THE SOCIAL SUSTAINABILITY MODEL FOR THE MARITIME LABOR FORCE

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ABSTRACT

THE SOCIAL SUSTAINABILITY MODEL FOR THE MARITIME LABOR FORCE

Environmental pollution, global warming, declining energy resources, declining economic productivity and negative social impacts in the world are forcing sectors to take sustainable measures. For this reason, the concern of creating a sustainable structure today has gained importance in the maritime sector as well as in all sectors. One of the features of sustainability, which is a popular concept today, is its longevity. The most valuable resource that can ensure the longevity of businesses is human resources. Considering that most of the goods subject to world trade are made by sea transportation, it is possible for shipowners to protect their assets with a sustainable maritime labor force. However, when both the studies in the literature are examined and the reports obtained from the maritime sector, it is seen that there is a constant supply deficit, especially on the side of the officers, and there is an emphasis on the shortage of seafarers. From here, when the difficulties of working conditions are added to the difficulties that seafaring is inherent in, arises the need for seafarers to be much more supported to do their profession. Therefore, the longevity of the human factor, which is at the center of sustainability, has become a significant issue for the maritime industry.

The purpose of this study is to create a sustainable model by determining the expectations of seafarers and the requirements that can meet these expectations in order to ensure the sustainability of the maritime labor force. In the study, it is thought that proposing solutions that will enable seafarers to achieve both economic and social welfare with the establishment of work-life balance will play an important role in increasing the interest of future generations in seafaring, in particular.

In the study, the Quality Function Deployment (QFD) method used to transform customer expectations into product features was used. The “Optimal Card Sorting” software program was used to determine the seafarer expectations that constitute the inputs of the Quality House, which is the application part of QFD, and the requirements that may

correspond to these expectations. Thus, the creation of a list of indicators that can be taken as reference in future scientific studies has been one of the important outputs of this study. The Fuzzy Analytic Hierarchy Process (FAHP) method was used in weighting the inputs of the Quality House because it eliminates uncertainties and gives more precise results. In addition, in order to get clearer results in the relationships matrix, the operations were performed using Fuzzy Logic. Modeling the House of Quality (HoQ) method, with Fuzzy Logic, FAHP and Card Sorting method has made this study unique, as well as eliminating uncertainties regarding the sustainability of the maritime labor force, resulting in more consistent results.

In the House of Quality, it was seen that the biggest absolute expectations were work-life balance, social benefit, education and training, and safe and healthy working environment. It was seen that the first ten requirements with the highest absolute importance that could correspond to these expectations were health and safety of people, social insurances and benefits, medical coverage and medical benefits, repatriation, understandable contract, quality and quantity of food, set up a land-sea-land career management system, short deployment and flexible working time, establishment of a crew welfare department and technology supporting safety at sea.

As a result of the study, the necessity of establishing a healthy work-life balance that prevents seafarers from being separated from social life and their families for a long time has emerged in order to ensure the sustainability of the maritime labor force. In addition, the implementation of social benefits that will guarantee the lives of seafarers and their families and the desire of seafarers to work on ships with a safe and healthy working environment are other important results of the study.

Keywords: Sustainability, Maritime Labor Force, Sustainability Reports, QFD, House of Quality (HoQ), Optimal Card Sorting, FAHP, Multinational, Multicultural.

ÖZET

DENİZ İŞGÜCÜ İÇİN SOSYAL SÜRDÜRÜLEBİLİRLİK MODELİ

Dünyada meydana gelen çevre kirliliği, küresel ısınma, enerji kaynaklarının azalması, ekonomik verimliliğin düşmesi ve olumsuz sosyal etkiler, sektörleri sürdürülebilir önlemler almaya zorlamaktadır. Bu nedenle günümüzde sürdürülebilir bir yapı oluşturma kaygısı tüm sektörlerde olduğu gibi denizcilik sektöründe de önem kazanmıştır. Günümüzde popüler bir kavram olan sürdürülebilirliğin özelliklerinden biri de uzun ömürlü olmasıdır. İşletmelerin uzun ömürlü olmalarını sağlayabilecek en değerli kaynak ise insan kaynağıdır. Dünya ticaretine konu olan malların büyük bir kısmının deniz yolu ile taşındığı düşünüldüğünde gemi işletmelerinin varlıklarını koruyabilmesi sürdürülebilir bir deniz iş gücü ile mümkündür. Ancak hem literatür hem de denizcilik sektöründen elde edilen raporlar incelendiğinde özellikle zabitlerde sürekli arz açığının olduğunu ve denizci eksikliğine vurgu yapıldığı görülmektedir. Buradan, denizciliğin doğası gereği içinde barındırmış olduğu zorluklara bir de çalışma koşullarının zorlukları eklendiğinde denizcilerin mesleklerini yapmaları için çok daha fazla desteklenmeleri gereği ortaya çıkmaktadır. Bu nedenle, sürdürülebilirliğin merkezinde yer alan insan faktörünün uzun ömürlü olması denizcilik sektörü için önemli bir konu haline gelmiştir.

Bu çalışmanın amacı, deniz işgücünün sürdürülebilirliğini sağlamak maksadıyla denizcilerin beklentileri ve bu beklentileri karşılayabilecek gereksinimleri belirleyerek sürdürülebilir bir model oluşturmaktır. Çalışmada, denizcilerin iş-yaşam dengesinin kurulmasıyla birlikte hem ekonomik hem de sosyal refaha ulaşmalarını sağlayacak çözüm önerilerinde bulunulmasının, özellikle gelecek nesillerin denizciliğe olan ilgisinin artmasında önemli bir rol oynayacağı düşünülmektedir.

Çalışmada müşteri beklentilerini ürün özelliklerine dönüştürmek için kullanılan Kalite Fonksiyon Yayılımı (Quality Function Deployment (QFD)) yöntemi kullanılmıştır. QFD'nin uygulama kısmı olan Kalite Evi'nin (House of Quality (HoQ)) girdilerini oluşturan denizcilerin beklentileri ve bu beklentilere karşılık gelebilecek gereksinimlerin belirlenmesinde "Optimum Kart Sıralama" programından yararlanılmıştır. Böylece

gelecekte yapılacak bilimsel çalışmalarda referans alınabilecek bir indikatörler listesinin oluşturulması bu çalışmanın önemli çıktılarından bir tanesi olmuştur. Kalite Evi girdilerinin ağırlıklandırılmasında belirsizlikleri ortadan kaldırması ve daha kesin sonuçlar vermesi sebebiyle Bulanık Analitik Hiyerarşi Süreci (Fuzzy Analytic Hierarchy Process (FAHP)) yöntemi kullanılmıştır. Ayrıca ilişkiler matrisinde de daha net sonuçlar alabilmek için işlemler bulanık mantık kullanılarak yapılmıştır. Kalite evi yönteminin Bulanık Mantık, Bulanık Analitik Hiyerarşi Süreci ve Kart Sıralama yöntemi ile modellenerek yapılması bu çalışmayı özgün kılmanın yanında deniz işgücünün sürdürülebilirliğine ilişkin belirsizlikleri ortadan kaldırarak daha tutarlı sonuçlar alınmasını sağlamıştır.

Kalite Evi işlemi sonucunda denizcilerin en büyük mutlak ağırlığa sahip beklentilerinin iş-yaşam dengesi, sosyal faydalar, eğitim ve öğretim, emniyetli ve sağlıklı çalışma ortamı olduğu belirlenmiştir. Bu beklentilere karşılık gelebilecek mutlak önem derecesi en büyük gereksinimlerin ise insanların sağlığı ve güvenliği, sosyal sigortalar, tıbbi teminatlar ve tıbbi faydalar, ülkesine geri gönderme, anlaşılabilir bir iş sözleşmesi, yiyecek kalitesi ve miktarı, kara-deniz-kara kariyer yönetim sisteminin kurulması, esnek ve kısa çalışma süresi, mürettebat refahı departmanı kurulması ve denizde emniyeti destekleyen teknolojiler olduğu görülmüştür.

Çalışmanın sonucunda deniz iş gücünün sürdürülebilirliğini sağlamak için denizicilerin sosyal hayattan ve ailelerinden uzun süre ayrı kalmalarını önleyen sağlıklı bir iş-yaşam dengesinin kurulmasının gerekliliği ortaya çıkmıştır. Ayrıca denizicilerin ve ailelerinin hayatlarını garanti altına alacak sosyal faydaların uygulanması, denizcilerin emniyetli ve sağlıklı çalışma ortamına sahip gemilerde çalışmak istemeleri çalışmanın diğer önemli sonuçlarındandır.

Anahtar Kelimeler: Sürdürülebilirlik, Deniz İşgücü, Sürdürülebilirlik Raporları, QFD, Kalite Evi, Optimal Card Sorting, FAHP, Çok Uluslu, Çok Kültürlü.

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LIST OF SYMBOLS

Symbol	Description
Ã	Fuzzy set
∑	Summation
∈	Is an element of
μ (x)	Membership degree function
∩	Intersection
%	Percent (Relative weight)

LIST OF ABBREVIATIONS

Abbreviation	Description
AAM	Actual Agreement Method
AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
APC	Accident Prevention Committee
ASA	Asian Shipowners' Association
A.W.	Absolute Weight
BIMCO	Baltic International Maritime Council
BMM	Best Merge Method
CBAs	Collective Bargaining Agreements
CMA CGM	Compagnie Maritime d'Affrètement - Compagnie Générale Maritime
DPA	Designated Person Ashore
E	Expectations
ECSA	European Community Shipowners 'Associations
ECDIS	Electronic Chart Display and Information System
FAHP	Fuzzy-Analytic Hierarchy Process
GRI	Global Reporting Initiative
HoQ	House of Quality
HR	Human Resources
HRM	Human Resources Management
ICS	International Chamber of Shipping
I.D.	Impact Degree

ILO	International Labour Organization
IMO	International Maritime Organization
IMS	Integrated Management System
I.R.	Improvement Rate
ISF	International Shipping Federation
ITF	International Transport Workers' Federation
MLC	Maritime Labour Convention
MSC	Mediterranean Shipping Company
MTC	Marine Training Center
OECD	Organisation for Economic Co-operation and Development
OOCL-OOIL	Orient Overseas Container Line- Orient Overseas International Limited
QFD	Quality Function Deployment
R	Requirements
S.D.	Satisfaction Degree
SEA	Seafarer's Employment Agreement
SPMS	South Pacific Marine Services
SSE	Security, Safety and Environment
STCW	Standards of Training Certification and Watchkeeping
TFNs	Triangle Fuzzy Numbers
UN	United Nations
WCED	World Commission on Environment and Development
WHO	World Health Organization
3DCV	Three-Dimensional Cluster View

1. INTRODUCTION

Reduction of energy resources in the world, global warming, environmental pollution, decreasing operational efficiency and negative social impacts cause enterprises to take sustainable measures. Also, technological developments and globalization forces companies maintain their presence in an environment of increased competition. The concern of creating a sustainable system in recent years is also a matter of importance in the maritime sector as in all sectors.

