher level of psychological safety, group development, or safety culture. However, the results of this research advocate for alternative practices of reinforcing the prevention of such avoidable disasters from occurring in the future. Amongst which, one way to start is potentially to work towards facilitating improved Psychological Safety, Group Development, and in turn, Safety Culture.

7.1 Recommendations For Further Research

For future and/or further research the authors have identified a number of details as recommendations that might be interesting for the academic community to either study or be attentive of when conducting research.

First and foremost, the authors of this study recommend the academic community to consider reiterating this study and generate additional data to this research area. Although, the main advice is rather to consider comparing the data samples from populations of different continents/countries instead. In other words, this would study how Psychological Safety and its correlation to GD and SC differs between organizations and people that reside from different nationalities or cultures. Not to mention, studying how the nature of Psychological Safety amongst those geographical areas might not only affect team development - but also be correlated to and potentially affected by the typical organizational safety cultures in the given areas. Additionally, this could generate data that can spark a debate about the effects that socio-economic factors might include for any potential divergences.

As for advice and take-aways, the use of a combination of methods could be beneficial to utilize as a data-collection approach when studying Safety Culture. That is, in order to achieve an improved accuracy and precision in the perception of Safety Culture within an organization. This is advice that other researchers advocate for, together with the authors of this study. However, the main and most vital component for success in any research project is, above all, to make sufficient efforts to prevent time from becoming an obstacle or limitation.

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9. APPENDICES

Attachment 1 – Tables *of* Demographic Questionnaire Items/Response Options *(1 Page)*

ITEMS	Demographic Items of Questionnaire
1	What is your age?
2	What gender(s) do you identify as?
3	What is your ethnicity/nationality?
4	Do you identify as a minority that could make you vulnerable to discrimination/exclusion? (Race/ethnicity, religion, sexual orientation, medical/physical conditions)
5	How many years of work experience do you have within your current field?
6	What is your profession/role?
7	How many individuals are there in your team(s) in most cases?
8	Finally, how often do you work in teams?

ITEMS	Response Options for each item								
	a	***b***	***c***	***d***	***e***	***f***	***g***		
1	*16-19*	*20-29*	*30-39*	*40-49*	*50-59*	*60-69*	*70+*		
	a	***b***	***c***	***d***					
*2**	*Males*	*Females*	*Non-Binary*	*Other*					
	a	***b***	***c***	***d***	***e***	***f***	***g***	***h***	***i***
*3**	*Sweden*	*Scandinavia*	*Africa*	*Middle East*	*Europe*	*Asia*	*Oceania*	*N. America*	*S. America*
	a	***b***	***c***						
*4**	*Yes*	*No*	*Maybe*						
	a	***b***	***c***	***d***	***e***	***f***	***g***		
5	*≤ 1 yr*	*2-5 yrs*	*5-10 yrs*	*11-15 yrs*	*16-20 yrs*	*20-30 yrs*	*≥ 30 yrs*		
	a	***b***	***c***	***d***					
*6**	*Crew (On-land)*	*Crew (On-board)*	*Students*	*Voluntary Search and Rescue*					
	a	***b***	***c***	***d***	***e***				
*7**	*3-5*	*6-8*	*9-12*	*13-20*	*20-30*				
	a	***b***	***c***	***d***					
*8**	*My work (more or less) only consists of teamwork.*	*1-2/week*	*3-5/week*	*1-3/month*					
****Items that contained either or both alternative response options such as 'Other' and/or 'Prefer to not share'***									