The long-term sustainability of the human factor, which is at the center of sustainability, has become an important issue in the maritime sector as well as in every sector. Today's conditions that lead to the maritime labor force to be sustainable, cause the maritime sector to take measures in this direction. The shortage of qualified seafarers is one of the most important problems in the maritime sector. According to the "Man Power Report" published by Baltic International Maritime Council (BIMCO) (2015), it is expected that the global demand for the maritime labor force will increase until 2025. There has also been a continued emphasis on seafaring shortage when examining BIMCO's previous reports. According to BIMCO/ International Shipping Federation (ISF) (2005) report, the issue of seafaring shortage had been described as a worldwide problem. The BIMCO / ISF (2010) report highlights future seafarer shortage as the ongoing tight labor market would cause to repetitive shortages for some officers (Leong, 2012; Thai et al., 2013). The literature, in particular, provides proof that the retention of officers is a significant labor force issue that needs to be addressed (Caesar et al., 2014).

This thesis study is intended to be used to provide assistance to these efforts and to fill the gap in the literature. Especially considering that taking new staff is more costly than the cost of holding existing staff, the importance of sustainability becomes evident. For this

reason, providing solutions for the longevity of the maritime labor force in the study will provide an economic advantage to shipping companies. Based on the solutions to be proposed in the thesis the fact that the indicators of the seafarers' access to both economic and social welfare are among the solution proposals can provide an increase in the interest of the young generations especially the maritime profession. This situation is important in terms of meeting the demand for seafarers who provide economic returns to the country.

Sustainability reports prepared by ship operators based on Global Reporting Initiatives (GRI) and Maritime Labour Convention (MLC) requirements, which are generally accepted by many sectors, were examined in depth and indicators related to the social dimension of the concept of sustainability were determined. A list of indicators was created by evaluating these indicators with the “Optimal Card Sorting” software used in scientific studies. This list of indicators that can be taken as reference in future scientific studies is one of the significant outputs of this study.

The purpose of this study is to create a model for the sustainability of the maritime labor force by modeling the QFD method used to reflect customer demands on product features with the help of Fuzzy Logic, FAHP and Card Sorting methods. In this way, uncertainties regarding the sustainability of the maritime labor force were eliminated and more realistic, consistent and precise results were obtained. Even though there are many studies on sustainability and QFD in the literature, the lack of a study proposing the solution of the social sustainability of sustainable maritime labor force by the method of Card Sorting and FAHP QFD makes the subject of this thesis unique.

The thesis work consists of eight chapter. In the first chapter of the thesis, an introduction on the subject was made and the purpose, unique side of the thesis, how it will contribute to the sector and literature was explained. In the second chapter, the literature on the subject was reviewed. In third chapter, literature review was conducted on the concept of sustainability and its historical development and dimensions, social sustainability, GRI and MLC. In the fourth chapter, the sustainability reports of shipping companies are examined in-depth and the indicators of expectations and requirements revealed in the first stage are explained. The fifth chapter contains the material and method used in the study. In this chapter, a model proposal on the social sustainability of the maritime labor force was

made and its steps were explained. Literature review on FAHP, Fuzzy Logic, QFD methods used in the study was conducted. The steps of the quality house method, which is the method of application of QFD, are described. In the sixth chapter, the expectations and requirements created in the fourth chapter were analyzed through Optimal Card Sorting program. Thanks to Optimal Card Sorting, the final version of expectations and requirements was created, as well as the consistency of experts. And also, the steps of the Optimal Card Sorting and FAHP QFD approach proposed were applied. In the seventh chapter includes the results and discussion obtained as a result of the calculations. The eighth chapter contains the conclusion part of the thesis study. General implications have been made regarding the sustainability of the maritime labor force. The current situation in the world has been revealed and recommendations for future studies have been presented.

2. LITERATURE REVIEW

The international shipping sector plays an important role in sustainability in economics and organizations the worldwide. In recent years, the sea transportation has resulted in a proactive approach to sustainable transport management due to social and environmental regulations and increasing stakeholder pressures (Yuen et al., 2019). The maritime industry is considered an important international development in terms of the emergence of an extremely organized and structured global labor market for seafarers (Wu & Sampson, 2005). Human factor according to IMO is a complicated and multi-dimensional subject that effects maritime safety and marine environmental conservation. It includes the all spectrum of human activities performed by seafarers, coastal management, governments, shipyards and other organizations, all of whom need to cooperation to address human problems effectively (IMO, 2003 Resolution A.947(23)).

Human resources that can ensure the longevity of organizations are based on sustainability principles (Kesen, 2016). Human resources competitiveness in maritime transport is a complex subject owing to different factors such as work-life balance, social climate on board, competitiveness, multinational working environment, security and technology (Barsan et al., 2012). The purpose of shipping companies is to maintain competitiveness and also manage this change thanks to programs to determine and fulfill the development and training wants of the labor force. Due to increased competition and technological advances, employers will have to choose either a highly specialized workforce or a general workforce development (Barnett & Pekcan, 2017). While there is a need for a specialized workforce for the use of special equipment produced with technological developments, however, decreasing personnel levels owing to rivalry will dictate the requirement for a generalist labor force (Barnett & Pekcan, 2017). According to shipping companies, the capability to retain crew provides numerous organizational benefits. Owing to the shortage of skilled ship's crew in the sector, retaining crew can conduce to the rivalry

vantage of shipping companies (Yuen et al., 2018). By creating a pool of professionally competent and motivated seafarers, shipping companies can be given a cost advantage through increased productivity and reduced absenteeism (Nguyen et al., 2014). Also, the success of companies depends on the ability of employees to develop their careers by managing changes in the workplace and skill requirements related to that job. In the shrinking skilled labor market, demonstrating more effective human resources management will assistance them maintain a competitive edge in a sector with a multinational and multicultural environment (Barnett &Pekcan, 2017).

It is understood that there is a general consensus that human resources gain significance in an economy where knowledge is important. Human resource management will become increasingly important as this function aims to create, develop and sustain human resources potentials for the future. Therefore, it is asked how companies should handle human resource management by ensuring the supply of qualified and motivated labor forces in the long term (Zaugg et al., 2001). Employees, who want to contribute to the organization they work for, meet the wants of the work force and have a plausible balance between work and life are the forthcoming potential for achievement (Zaugg et al., 2001).

The shortage of skilled seafarers, especially officers and engineers, in the shipping industry has been a growing concern (McLaughlin, 2015; Caesar, 2013). Given that more than 90% of the world's trade volume is carried out by sea, this problem is a global challenge to overcome (Yuen et al., 2018). Factors such as busy work pace, insomnia, withdrawal from social life, workplace noise, time pressure, stress, physiological needs, coping with controls, lack of recreation affect not only the mental health of seafarers, but also on turnover intentions (Gu et al., 2020). This explains why the number of young people who want to work at sea continues to decline globally (Carotenuto et al., 2012; Ruggunan and Kanengoni, 2017). Research shows that around 55% of junior cadets do not want to work on ship for more than ten years, which more highlights the significance of retaining crew (Ruggunan & Kanengoni, 2017; Caesar, 2013). There is general consensus in the literature that seafarer shortages will increase and a more volatile global seafarer labor market will emerge (Gekara, 2009). Fatigue caused by a fast working pace combined with a heavy working environment, less rest periods despite long working hours, repetitive tasks and being constantly alert are bad working conditions that negatively affect the seafarer. Too much stress associated with

working onboard is attributed to bad living and working conditions (Yuen et al., 2018). Poor working conditions not only reason illness, work accidents, fatigue, tension and dissatisfaction, but they are also the sources of rapid seafarer turnover and reduced productivity (Hafez, 1999). If similar or compensatory opportunities are not provided to the seafarer who has to stay away from the natural habitat, family and general social structure for a certain period, even high wages alone will not be sufficient for the seafarer to continue his profession happily and healthily for many years (Cömert, 2008). Pursuing a career at sea may not be satisfactory, despite obvious attractions and advantages such as international sailing opportunities and high fees (Fei & Lu, 2015). In various workplaces, while employees have worked in the same workplace for years, seafarers often leave ships after a few months of work, thus creating a constant circulation of seafarers on board (Arslan, 2006). Seafarer shortages and the minimalist level of personnel on board have increased the workload of seafarers faced with longer and tighter work schedules (Thai & Latta, 2010). The very high rate of mobility among officers demonstrates the significance of retaining qualified officers to meet forthcoming maritime labor demands. Unfortunately, many of these officers leave ships to pursue careers on the land side of the maritime industry (Caesar, 2013). Despite the opportunity to travel the world, extremely gainful job offers and adventurous work environment, most of these seafarers tend to quit their ship business by accepting opportunities on land and this situation is increasing day by day (Kantharia, 2017). For this reason, Caesar (2013) emphasized succession planning in organizations compiled from various sources. There seems to be six attractions in a career for young people. These include travel opportunities, stimulating work, working with new technology, early responsibility and fair rewards. It may be claim that a seafaring profession offers such attractions in abundant, yet the shipping sector is in rivalry with other similar sectors for persons with ability and a chance to exercise their preference of career (Barnett & Pekcan, 2017). For shipping to be sustainable, skilled seafarers and officers must be retention and the attraction to seafaring must continue to be the main focus in the future (Cahoon et al., 2010).

In terms of acquiring and retaining qualified labor force, it is questioned how shipping companies can become sustainable organizations in the future. Employment and recruitment of seafarers must take a long-term approach to provide supply is sustainable, in

any case of economic conditions (Caesar, 2013). It is also to make the maritime profession attractive enough to prevent young people from finding jobs on land (Sulpice, 2011).

Briefly, sustainability in human resources is characterized by applied research by ensuring a compatible work-life balance, increasing employment, and encouraging individual responsibility (Zaugg et al., 2001). The measures taken in sustainable human resources management take the company and the individual as equal partners: both meeting individual wants is encouraged, and maintaining a company's competition power is supported by sustainable labor force management (Zaugg et al., 2001).

In the literature, sustainable human resources management (Enhert, 2009), human resources, capabilities and sustainability (Gollan, 2000), sustainable human resources management in business management (Kesen, 2016), human resources allocation using QFD method (Kozanoğlu, 2009), human element in shipping (Barnett & Pekcan, 2017), a model proposal on the supply and employment on seafarer market (Cömert, 2008) and human resources management for seafarers (Arslan, 2006), it is seen that the were made to work on. However, the fact that there is no study in the literature that offers a solution with the Quality House approach including Card Sorting and FAHP in order to reveal the social sustainability model of the maritime labor force makes this thesis study unique. This thesis study was carried out in order to complete this gap in the literature and to offer a model proposal to the sector to avoid seafarers shortage and have a longevity maritime labor force.