Attachment 2 *– GDQs Questionnaire items (1 Page)*

GDQ SCALES	Original Item Code	GDQs Questionnaire Items
I	*1**	*Individuals seem to go along with whatever the group suggests*
	*5**	*When members talk, they address the same few people*
	*9**	*Members seem very concerned about feeling safe in the group*
	*13**	*People seem hesitant to express a different point of view*
II	*2**	*People express frustration with how this group is functioning*
	*6**	*The group seems split over a number of issues*
	*10**	*There is quite a bit of tension in the group at this time*
III	*3*	*Trust is high in this group*
	7	*Members are satisfied with the group's progress*
	11	*We can rely on each other; we work as a team*
IV	*4*	*The group acts on its decisions*
	8	*The group encourages innovation and creativity*
	12	*Commitment to the group's task is high in this group*
***Items that have been identified as negatively worded, thus had their score ratings inverted.**		

Attachment 3 *– Table of SCOPE-PC items compared to questionnaire items (1 Page)*

Dimension	Original Item Code	Safety Culture Questionnaire Items
1	C1	We are given feedback about changes put into place based on event reports
	C2	Staff will freely speak up if they see something that may negatively affect safety
	C3	We are informed about errors that happen in this line of work
	C4	Staff feel free to question the decisions or actions of those with more authority
	C5	We discuss ways to prevent errors from happening again
	C6N	Staff are afraid to ask questions when something does not seem right
	C7	Professionals discuss errors that occured, with each other
	C8	Professionals discuss errors that occured, with other disciplines
	C9	We are given personal feedback about our own reports
	B4N	My supervisor/manager overlooks safety problems that occur over and over
2	F1N	Problems often occur in the exchange of information across disciplines
	F2N	The fact that problems are managed by different professionals is causing problems
	F3N	Disciplines that we co work with do not coordinate well with each other
	F4	There is a good exchange of information between professionals
	F5	There is a good exchange of information between supporting staff
	F6	Disciplines/departments work together well to achieve as high safety as practically possible
	F7N	Things "fall between the cracks" during cases of shift change and/or changes of staff/crew
	F8N	Important safety-related information is often lost because problems are managed by different professionals
3	A5N	It is just by chance that more serious mistakes don't happen around here
	A7N	We use more agency/temporary staff than what is best for practical safety
	A8N	Staff feel like their mistakes are held against them
	A10N	In this profession we work longer hours than what is best out of safety perspectives
	A12N	When an event is reported, it feels like the person is being written up, instead of the problem
	A13N	We work in "crisis mode" trying to do too much, too quickly
	A14N	Staff worry that mistakes they make are kept in their personnel file
	B3N	Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts
4	B1	My supervisor/manager says a good word when he/she sees a job done according to established safety procedures
	B2	My supervisor/manager seriously considers staff suggestions for improving safety
	B6	The actions of my supervisor/manager show that safety is top priority
	B7N	My supervisor/manager seems interested in safety only after an adverse event happens
5	A1	People support one another.
	A2	We have enough staff to handle the workload
	A3	When a lot of objectives needs to be done quickly, we work together as a team to get the job done
	A4	People treat each other with respect
	A11	When someone gets really busy, others help out
6	D2	When a mistake is made, but is caught and corrected before affecting safety, how often is this reported?
	D3	When a mistake is made, but has no potential to cause any harm, how often is this reported?
	D4	When a mistake is made that could cause potential harm, but does not, how often is this reported?
7	A6	We are actively doing things to improve safety
	A9	Mistakes have led to positive changes here
	A16	Our procedures and systems are good at preventing errors from happening

Item codes marked RED/end with the letter 'n' are negatively worded items.

Attachment 4 *– Table of Psychological Safety Questionnaire items (1 Page)*

Original Item Code	Psychological Safety Questionnaire Items
1	*In this team, it is easy to discuss difficult issues and problems*
2	*I won't receive retaliation or criticism if I admit to an error or mistake.*
3	*It is easy to ask a member of this team for help.*
4	*I feel safe offering new ideas, even if they aren't fully formed plans.*
5	*In this team, people are accepted for being different.*
6	*My teammates welcome my ideas and give them time and attention.*
7	*Members of this team could easily describe the value of others' contributions.*
8	*In this team, people talk about mistakes and ways to improve and learn from them.*
9	*We take time to find new ways to improve our team's work processes.*
10	*Members of this team raise concerns they have about team plans or decisions.*
11	*We try to discover our underlying assumptions and seek counterarguments about issues under discussion.*