There are many studies in which FAHP and QFD methods are used as methods in this study. Literature review on these methods are included in the relevant sections of the thesis.

3. CONCEPT OF SUSTAINABILITY

There are many studies on the concept of sustainability in the literature. Most researches explained the concept of sustainability, the importance of sustainability, historical development today. Likewise, most of the studies have addressed the economic, environmental and social aspects, which are the dimensions of sustainability, either individually or as a whole.

The word "Sustainability" comes from the Latin "*sustinere", and means to "maintain","sustain", "support", "endure", and* "*to restrain*" (Caradonna, 2014; Katunian, 2019; Pal & Hazra, 2015). The term of sustainability was first appeared in forestry, where it means never harvesting more than what the forest yields in new growth (Wiersum, 1995). The concerns of our Paleolithic ancestors regarding with extinction of their prey and the concerns of early farmers about preserving soil fertility show that the concern to conserve natural resources for the future is permanent. Considered a milestone, the Rome club's report predicted that many vital natural resources would be depleted within a generation or two (Kuhlman & Farrington, 2010). Therefore, the adoption of the concept of sustainability in the report Our Common Future of the UN World Commission on Environment and Development (also known as the Brundtland Commission) in 1987 was welcomed. With the Burunland report, the concept has become a popular concept today. The Brundtland Report explains sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Since the publication of the Brundtland report, the principle of sustainable development has gained general acceptance. The organizing standard for sustainability is sustainable development, which includes the four areas: ecology, economics, culture, and politics (Pal & Hazra, 2015). In this report, sustainability refers to the capability to sustain three fundamental dimensions of a human system over time, namely, economic development, conservation of the environment and social inclusion (Roca-Puig, 2019).

3.1. Economic Dimension of Sustainability

Sustainable development is most often described as the need to maintain the stocks of human, natural, man-made and social capital required by societies to generate a sustainable (Omann & Spangenberg, 2002). Economic principles covers terms like ethical investments, eco-efficiency, and environmental accounting (Glavic & Lukman, 2007). From the perspective of neoclassical economic theory, sustainability can be defined as maximizing the welfare level. Most economists have simplified this definition to maximize the benefit provided by consumption. Although this definition can be criticized as a simplification, it includes many components related to the welfare of people such as housing, transportation, health and education (Harris, 2000). Economic sustainability should be able to consistently manufacture commodity and services, protect grades of state outer debt, and avoid excessive industrial unbalances that harm industrial or agricultural manufacture (Harris, 2000).

Glavic and Lukman (2007) emphasized the statements of Environmental accounting, Eco-efficiency and Ethical investments regarding the economic dimension of sustainability. Environmental accounting is conceived to bring to the attention of corporate stakeholders by enhancement the environmental quality and profitability of the company while decreasing environmental costs. Eco-efficiency is the provision of commodity and services at competitive prices that meet people wants without compromising the quality of life, while decreasing the ecological effects and resource intensity round the life cycle to a harmonious level. Ethical investments are financial instruments such as environmentally sensitive corporate practices, investments, mortgages, pensions and utilities that support workforce diversity and improve product quality (Glavic & Lukman, 2007).

3.2. Environmental Dimension of Sustainability

Environmental dimension; it is a concept related to reducing the damages caused to nature by human beings, primarily industrial activities and protecting the environment and ecosystem (Akkoyun, 2016). Environmental principles refer to concepts that define environmental performance to reduce the use of dangerous or toxic substances, energy and resources. These concepts are: recycling, renewable resources, source reduction, reuse,

resource minimization, repair, regeneration, remanufacturing, recovery etc.(Glavic & Lukman, 2007). This includes preservation of biodiversity, air and other ecological system functions not classified as economic resources (Harris, 2000).

Glavic and Lukman (2007) explained some environmental principles and concepts determined to ensure environmental sustainability as follows.

- Renewable resources are constantly renewable materials and energy refers to the sources. In other words, they do not rely on fossil fuels with limited availability. This concept emerged in reaction to rising carbon dioxide emissions. The concept has been created by an increase in a sustainable set of values and includes energy sources such as sun, wind, hydroelectric and tidal.
- Minimization of resource, the fact that natural resources are not unlimited, worry regarding with raw materials, energy and water consumption have created the concept of resource minimization. The minimization of resource use is understood as the protection of natural resources. In other words, the concept does not only cover energy, raw materials and water; it includes forestry, fishing, hunting, and other habitats. The reduction in material and energy use can result in dramatic cost reductions.
- Source reduction is a form of implementation that reduces the amount of material used for the production of a product by redesigning the process from production to consumption. This description includes both materials and energy.
- The recycling is a resource recovery method in which waste products used as inputs in the production process are collected and included in the process.
- The reuse means the reuse of waste in different processes without any structural changes.
- Repair is the development of the product to increase its durability and quality in order to be able to use it again. Increasing the service life of the product reduces consumption.
- Regeneration is the regeneration of the material for use in the same or different processes.

- Recovery is an action feasible to materials, waste and environment. It is the process of restoring the materials in the wastes for different purposes and useful uses than the actual use.
- Remanufacturing is the regeneration of materials, machines, devices or other objects so that they can be reused.

3.3. Social Dimension of Sustainability

Social dimension refers to fairly, respectful, safe, liberal, contributing to mankind and the environment. And also, the concept of health and safety generally refers to the working conditions and contains standards and responsibilities (Glavic & Lukman, 2007). Social sustainability focus on individual assets like consumption, income, education, experience and work, while corporate sustainability targets processes between people, such as democracy, gender equality, or independent sources of information (Omann & Spangenberg, 2002; Harris, 2000). Most of the discussions on sustainability have been on economic and environmental factors. Therefore, when it comes to sustainable development, the social dimension gets less concern and consequently it is conceptually the minimum developed of these three basic elements because it is hard to describe (Ajmal et al., 2018; Boström, 2012). Looking at most of these describes agree that social sustainability is the quality of life, especially for the most undefended personals or groups, that foster enduring circumstances for human welfare and are based on a set of worth or fundamental ethic principles such as equality, justice, trust and participation (Ajmal et al., 2018; Roca-Puig, 2019). Omann and Spangenberg (2002) examine several scenarios for dealing with priority issues social sustainability criteria gender equity, life-forms, flexibilization of working time, working time reduction, part-time work, and redistribution, full employment, Informal work, innovations and participation, social security is committed to.

3.4. Relationship Between Social Sustainability and Human Resource Management

Boudreau and Ramstad (2005) stated that human resources have a very important place for sustainability. The traditional human resources paradigm describe human resources contribution as supporting organization aims through aligned human resources services, programs, policies and practices (Boudreau & Ramstad, 2005). Human resource development can be defined as an inventive combination of people, methods and systems to foster individual and organizational learning that creates and sustains the effectiveness of the organization (Katunian, 2019). Sustainable human resource management refers to social norms that consider the principles of trust, loyalty, equal ethics and interdependence in working relationships and therefore promote sustainable individual and organizational behavior (Roca-Puig, 2019). Conceptual approaches linking sustainability and human resources are sustainable human resources management, strategic human resources, sustainable resource management and sustainable work systems management. In these concepts, connecting sustainability and human resources, focus narrowed on distinct aspects that included: work-life balance, working conditions, harmony among workers, community and company, and labor shortage, among others (Ehnert, 2009). It is described by instrumental and methodological approaches whose aims are sustainable, socially responsible and efficient training, long-term recruitment, retention, and disemployment of workers. Ensuring a compatible work-life balance, increasing employability and strengthening personal liability play a crucial role in the term of sustainable human resources management (Zaugg et al. 2001). Social sustainability will focus more on the welfare of people and quality of life, the ability to maintain oneself and all dependents based on one's salary, access to paid labor for anyone who wishes, and social security when there is no paid work, but still working for the public good (Omann & Spangenberg 2002). Social trust in the business context; it is about, health and safety, job security, education and learning, charges that give fundamental decent life and vocational development (Missimer et al., 2016). These basic human resource management practices are in line with the collaboration and involvement of employees and with the theory of social change outlined extensively in the social sustainability literature (Roca-Puig, 2019). Social sustainability, when analyzed, leads us to see human beings as intrinsically human, where worth and attitudes guiding

people's attitude drive the social conversions essential to provide human welfare (Roca-Puig, 2019). When some studies are examined, it has dealt with the connection between the social dimension of sustainability and human resources management, particularly in relation to organizational social responsibility; hence, social sustainability principles are embedded in sustainable human resources management (Roca-Puig, 2019). The relationship between sustainability and human resources management is cited as a developing and innovative approach. The intersection between human resource management and sustainability is based on two assumptions: the sustainability of human resource management processes and the role of human resource management in supporting corporate sustainability (Macke & Genari, 2019).

To ensure sustainability in all disciplines, it is believed that the social dimension of sustainability must be ensured first. Because human, which is the most important factor in ensuring sustainability, has an important role in realizing economic and environmental sustainability factors. Therefore, more emphasis has been placed on social sustainability among disciplines. Social sustainability focuses on social relationships, interactions and meeting human needs that affect sustainable development. For this reason, it is important that business administrations increase the level of life, ensure social integration and value employee and Human Rights (Kesen, 2016).

The importance of sustainability in human resource management and its relationship with it’s functions, explains it from two different perspectives (Esen et al., 2018). One dimension of the discussions is addressed from a macro point of view and focuses on the contribution of organizations to their economic and social environment. This approach is often associated with dimensions of social and ecological sustainability. According to this idea, organizations contribute to the social and economic environment in terms of sustainability through HRM practices. Another approach to the relationship between sustainability and HRM is very low level and addresses the issue at the grade of internal elements and relationships in the HRM system. This approach, focuses on human resource scarcity, increased health problems caused by work, and an aging workforce, but sees the sustainability of the HRM system as a “survival strategy” for business (Ehnert & Harry 2012).