Attachment 5 *– Figures of Group Development (Inv) & Safety Culture (Inv) Residual plots (1 Page)*

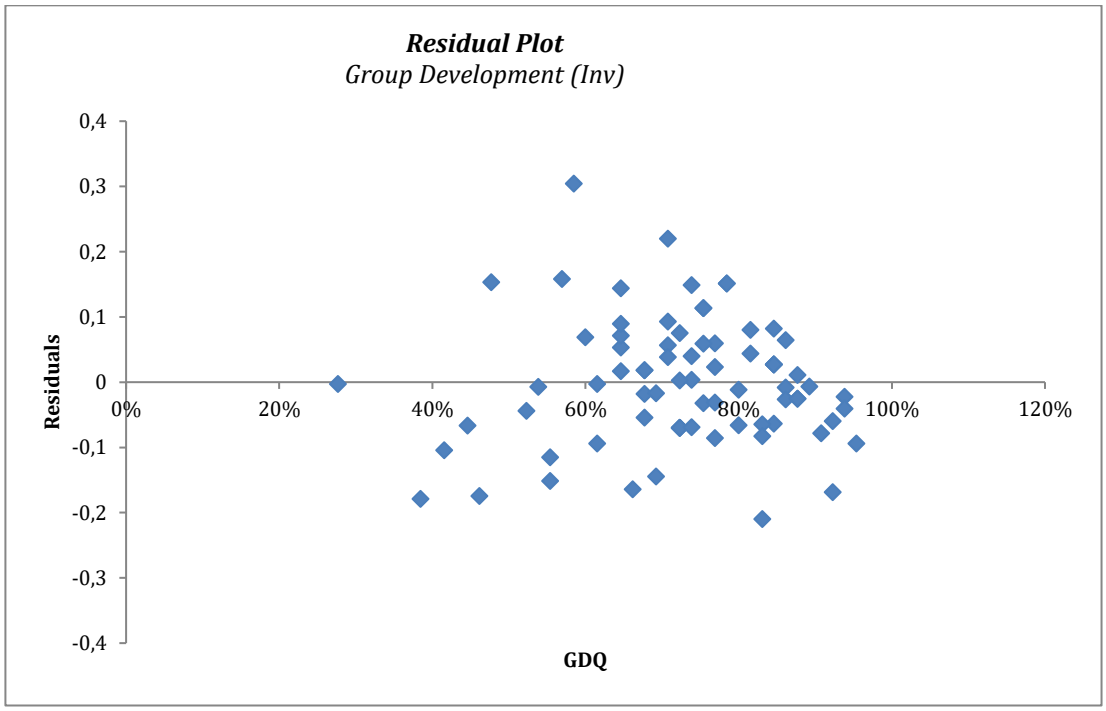

Fig. 4. *Group Development (Inv) Residual Plot (Above)*

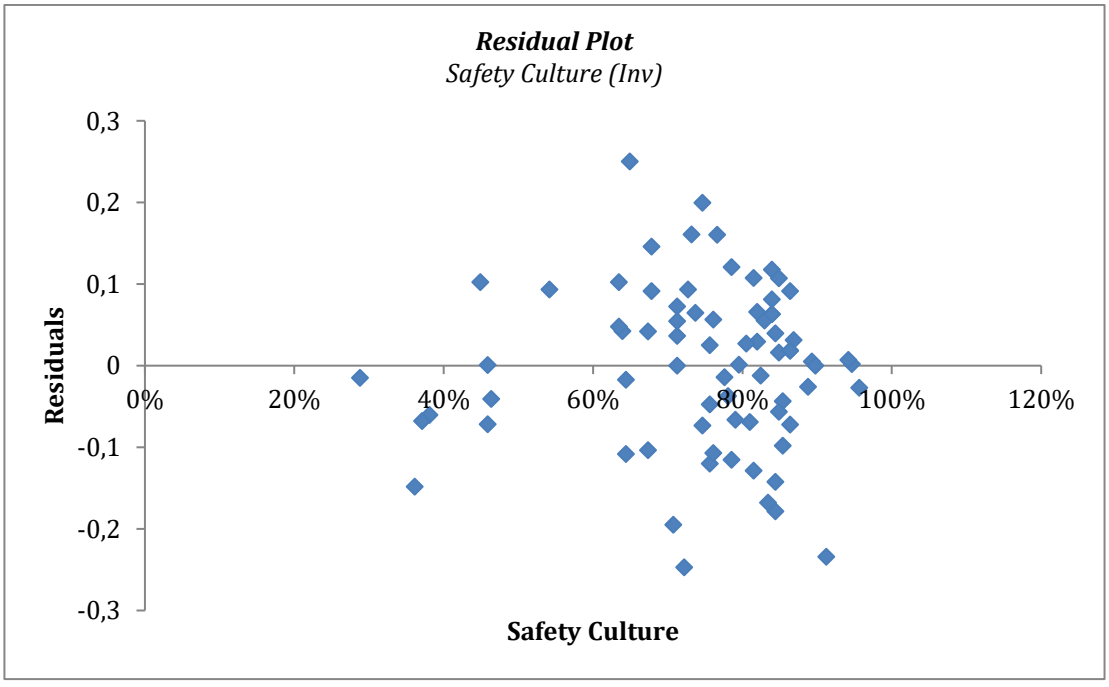

Fig. 5. *Safety Culture (Inv) Residual Plot*

Attachment 6 *– Table of respondent scores as percentages of maximum score values per aspect - PS/GD/SC (2 Pages)*

Resp.	Psychological Safety	Group Development	Safety Culture
1	65%	62%	64%
2	75%	65%	76%
3	96%	82%	77%
4	60%	69%	67%
5	76%	65%	79%
6	78%	65%	71%
7	95%	85%	87%
8	85%	72%	85%
9	89%	77%	82%
10	71%	65%	64%
11	71%	68%	75%
12	93%	88%	86%
13	93%	58%	73%
14	95%	74%	79%
15	56%	54%	64%
16	100%	86%	86%
17	84%	74%	74%
18	85%	71%	73%
19	73%	69%	91%
20	100%	78%	95%
21	80%	74%	68%
22	93%	75%	84%
23	98%	71%	75%
24	44%	55%	46%