3.5. Global Reporting Initiative (GRI)

The Global Reporting Initiative is an independent non-profit organization that has been providing guidance to businesses in sustainability reporting since 1997, in order to achieve a globally sustainable economy. Sustainability reporting is a measurement, disclosure and accountability practice for inner and outer stakeholders for corporate performance for the sustainable development goal (GRI, 2018). GRI helps governments and organizations in the world explain their effect on their relationships with crucial sustainability topics such as environmental change, economic efficiency, human rights and social well-being. GRI serves by establishing a generally accepted reporting framework on the social, economic and environmental performance of a company. It has been created for use by any organization, large or small, in any industry, all over the world (GRI, 2018). GRI constitutes the basis of many issues in reports on sustainability. As in many other sectors, many companies operating in the field of maritime transport are based on GRI indicators. It addresses the practical issues faced by a wide variety of organizations serving nationally or in different geographies, from small businesses to large businesses. The GRI includes generic or industry-specific content that is accepted by a great variety of organizations around the world to evaluate a firm's sustainability performance (Sustainability Reporting Guidelines GRI Version 3.1, 2011).

When the sustainability reports are evaluated in terms of the sustainability of organizations, they also include an evaluation in terms of environmental, social, economic and administrative aspects (Hill, 2007). In this context, the need for evaluation of institutions has arisen, and in order to meet these expectations, it is seen that especially since 1989, companies that have been offered to the public have started to report their policies and their impacts on the sustainability, environment and community, apart from the periodic financial reports (Kolk, 2004). Since governments do not have a legal obligation or standard for these reports, organizations such as the Global Reporting Initiative (GRI) established in 1997 are trying to establish a standard. The indicators related to the economic, environmental, and social dimensions of sustainability in GRI are explained below (Sustainability Reporting Guidelines GRI Version 3.1, 2011).

3.5.1. GRI Economic Indicators

The GRI economic dimension of sustainability concerned with the economic conditions of businesses and their effect on economic structures at international and local levels. Financial performance is one of the main factors for understanding a business and its sustainability. This knowledge is reported in financial statements in certain periods. Often less reported and often requested by users of sustainability reports, it is the firm's contribution to the sustainability of a greater economic system. Here, first of all, the indicators related to economic performance appear. These;

Direct economic worth generated, including operating expenses of firms, earned income, personnel compensation, earnings, investments and payments to company shareholders.

Other indicators related to economic is market existence. These;
- Start-up wage range rates by gender compared to the local minimum wage at considerable places of operation.
- Spending applications, policy and rates on local suppliers.
- Local recruitment procedures and ratio of top management retained from the regional community.

As indirect economic effect, effect of infrastructure investments and the development and services firstly ensure for the public benefit are taken into account.

3.5.2. GRI Environmental Indicators

The environmental sustainability relates to a firm's effects on all natural systems, including climate, water, air, soil and ecosystems. Environmental Indicators covers performance related to energy, water and materials used as inputs in many areas, and outputs such as wastewater and emissions released into the environment. It also addresses other issues such as biodiversity, environmental suitability and environmental expenditures. The indicators of the environmental dimension of sustainability are

• Water,
• Emissions, Effluents and Waste,
• Materials,
• Biodiversity,
• Energy
• Compliance (Monetary value or number of penalties and sanctions for violation of the environmental regulations or laws),
• Products and Services (Actions to reduce the environmental effect of products and services),
• Transport (Effects on the environment during the transportation of the products and all other commodities) and
• Overall (Total environmental investments and protection expenditures).

3.5.3. GRI Social Performance Indicators

The GRI social dimension of sustainability is related to the effects of a company on the social systems in which it operates. The social performance indicators are labor practices, society, product responsibility and human rights. As these are particularly relevant to our topic, the indicators related to labor practices are Employment, Training and Education, Work Force/Management Relationships, Occupational Health and Safety, Diversity and Equal Opportunity and Equal Wage for women and men.

3.6. The Importance of the MLC for a Sustainable Maritime Labor Force

Seafarers' rights are complex as they are governed by both national and international conventions. Owing to the global nature of sea transportation, the protection of seafarers at the universal level is a very important issue. For this reason, efforts have been made to review international maritime labor standards and form a new convention under one roof that is applicable, consistent and adapted to today's conditions. In this context, within the framework of the studies carried out in the meetings held between 2001-2005, the Maritime Labour Convention (MLC) was created as a result of updating and merging 69 official

documents, including 37 ILO Conventions, 29 Recommendations and 3 amendments not included in ILO Conventions (Göksu, 2014). The Maritime Labor Convention was accepted as a result of the voting in the 94th session of the International Labor Organization Conference held in Geneva between 07th-23rd February, 2006 with the participation of 106 countries. The convention entered into force on 20th August, 2013 for Member States meeting this requirement, 12 months after the ratification of 30 countries holding 33% of the total ship tonnage (MLC, 2006).

The purpose of the MLC is to compose a sole and consistent tool that sets the minimum international standard and brings together more than 68 international working standards related to crew on ships. MLC's aim is to preserve crews' social rights and employment on the ship (Barnett & Pekcan, 2017). In the MLC, regulations and code are regulated below five headings: minimum requirements for crew to work onboard; food, recreational places, health protection, employment conditions, medical care, accommodation, seafarer welfare and social security protection; and a chapter on compliance and enforcement topics (MLC, 2006). The Maritime Labor Convention, also known as the Seafarers' Bill of Rights, determines the minimum rights of crews onboard. Maritime labour certificate must be on ships over 500 gross tons operating in international waters or between harbor of distinct countries (URL-1).

MLC 2006 is a convention aimed at guaranteeing the rights of seafarers, so that human rights at sea can be guaranteed at the international level. With this contract, it is expected that seafarers' social, economic, nutritional and housing problems will be eliminated. Ensuring wage satisfaction of seafarers, improving physical conditions on board, facilitating communication, providing fresh and sufficient provisions and ensuring social security will increase the level of satisfaction and consequently success of seafarers (Göksu, 2014).

4. DETERMINING THE SOCIAL SUSTAINABILITY INDICATORS

In the study, the sustainability reports of companies such as Maersk, MSC, CMA-CGM, Cosco, Hapag Lloyd, Hamburg Sud, Hanjin, Evergreen and OOCL-OOIL, which have important shares with the alliances they have established in maritime transport, were examined to determine the indicators related to the social sustainability of the maritime labor force. In this process, each page in the reports was carefully examined and the most emphasized issues by the companies were revealed. In the first stage, 147 indicators (Appendix-B) related to the subject were determined. In the following process, indicators were revealed that firms both meet in the common denominator and specifically focus on. These indicators were formed as 9 expectations and 25 requirements (solution suggestions) that could correspond to them. These expectations and requirements are described one by one below.

4.1. Expectations

Expectations resulting from the analysis of sustainability reports in the study were referred to with the letter (E). Indicators on the expectations of the maritime labor force represent the categories in the Optimal Card Sorting program in the next chapter.

E1. Work-Life Balance: Meeting the desire for a harmonious work-life balance is much more difficult for seafarers working at sea. Seafarers are particularly faced with erratic working periods, seven-day work per week and restricted free time options, away from their families and social networks (Hapag Lloyd, 2007). It is the most natural right of seafarers to spend time with their families. Hamburg Süd (2017) provides the opportunity to spend a

several weeks or months at home for seafarers who have been on board for several months (Hamburg Süd, 2017). Companies organizes flexible working times (Hapag Lloyd, 2007; Hamburg Süd, 2017) and short deployments for the crew on the ships, taking into account personal events such as births, looking after their elderly relatives, special weddings as much as possible (Hapag Lloyd, 2007; Hamburg Süd, 2017). In addition, the spouse and children of the crew are also allowed to travel on the ship with them. Emphasis is placed on the importance of further deployment planning that takes into account employee performance, the technical aspect of the journey and social aspects (Hapag Lloyd, 2017).

E2. Fair Treatment: Providing fair treatment and equal opportunities to everyone regardless of language, religion, race and gender is one of the significant principles of social sustainability. It is observed that IMO studies on empowerment of women especially on gender discrimination. Companies are making efforts to increase the number of female personnel employed in this direction. All employees must be treated equally and reasonably in order to create equal and diversified job opportunities and a cohesive and productive team of employees (Cosco, 2018). In a safe and stable working environment where there are positive and effective working relationships between managers, employees and employee representatives, all employees should be treated equally (Maersk, 2018).

E3. Social Benefit: There is a need for the existence of social security and related policies that will guarantee the lives of employees. When the reports are examined, among the benefits that companies apply to seafarers, health insurance, unemployment insurance, occupational accident insurance, additional health insurance, pension and health insurance, housing fund, an extra month's wage, paid vacation, capital-forming advantages, maternity benefits, death benefit is available (Cosco , 2018; Hapag Lloyd, 2017).

E4. Safe and Healthy Working Environment: Seafarers work on ships with safe and secure working conditions (Maersk, 2018). OOCL-OOIL states that operations are carried out in a safe working environment to prevent work hazards, safety and health risks and work injuries for seafarers. Fatal accidents and more than one day leave accidents are monitored by CMA CGM (2018) regarding safety in the workplace.

E5. Education and Training: Education and Training is part of a comprehensive strategy for professional development and career management of employees. Maritime companies have various practices regarding this issue in their sustainability reports. For example, Hamburg Süd (2018) organizes seminars, workshops and online training courses to improve the professional and personal skills of seafarers. CMA CGM (2018) conducts training courses, regular exercises and cruise simulators program for the personnel working at sea and especially all second officers. In addition, a training program is established for all seafarers of the company, based on possible effect and the rank of the employee on the environment. This training course is done via e-learning and every seafarer can connect to the program both on land and on ship. Exclusive courses for officers are also regularly held at the company's headquarters to inform and educate officers on safety, safety and health and environmental issues (CMA CGM, 2018).

E6. Communication: Companies have adopted specific measures to encourage open communication, such as creating a positive work environment, encouraging a louder culture, gaining access to front-line management and targeting clarity in all communications. Communication is important for establishing constructive and productive business relationships between managers, employees and employee representatives (Maersk, 2018). Also, communication and safety are related issues. MSC (2018) sees safety as an area that benefits from effective communication. Providing clear messages in a timely manner about risks and related measures or registering seafarers' concerns before an accident occurs demonstrates the importance of communication (MSC, 2018).

E7. Quality of Life on Board: For crews, the vessel is both a workplace and a living environment where they will spend their lives for a particular duration of time. For this reason, it is important to meet the wants of seafarers without compromising their quality of life. MSC (2018) has developed specific policies to ensure adequate standards for all crew members working on ships in line with the MLC and to guarantee an excellent working atmosphere on board. These are social facilities available on board such as food quality and quantity, free high-speed internet, capacity building and recreational facilities and activities aimed at protecting both mental health and the physical of the crew (MSC, 2018). In this direction, CMA CGM (2018) emphasizes the ergonomics of ships. It has also created sports

and performance centers to optimize the health and physical performance of seafarers and to decrease the accident ratio (CMA CGM, 2018).

E8. Motivation: Everyone wants to be thanked and appreciated for a job well done. OOCL-OOIL (2017) emphasizes the significance of incentive and appreciating seafarers' contributions and hard work. Key indicators of staff satisfaction, loyalty and well-being and provide seafarers with the opportunity to improve the quality of service provided (MSC, 2018). Shipping companies take various initiatives to increase the motivation of seafarers. For example, in 1998 Hanjin Shipping launched its annual compensation program based on the assessment of seafarers' individual performance, motivation and skills (Hanjin, 2006). MSC (2017) motivates seafarers to be more passionate about the company's mission, vision and core values. It focuses on a good understanding of effective leadership qualities, how to build a team, and how to avoid mistakes by creating a related leadership and team building workshop. It also allows them to adapt to a multicultural and diverse environment to motivate and encourage young people and ratings (MSC, 2017).

E9. Employment Terms and Conditions: The conditions under which seafarers will be employed are very important. These conditions must also be understandable to all. Seafarers' employment agreements, include wages, working hours and rest hours, repatriation, entitlement to leave, compensation paid to seafarers for loss or sinking of the ship (MLC, 2006). In addition, it is important that seafarers' leave periods and joining and leaving dates are determined in a fair period of time and necessary arrangements are made for their safe join on board. CMA CGM (2018) states that seafarers should be fairly warned about ship departures so they can make family arrangements.

4.2. Requirements

The requirements resulting from the analysis of the sustainability reports in the study were referred to with the letter (R). Indicators regarding the requirements that may correspond to the expectations of the maritime labor force represent the cards in the Optimal Card Sorting program in the next chapter.

R1. Competitive Wage Policy: Emphasis is placed on establishing a competitive wage policy to attract, motivate and retain seafarers and new talents. In this sense, CMA CGM (2018) implements policies such as external competitiveness, equality within the company and performance-based remuneration. The implementation of a fair wage policy is especially important for retaining seafarers (CMA CGM, 2018). And also, an attractive working environment for seafarers involves fair pay. When calculating wages in line with duties, work done, responsibilities, performance, and market in general, it does not matter whether the employee is male or female (Hapag Lloyd, 2017).

R2. Timely Payment of Wages: One of the problems of seafarers is that they cannot get their salary on time due to various reasons. Especially, seafarers, who have to work for months without being paid due to the economic crisis in the world, cannot receive their salary even after leaving the ship. It is aimed to ensure that seafarers receive regular wages through international laws, especially the MLC (2006), and collective bargaining agreements. However, although seafarers' right to pay is protected by law, this problem continues in practice. Most companies are known to be sensitive about paying salaries on time. MSC (2018) has shown in a survey of seafarers that early payment of wages motivates and creates loyalty. This assessment of seafarers' immediate payment of wages is seen as an important outcome for MSC.

R3. Long Service and Performance Award: With the long-term service and performance awards, it is ensured that the motivation of seafarers is increased and their commitment to work is increased. In addition, establishing a wage and reward system can increase the productivity of businesses. Undoubtedly, rewards are a cost element for the business. But it is an important factor in the sustainability of a motivated maritime labor force. At the OOCL-OOIL (2017) the long service and performance award is given to appreciate of seafarers' hard work and commitment to the company.

R4. Health and Safety of People: The safety of seafarers and their working in a healthy environment is an important priority for companies (Cosco, 2018; CMA CGM, 2018). The safety policy of the companies is designed to avoid accidents that could cause injury or death to seafarers or major damage to ships, property or the environment. The main health and safety risks for the seafarers; falls from height, fire, explosion, psychosocial risks,

manual handling operations, risks associated with noise and vibration (CMA CGM, 2018). Some of the operations and work done on ships involve significant risks. CMA CGM (2018) has established an Accident Prevention Committee (APC) to examine the near misses reports and take measures to prevent these risks. This committee prepares annual prevention plans by reviewing feedback on ship accidents, near misses and inspections and innovations that can increase safety on ships (CMA CGM, 2018). In addition, the Security, Safety, Environment (SSE) department established within the company performs inspections on ships to verify that the safety policy is properly implemented and examines risks (CMA CGM, 2018). Similarly, it appears that a Health and Wellness Committee has been set up in MSC on safety themes such as falls, trips, slips and falling objects (MSC, 2018). In addition, it is seen that the MSC provides training and guidance on the transport and management of hazardous substances and chemicals that seafarers may be exposed to (MSC, 2018).

R5. Working Hours and Overtime: The difficulties of working at sea also bring along long working hours. If the working time determined by law is exceeded, overtime is involved. According to the Maritime Labour Convention (MLC) (2006), “hours of work means time during which seafarers are required to do work on account of the ship”; on the other hand, “hours of rest means time outside hours of work; this term does not include short breaks”. The "Rest Hours Record Book", available in electronic or printed form for each seafarer, is compared with the working hours and the rest of the crew to ensure respect with Collective Bargaining Agreements (CBA) and other regulatory requirements (MSC, 2018). In MSC, overtime is paid according to the Collective Bargaining Agreement (CBA). Seafarers' salary on overtime hours and holidays are payed according to the Company's regulations (Cosco, 2018).

R6. Relationships Between Managers and Employee: One of the most significant factors affecting seafarers' performance and happiness on board is their relationship with their managers. Seafarers, who have good relationships with their managers, who trust and respect them, are more efficient and willing in their jobs. In the sustainability reports of Maersk (2019), the importance of constructive and productive business relationships between managers, employees and employee representatives was emphasized. The relationship between staff representative and management is to address more in-depth areas of action for the labor climate in general (CMA CGM, 2018). Most of the crew managers at

Hapag-Lloyd (2017) emphasize that they have a lot of knowledge due to their maritime experience and this is an advantage. Each manager is expected to assess how satisfied seafarers are with their daily duties and take appropriate action if necessary (Hapag Lloyd, 2017). Cosco (2018) has implemented an important application on this subject. A communication platform was created between employees and the company in order to understand the thoughts and opinions of the employees and to solve their problems by creating the " Voice of Employees " e-mail account. Cosco encourages employees express their objections and problems in order to adopt a sustainable, healthy and balanced development.

R7. Marine Training Center: Marine Training Centers (MTC), established by companies, train young seafarers and assign young cadets to ships. Talented seafarers were an asset to Hamburg Süd (2017) and after completing their training, they employ them on the company's ships. The trainees who are trained in these centers are respectively cadets, ordinary seaman, able seaman and those who reach certain conditions have the opportunity to work on deck duty or engine room as fully qualified able seamen. In these centers, training can be given as required by the job of every staff member, from steward to officer (Hamburg Süd, 2017). MSC (2018) aims to achieve a sustainable approach by establishing the MSC academy on this subject, as well as a pool of high-potential seafarers who increase their knowledge of business and corporate culture. Training centers are also used to maintain the high standard of crew navigational and ship operations skills. In addition, it is seen that special training courses are organized through classroom training, computer-based training and simulator training to improve the technical and social skills of seafarers (MSC, 2018). Companies appear to provide seafarers with a wide variety of professional training as well as mentoring programs (MSC, 2018; CMA CGM, 2018). Similarly, the OOCL academy established by OOCL provides support to students in the form of internships, sponsorship, mentorships or individual improving programs (OOCL-OOIL, 2017).

R8. Technology Supporting Safety at Sea: Technology is a crucial factor in providing the safety of crew, ship and freight safety. In this regard, MSC (2018) has equipped the ships with a third radar, which is far above the legal requirement, to improve navigation safety. And also, additional security measures can be taken by providing accurate measurement of the distance from the fore and aft side of the ship to the pier during berthing

using long rangefinders or by equipping the captain's cabin with Electronic Chart Display and Information Systems (ECDIS). On another important issue, the increase in technological innovation in the sector creates uncertainty among seafarers. With timely identification of future technological changes, companies can support to develop the necessary skills for seafarers. And also, employees whose jobs are disappear due to the adoption of new technologies should be supported by companies (Maersk, 2018). CMA CGM (2018) has established a Fleet Navigation Center on this subject. Here, in order to reduce the risks related to navigation, bad weather conditions are analyzed by the expert captains in the fleet centers, and the captains and officers on board are offered safe navigation (CMA CGM, 2018).

R9. Equal Opportunity and Diversity: The diversity is defined by gender equality, intergenerationality and multi-culturalism in order to enable mutual enrichment. Diversity plays an important role in guiding companies' strategy. As a source of innovation and inspiration, it helps the companies to better understand customer expectations, quality services and to offer them tailored shipping solutions (CMA CGM, 2018). At the same time, various teams and inclusive cultures equality provides companies with a competitive advantage (Maersk, 2018). Companies are trying to offer equal opportunity and increase diversity in order to progress in their sectors and create a harmonious and efficient staff team (CMA CGM, 2018; Cosco, 2018; Maersk, 2018). And also, the companies are committed, based on nationality, gender, age, class, religion, race, disability, ethnic origin, color and political opinions, to eliminating all kinds of discrimination (CMA CGM, 2018; MSC, 2018). The “Diversity for better performance” Committee was established in 2017 by the CMA CGM Group. The purpose of this Committee is transform diversity into the group's source of achievements and focus on three areas: interculturality, which are aiming at improving understanding and encouraging exchanges among various foreign partners. Intergenerationality: developing knowledge and skills transfer among the various generations. Gender equality: feminize the image of the Group and reduce gender status (CMA CGM, 2018). Exposure to different cultures can enrich the lives of people (OOCL-OOIL, 2017). Similarly, Cosco (2018) provide equal opportunities in promotion, recruitment, career improving, training and education and awards, regardless of nationality, age, gender, race, religious or physical ability. Regarding this issue, at Maersk (2018), reports on employment decisions affected by factors such as gender, nationality, religion,

ethnic origin or sexual orientation have been addressed through internal complaints systems. When the sustainability reports are examined, it is seen that especially female employees are encouraged by companies. In building a sustainable future, equal opportunities between women and men are an important factor. This is one of the 17 objectives on which the UN Sustainable Development Agenda, committed by countries around the world, is founded. In addition, under the theme "Empowering Women in the Maritime Community" the international maritime community and the IMO celebrate the yearly World Maritime Day. Because of the experience, diversity is better for management, teamwork and business performance (URL-3).

R10. Establishment of a Crew Welfare Department: Ensuring the well-being of the crew working at sea is important for companies. Companies are responsible for meeting Maritime Labour Convention (MLC) requirements. At the same time, it must take every precaution for the welfare of the crew so that seafarers adopt ships and make their lives easier. In this regard, MSC (2018) has established a "Crew Welfare Department" with a compatible MLC inspector to provide sufficient standards in line with the MLC on its ships, and to create a good working atmosphere. With this department, it is aimed to monitor and inspect the compliance of ships with MLC. In addition, working in coordination with other relevant departments to raise recognition about reporting procedures, complaints and process offered to seafarers is considered to contribute to the process (MSC, 2018).