25	85%	85%	68%
26	33%	42%	38%
27	84%	65%	86%
28	71%	72%	79%
29	93%	86%	82%
30	40%	45%	46%
31	96%	89%	81%
32	67%	68%	76%
33	69%	83%	76%
34	91%	86%	85%
35	82%	71%	71%
36	95%	85%	84%
37	100%	85%	84%
38	96%	88%	84%
39	65%	48%	54%
40	93%	82%	83%
41	95%	85%	84%
42	80%	71%	71%
43	71%	60%	63%
44	100%	78%	85%
45	27%	28%	29%
46	85%	80%	82%
47	93%	75%	65%
48	71%	72%	84%
49	71%	72%	83%
50	75%	68%	67%
51	78%	75%	78%
52	76%	57%	63%
53	93%	88%	86%
54	31%	46%	37%
55	87%	75%	80%
56	73%	74%	81%
57	51%	52%	72%
58	85%	77%	76%
59	75%	68%	84%
60	91%	91%	89%
61	78%	72%	81%
62	95%	95%	89%
63	80%	80%	78%
64	22%	38%	36%
65	95%	92%	90%
66	100%	94%	94%
67	56%	62%	45%
68	84%	83%	85%
69	75%	77%	71%
70	47%	55%	46%
71	98%	94%	96%
72	84%	92%	80%
73	55%	66%	71%
74	80%	77%	85%
75	82%	83%	76%

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