R11. Understandable Contract: There are many seafarers of different nationalities working on ships that host a multicultural work environment. It is very important to determine the conditions under which these seafarers will work, with a clear and understandable employment contract. Working conditions on ship are regulated are regulated by a valid Seafarers' Employment Agreement (SEA) in accordance with the relevant Collective Bargaining Agreements (CBAs) and are duly explained to all seafarers at all times prior to signing this contract (MSC, 2018). Cosco (2018) emphasized that employees should enjoy the freedom of association and collective bargaining in accordance with the law.

R12. Medical Coverage and Medical Benefits: Medical care and health benefits are provided to seafarers while on ship and also during their holiday in their country (MSC, 2018). In the open sea, it can always be the case that any seafarer needs immediate medical attention. In such medical emergency cases, Hapag-Lloyd (2017) aimed to create a telemedicine method. Thus, a visual and auditory connection was established between the doctors in the company and the crew of the ship, enabling the patient to be intervened remotely. Basic information such as the type of injury and vital signs of the patient is transmitted by e-mail and telephone (Hapag Lloyd, 2017).

R13. Social Insurances and Benefits: Emphasis is placed on a multi-level insurance assistance system to provide seafarers with effective guarantees and to improve team solidarity and integrity. On this issue, Labor Insurance Management Procedures have been formed by the Cosco shipping. In addition, with regard to statutory benefits, the company emphasized the importance of fulfilling statutory obligations and responsibilities, full and timely payments for social insurance (Cosco, 2018). It is also an important issue that companies regularly provide legal consultancy to employees in order to assist employees in legal matters regarding the protection of their rights and to increase their awareness (Cosco, 2018). In addition to social insurances, Hapag-Lloyd (2017) appears to have an extra monthly salary and paid leave policy in specific cases, such as after the birth of the child. The OOCL-OOIL (2017) put emphasis on health insurance and pension funds to provide that seafarers are well cared for.

R14. Access to the Internet: Providing internet access for personal use by seafarers who are away from their families and social environment for a long time is an important issue for the crew. Providing internet access for personal use, according to a survey conducted by International Chamber of Shipping (ICS) and European Community Shipowners 'Associations (ECSA) with support from the Asian Shipowners' Association (ASA), it was observed that the seafarers participating in the study increased their mental health and well-being by 60% and their morale by 69% (URL-4). Seafarers' access to online services and social media while on ship is a priority for seafarers trying to communicate with family and others. Seafarers' access to social media and online services while on board is a priority for crew trying to communicate with friends and family. Therefore, MSC appears to

invest in the necessary hardware and software to maintain seafarers' morale and satisfaction and keep the crew connected to the world through the internet (MSC, 2018).

R15. Collaboration with Universities and Secondary Education: Collaboration with university and secondary education offers students the opportunity to get to know the companies and the sector closely. It can also create various job opportunities for students who want to work at sea. Regarding this cooperation, CMA CGM (2018) states that there are joint initiatives in the form of conferences, speeches by experts at the university courses, roundtable discussions and business projects. OOCL-OOIL (2017) emphasized the importance of supporting research projects of universities and providing internships, mentorship, sponsorship and personal development programs to students through collaboration. And also, MSC (2018) states that by making bilateral internship agreements with public schools, which includes a mentoring program, it enables students to learn the competence and technical skills required for work.

R16. Set up a Land-Sea-Land Career Management System: For seafarers, in addition to the natural difficulties of working on the ship, their stay away from their families and social life, the stresses created by their work, etc. for reasons many seafarers consider working on land. Seafarers who work on the ship for a certain period of time and achieve professional competence are assigned to departments on land within the company, ensuring that they do not stay away from social life. Thus, various opportunities are created for the career development of seafarers. In addition, departments on land are provided with a better understanding of the work done on the sea side. CMA CGM (2018) stated that by establishing a "land-sea-land" career management system for officers of its fleet, it offers job opportunities in the head office to facilitate discussions between departments and provide them with career opportunities on land.

R17. Set up a Psychological Support Unit: CMA CGM (2018) mentions the importance of establishing a psychological support unit to prevent psycho-social risks in the workplace, to optimize work processes and procedures and to improve life at work for employees. The priority areas to be worked on are the work environment, employee guidance and social climate. The unit is available 24/7 by phone or online and is a fully secret area for workers to speech to somebody of their selection. Preventive programs have been established

to measure, analyze and monitor psycho-social risks. Together with the occupational psychologist, emphasis was placed on training managers on identifying risk factors in the workplace, emotional and relational intelligence and supporting employees with difficulties (CMA CGM, 2018). In addition, CMA CGM, (2018) is stated that a support process is implemented, including various meetings between the manager, human resources, and occupational psychologist, to help employees return from their long-term absences (CMA CGM, 2018).

R18. Recreational Activity: Recreational activities play an important role in helping seafarers socialize on board, optimize their physical performance and health and decrease the accident number. When the applications of the firms on this issue are investigated, it is seen that CMA CGM (2018) has received consultancy services from a company that is an expert sports and performance center and approaches this issue more professionally. A three-month pilot implementation was conducted on a ship receiving consultancy, and there was a 40 percent improvement in the physical condition of the seafarers (CMA CGM, 2018). MSC (2018) also emphasizes the importance of training and communicating seafarers on the advantage of physical activity on ship and during holiday. Cosco (2018) emphasizes the importance of equipping ships with sports facilities or gymnasiums to encourage the seafarer to remain physically active on ship and socialize with tournaments, games and other activities among seafarers.

R19. Short Deployment and Flexible Working Time: Factors such as seafarers' finding themselves in limited areas of a ship where social life is almost nonexistent, family longing and loneliness negatively affect them. Therefore, it is an important issue in terms of the sustainability of the maritime labor force to organize short deployment periods for seafarers and to create flexible working times based on their special days. With their commitment and competence, all seafarers make an important contribution to the success of companies. Accordingly, providing them with attractive working conditions and development opportunities, flexible working time arrangements for a better work-life balance play a significant role in attracting qualified and motivated people in the future (Hamburg Sud, 2017).

R20. Quality and Quantity of Food: Another important issue that seafarers care about while on board is adequate and quality nutrition. Perhaps one of the greatest pleasures of the crew on board. Working together of seafarers of different nationalities, cultures and religions is an important factor to produce food suitable for their culture. According to the World Health Organization's (WHO) guidelines on sult, sugar and saturated fat, nutrition and meal planning is an issue that should be followed in terms of the amount of calories seafarers should take daily (MSC, 2018). When MSC's sustainability reports were examined, it was revealed that the satisfaction of the seafarer with the diet on ship was increased according to the crew engagement survey (MSC, 2018). In the CMA CGM (2018) sustainability report, it emphasizes that direct supply of ships without using the services of a shipchandler has achieved positive results in terms of both food quality and prices.

R21. Creating A Positive Work Environment: Creating a positive work environment is a significant issue to foster open communication on board (MSC, 2018). Especially, creating a warm environment between departments and among employees can increase employees' belonging to the company. Various activities can be organized to make this happen. For example, Hapag Lloyd (2017) organizes events during holidays to strengthen the relation between land and sea workers. Employees are also permitted to visit Hapag Lloyd ships on a regular basis to gain a better understanding of their colleagues' work at sea (Hapag Lloyd, 2017).

R22. Repatriation: Seafarers must be safely repatriation by covering their travel, subsistence and essential expenses due to the termination of their service contracts abroad or due to obligatory circumstances such as illness or accident. MSC sustainability reports state that the costs of repatriation arrangements are covered, as appropriate, following the completion of the employment contract of the staff working onboard or in cases of work illness. The report also states that seafarers who need to leave the ship for medical reasons receive high quality medical care and are paid sick pay in a timely manner in accordance with applicable CBA terms and conditions and legal requirements (MSC, 2018).

R23. Fair Warning of Ship Departures: Seafarers returning to their homes after long working periods can be sent back to the ship by the company in a very short time while trying to adapt to the land and social life. And also, these situations can happen suddenly. In order for seafarers to both have enough rest and fulfill their responsibilities related to their family and environment, it is an important issue to be informed in advance within a reasonable time of the date of joining the ship after an adequate period of leave. With regard to the matter, the CMA CGM (2018) stressed that seafarers need fair warning of ship departures, except in case of emergency, in order to make family arrangements.

R24. Compensation: Special attention should be paid to the liability and compensation of seafarers for death and personal injury (MSC, 2018). Under the "employment terms and conditions" guideline policy created by the OOCL, emphasis is placed on benefits and compensations related to holidays, leave right, and rest periods (OOCL-OOIL, 2017). And also, Cosco (2018) emphasizes that great attention should be paid to the conservation of rights and interests and to provide reasonable compensation and benefits for employees.

R25. The Popularization of Marine Culture: In order to have a sustainable maritime workforce, it is necessary to transfer the marine culture to future generations through joint initiatives by both the public and maritime companies. In Evergreen's (2016) sustainability reports, it emphasizes that it attaches importance to the training of new generation sailing talents. Through the foundation established by Evergreen, they aim to expand the vision of children through education by visiting schools in remote villages and to explain the living conditions and working environment on board. With Evergreen Marine, it was aimed to benefit young people by giving various career lessons on “Away from poverty by sailing - Create A Golden Shipping Line for Yourself”. In addition, it is stated that various promotional and educational activities as well as marine culture lessons are held at the Evergreen Marine Museum. Regular sponsorship is provided to school children in remote villages to visit the museum and activities such as a sea painting contest, sailing camp, teachers' workshop camp are aimed at increasing the interest of young people in marine culture (Evergreen, 2016).

5. MATERIALS AND METHODS

In this thesis, first of all, sustainability reports prepared by ship operators that have important shares in maritime transportation based on the generally accepted Global Reporting Initiatives (GRI) and MLC requirements were examined in-depth and the indicators related to the social dimension of the concept of sustainability were determined.

The sustainability reports of shipping companies were examined and 147 indicators were obtained at the first stage. In the following process, the indicators that were emphasized and important by the companies were determined and both the indicators meeting on the common ground and the special but important indicators within the company were revealed. These indicators were formed as 9 expectations and 25 requirements that could correspond to them.

In the next step, the Optimal Card Sorting software program was used to draw the general framework of expectations by consulting experts' opinions. Thus, both the consensus and consistency of the experts were measured with this software program.

The indicators related to the finalized expectations constitute the input part on the left side of the Quality House, and the requirements constitute the upper part. The FAHP method was used because the uncertainties were eliminated in the weighting of Quality House inputs (expectations) and gave more precise results. On the right side of the quality house is the analysis of expert evaluations. According to the subject of the study, these evaluations were determined as satisfaction ratings, improvement rates and impact ratings. Fuzzy numbers are also used to evaluate these parameters. In the center of the quality house, the degree to which requirements meet expectations by creating a matrix of relationships was again revealed using fuzzy numbers. The final step of the quality house is the final part

of the evaluation and comparison. As a result of the calculations made here, strategic results were achieved by prioritizing the requirements.

5.1. The Proposed Model for Sustainability of Maritime Labor Force

Figure 1 shows the process steps for the model proposal. Accordingly, the first pillar of the model proposal was the data collection process. After reviewing the literature on the subject, GRI, which will be the basis for sustainability reports, and MLC, which is a convention directly related to the subject of the study, were examined. In the later process, the reports of the ship's operators were examined and the data collected were analyzed. As a result of this analysis, both expectations were determined and requirements that would meet the expectations were created in the first stage.

At the other stage, the indicators determined were entered into the Optimal Card Sorting program. The Hybrid method was used in the program, allowing experts to add or subtract categories created by the author. This process was done based on the idea that some cards in the requirements (cards) may be in the main category. As a result of card sorting, the general framework for expectations and requirements was drawn up. At the same time, both the consensus and consistency of experts were measured with the Optimal Card Sorting program.

FAHP method was used to determine the importance of expectations. A questionnaire was prepared for binary comparisons of indicators related to expectations, and experts were asked to compare each item with the others. As a result of the calculations, expectations were prioritized. The degree of satisfaction and the degree of impact on the right side of the Quality House was obtained through a survey by contacting experts. As a result of the calculations in the Quality House, the absolute and relative weights of the expectations were calculated. In the next step, the relationship between expectations and requirements was determined. As a first step here, a questionnaire containing expectations and requirements was created and experts were asked whether each expectation was related to each requirement, if any, the relationship degrees were asked to be written. The resulting values were converted to fuzzy numbers and the process continued. In the last step, all

parameters in the quality house were converted to crisp numbers and the absolute and relative importance of the requirements were calculated.

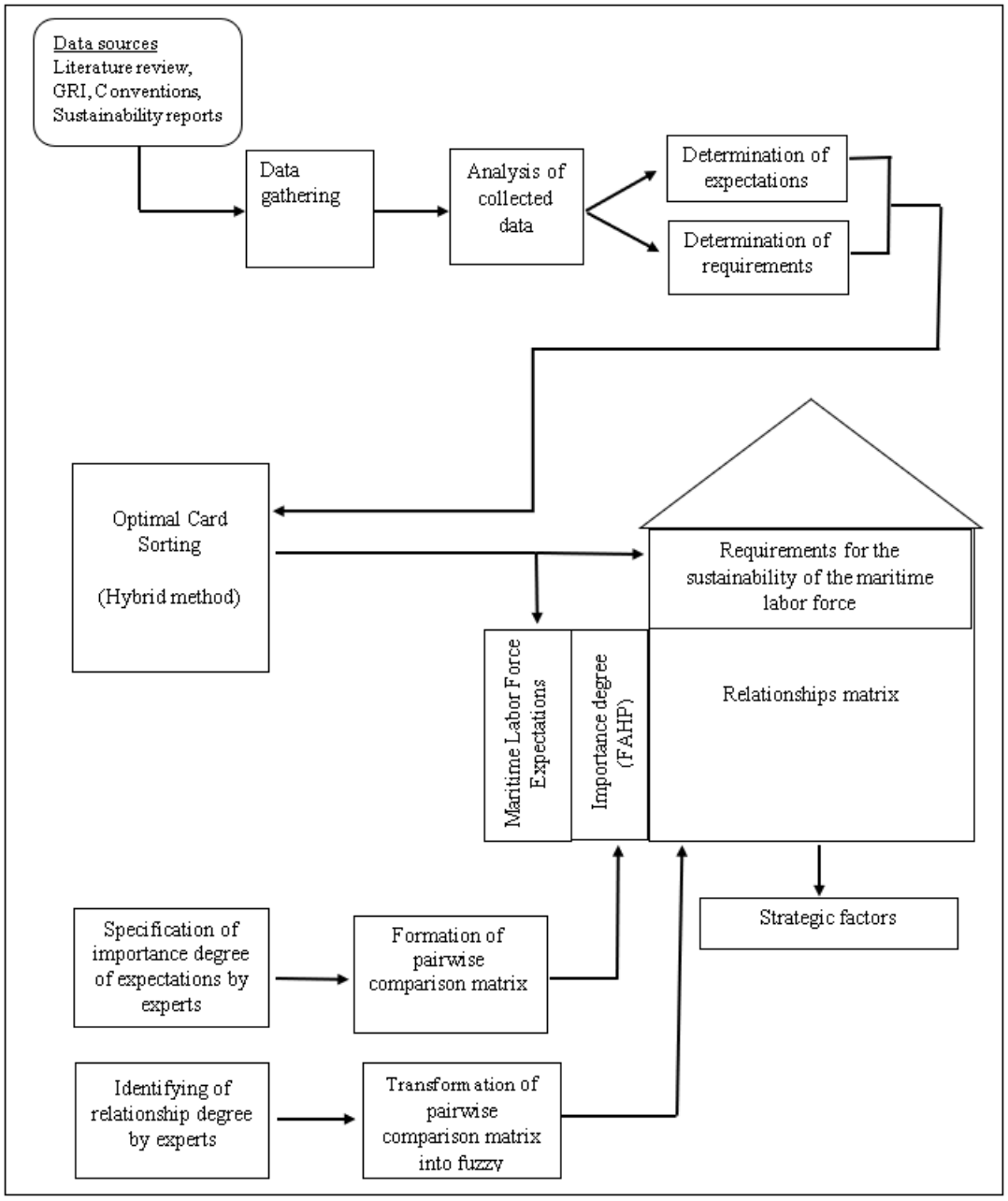

Figure 1. Steps of the proposed sustainability model for the maritime labor force.

5.2. Quality Function Deployment (QFD) and its Historical Development

Quality function deployment is a systematic method to transform customers' expectations (voice) into the final product through various product planning, production stages, and engineering to achieve customer satisfaction (Kozanoğlu, 2009). QFD convert consumer needs into product design feature to increase consumer pleasure (Uppalanchi, 2010). QFD is a customer-focused quality methodology that essentially converts customer requests into measurable performance changes, assisting to obtain an optimized process and a good deploy and sales channel. Researches have shown that QFD decreases the problems encountered in production or service-related processes by half, shortens the design process and rise the rate of profitability (Güllü & Ulcay, 2002). Quality function deployment is used to determine the design features of a product to meet the customer's needs, as well as to prioritize those features and then select the most significant features in the design process. To develop a quality product or service, it helps customers make basic tradeoffs between their needs and the technical requirements that can meet those needs. Therefore, quality function deployment is not only a methodological tool, but also a universal concept that provides a tool for translating customer needs at every stage of service and product development (Uppalanchi, 2010). Ideally, each translating uses a graphic called the “House of Quality” (HoQ), which is a popular design tool. A quality house contains information on performance characteristics or relationships between customer needs and design requirements. The main purpose of the QFD application is to determine the target values of the design requirements for a new product or a product to be developed based on the information found in a quality house (Kozanoğlu, 2009).

QFD method was first appeared in Japan. The term QFD, which consists of the words “Hin shitsu”, “Ki nou” and “Ten kai” in Japanese, was first translated into English as “Quality Function Deployment” (Guinta & Praizler, 1993). QFD was developed by Professors Shigeru Mizuno and Yoji Akao in the late 1960s. According to Akao (1990), QFD is the method that aims to meet the demands of the consumers and make these requests an important quality assurance, make it necessary to use this understanding at every point of production, and aim to improve the design quality for the final product. The aim of professors Mizuno and Akao was to develop a quality assurance method that would design consumer pleasure before a product was produced (Kozanoğlu, 2009). The first article on QFD was a

work by Akao in 1972 titled “Development and Quality Assurance of New Products: A System of Quality Deployment”. Akao understood the value of this approach and put forward the idea of transforming product design characteristics into specific quality control points in production quality control schemes in order to benefit from its power in the product design process. Akao has named the QFD approach as "Hinshitsu Tenkai (Quality Deployment)" in this article and explained this approach in a systematic way (Kelesbayev, 2014). QFD has emerged in order to meet customer demands during shipbuilding processes in Japan. In 1972, quality tables created by Mizuno and Furukawa were used at the Kobe shipyard owned by Mitsubishi Heavy Industries. These tables show the systematization of customer requests based on functions and the relationships between these functions and quality characteristics. All these ideas and developments are integrated and at the end Quality Function has been shaped (Akao, 1997). America and other countries of the world met with QFD as a result of the success achieved by Toyota Group in 1977-84 by applying this method. Roof matrix was used in quality tables created for the first time in Toyota Group, and Tsuneo Sawada used the term "Quality House" for quality tables while making a presentation at the research conference of the Japanese Quality Control Society in 1979. Today, QFD is seen as a method and a quality system that is accepted in the world used by all kinds of researchers, industries and enterprises (Kelesbayev, 2014).

5.2.1. Literature Review on QFD

The main objectives and functions of QFD stand out as product development, quality management and consumer wants analysis (Akkoyun, 2016). The QFD methodology can also be used for product design or product development, decision making, costing, a new service, an existing product, investment planning, engineering, process management, teamwork and even policy management (Güllü & Ulcay, 2002). There are many studies in the literature since QFD is a method that has proven its effectiveness by businesses and is a popular approach. It is seen in the literature that many authors and researchers have carried out studies in various fields related to QFD. Some of these are given below.

Govers (1996), discussed the emergence and spread of the QFD method. The application areas of the method and the Quality House approach have been summarized in 10 steps. Güllü&Ulcay (2002), the implementation stages of the Quality Function Deployment (QFD) are mentioned and it has been shown how to evaluate the results by applying this application to a company. In the study conducted by Chan and Wu (2002), publications on the emergence and development of QFD, its use and application areas were examined. Celik et al. (2009) in their studies on ship investment decisions in the crude oil tanker market were determined together with the QFD using methods such as FAHP and FAD. Liu (2009) in the article proposed an extended fuzzy QFD approach to product development from product planning. In the proposed approach, α cutting operations are used for fuzzy set calculations. Kozanoğlu (2009) in his doctoral thesis, he proposed a model of personnel selection based on fuzzy quality function propagation by examining fuzzy quality function propagation and fuzzy multi-criteria decision making approaches in the process of selecting personnel suitable for Human Resources. The fuzzy logic approach was used to model the uncertainty that may occur. Lam (2015) in a container ship operator application, the customer requirements and their corresponding solution suggestions using an integrated model such as QFD-ANP revealed. Lam&Lai (2015) in their study, customer demands were determined in line with the environmental performances of ship operators, and the requirements were determined by using an integrated model such as QFD-ANP. Akkoyun (2016) in his thesis, an integrated model with fuzzy logic and QFD is used.

As can be seen from the literature review, it has been observed that the emergence and historical development process of QFD were discussed in most of the studies conducted by the researchers. At the same time, the quality house method, the main application method of the QFD approach, has been the application subject of most studies. In addition, it is observed that methods such as fuzzy logic, FAHP, ANP are used to determine the importance degree of quality house inputs and eliminate uncertainties.

5.2.2. QFD Team Composed for the Evaluation of Indicators

The QFD team was created of the highest qualified experts among seafarers. The reason for this is that all expectations of the ship's employees are first gathered at their superiors and then delivered to the captain and the company authorities on land. Also, the "Shipboard Complaint Form", which is created in accordance with MLC and where the seafarers' complaints and requests are stated, is read and evaluated by the captain. Therefore, all requests from the ordinary seaman to the officer are within the knowledge of the captain and authorized managers on land. It was also thought that these authorized persons would respond by including their own experiences.

Each of the experts were selected from the Captain and the Chief Engineers. In addition to this qualification, it was created from people who worked at sea for an average of 15 years and more and then worked as a human resources manager in ship operators or a manager position in other departments. In addition, among the experts with these professional experiences, there were experts working as academics at universities or working in the academic field. Information about the experts is given in Table 1.

Table 1. Information on experts in the QFD team.

QFD TEAM	**AREAS OF EXPERTISE**			
	Oceangoing Master	**Oceangoing Chief Engineer**	**Experts Working in the Academic Field**	**Company Executives (H.R., DPA, Technical Manager, etc.)**
Expert 1	√			√
Expert 2		√	√	√
Expert 3	√		√	√
Expert 4	√		√	√
Expert 5	√		√	
Expert 6		√	√	√
Expert 7	√			√
Expert 8	√			√
Expert 9	√		√	√
Expert 10	√		√	

First of all, experts were asked to evaluate the indicators obtained as a result of literature review and examination of sustainability reports with the optimal card sorting program. Then, a meeting was held on the determined day and time and they were evaluated the importance, satisfaction and impact degrees of the expectations used in the quality house. In the last phase of the meeting, the determination of the relationship matrix between expectations and requirements was made by the experts.

5.3. Card Sorting

Card sorting methodology is used to form and asses a harmony between an knowledge structure and the mental models of the objective group that will enable them to easily find, comment and apply information (Jong et al., 2020). In addition, previous research has shown that mental models can provide valuable insights into how they fit into other types of information structuring, such as items in a questionnaire (Jong et al., 2020). Card sorting is an interactive research method aimed at understanding how participants understand and organize concepts. Card sorting is a well-developed method of computing often for obtaining information (Skillen, 2019). And also, card sorting is a well-established research technique for exploring how people understand and classify information. When making a card classification, participants work with a set of cards or objects, each representing one item. In a card sort, participants treat item names as given and participants should be familiar with the items (Maiden, 2009). While card sorting shows how people understand different concepts or ideas, it also helps them sort or organize items according to set criteria. Card sorting provides insight into how people group or categorize thoughts, which enables to make safe and more informed decisions. By defining common groups with extensive and live visualizations, this data can be used to support design changes and recommendations (URL-2). In the social sciences, card sorting is a participant research method that purposes to involve participants in the joint development of conceptual categories and definitions and to information their approach and organization to the subjects (Conrad et al., 2019). The participant is given a group of cards with terms, objects or shapes on them to categorize (Skillen, 2019). Then the participants sort the cards into categories. When making each sorting, the participants give the sorting criteria, more than two card

groups resulting from the sorting, the name of each category attributed to each card group, and the cards within the category. So analysts can use card sorting to learn about which cards are similar and which are dissimilar (Maiden, 2009). These changes frequently drive the degree to which a searcher pre-identifies the labels displayed by the cards and the categories for which they are ranked in the variation label. In cases where the participant invites card labels or categories with card sorting methods, the resulting datasets can be best analyzed qualitatively, while Card Sorting studies that determine card labels or categories can table the results numerically for quantitative analysis, such as similarity matrices. Card sorting is an object-based method for providing more recall during practice and offers first-hand contact with intangible or seldom expressed concepts (Conrad et al., 2019). In addition, card sorting involves several methods aimed at understanding the subjectivity of participants. From techniques used in the fields of computer science and software to academic variations in social science research, as well as card sorting methods for therapeutic approaches and educational design, are used to create various data sets for quantitative, qualitative or mixed method analysis (Conrad et al., 2019).

In this study, in particular, card sorting methodology was applied to evaluate and validate indicators. In the card sorting, this was determined by assessing how many participants grouped every item in the intended structure. In the card sort, this was evaluated by analyzing how the items were grouped and placed in structures by the participants themselves, according to their mental models. The resulting groups provide insight into the participants' mental models of these structures, including an agreement or disagreement between users.

5.3.1. Card Sorting Types

Card sorting involves creating a series of cards representing various concepts asking participants to group them in a way that makes sense to them. Depending on what kind of information is desired to be accessed, an open, closed or hybrid card sorting technique is used. Generally, three types of card sort techniques are used: open, closed and hybrid (URL-2).

Open card sort: Participants sort the cards into categories that are meaningful to them and label each category themselves.

Closed card sort: Participants sort the cards into given categories.

Hybrid card sort: Participants divide the cards into the categories given to them and can also create their own categories.

In this study, hybrid card sorts were used, as it allows experts to divide the cards into categories given to them and create their own categories. Because experts may think some of the cards may be categories. Thus, the experts were given the opportunity to create their own categories.

5.3.2. Advantages of Hybrid Card Sort

In a hybrid card sort, it allows participants to sort the cards and create their own categories. If there are several categories, the hybrid card sort can be used. This means that people will be able to use pre-created categories as well as create new categories to complete card sorting. Hybrid card sorting can be used if a category model is desired to generate ideas and inspire people to group information. It also provides an opportunity to see if attendees have created better category labels than previously created categories (URL-2).

In qualitative interviews, hybrid card sorting offers additional elasticity, permit people to think and answer at their own pace, review their sorting decisions. Whether adapting methods from psychology, computer science or some of the intersections here, card sorting techniques in interviews are often noted to be very useful in studying various concepts and approaches to organizing expressions (Conrad et al., 2019).

Indicators obtained by the Optimal Card Sorting method are analyzed with visuals such as Similarity Matrix, Dendrograms, 3D Cluster View.

5.3.3. Similarity Matrix

The similarity matrix is a simple representation of pair combinations aimed at giving a quick idea of the cards that participants match most frequently in the same group. The darker the blue at the intersection of the two cards means that the more often they are matched by participants. And also, the similarity matrix displays the percentage of peoples who group the two cards together. The degree of agreement of the participants on the cards is determined according to the darkness of the blue and the size of the cluster (URL-2).

5.3.4. Dendrograms

For hybrid card types, two different dendrograms are used to interpret card sorting. The first of these is the Actual Agreement Method (AAM), which is very useful when it comes to participant 30 or more (URL-2). The other is the Best Merge Method (BMM), which is very useful when it comes to less participant (URL-2). Since the number of participants in the study was 10, BMM was used.

The BMM dendrogram makes assumptions about larger clusters based on pair relationships saying that “X% of respondents participate in some parts of this grouping”. The BMM algorithm divides each sample of a category from each participant into its base pairs. The pair with the highest points is fixed. This situation repeats and when the pinned pair intersects with an existing fixed category, it is agglomerated with that category. Later, all subsets of this newly formed category are eliminated (URL-2).

5.3.5. Optimal Sort 3D Cluster View

The 3D cluster view (3DCV) visualizes the similarity between cards as three-dimensional spatial relationships. Each point in the visualization represents an individual card. It is seen that cards that are close to each other are sorted in the same category more

often. The further apart that any 2 cards appear, the less frequently they were sorted together (URL-2).

Polygons are shown over groups of cards that are clustered together. Each of these groups can be interpreted as a potential category within information architecture. These are derived from looking at how many participants created similar categories to a particular group and comparing the most common labels that participants gave these categories. The 3DCV combines aspects of both the similarity matrix and the dendrograms by visualizing the similarity between cards and potential groupings of cards (URL-2).

5.3.5.1. Working Principle of 3DCV

The 3DCV is a method for visualizing similarity between individual points in a dataset in a more meaningful way. The 3DCV algorithm projects a dataset with many dimensions (represented by a distance matrix) into a lower-dimensional space while maintaining the relationships between points in the dataset. The distance matrix can be derived from the similarity matrix where each point in the dataset is an individual card. This means that a card sort with 50 cards would generate a 50 by 50 distance matrix, resulting in 50 dimensions. The 3DCV method projects this down to 3 dimensions which is much easier to visualize, while still maintaining the relationships between cards. Then uses a hierarchical clustering method to separate the cards into a hierarchy of groups, similar to the structure of a dendrogram. Groups are divided in a way that ensures that the most similar cards are grouped together. Each level of the hierarchy corresponds to the number of groups displayed. At the top level there is one group containing all of the cards, at the second level there are 2 groups that together contain all of the cards, and so on. The grouping slider changes the level of the hierarchy that is currently displayed while combining or splitting groups navigates individual branches of the hierarchy (URL-2).

5.3.5.2. Comparison of 3D Cluster View with Other Analysis Methods

While the 3D cluster view (3DCV) combines aspects of both the similarity matrix and the dendrograms by visualizing the similarity between cards and potential groupings of cards, there are some key differences between these analysis methods. Both the 3DCV and the similarity matrix show the similarity between cards, however, the 3DCV also shows similarity as a spatial relationship between each card, which the similarity matrix does not. Both the 3DCV and the dendrograms show clusters of potential groupings based on hierarchical analysis, however, the 3DCV shows the spatial relationships between these clusters, which the dendrograms do not. The 3DCV provides a new perspective of card sort results by presenting these relationships in three-dimensional space (URL-2).

5.4. Fuzzy Logic

Fuzzy logic emerged for the first time with the article "Fuzzy Sets" published by the Azeri scientist Lotfi A. Zadeh in 1965. Zadeh (1965) proposed the use of fuzzy set theory as a modeling appliance for complicated systems that people can control yet are difficult to precisely describe. Zadeh stated that the membership degrees of object classes encountered in real life are not precisely described, and that the dual logic system represented by 0 and 1 is inadequate to express these thoughts, referring to the blurring of people thought (Zadeh, 1965). And also, the degree of cluster belonging varies between 0 and 1, and 0 means not belonging to the cluster and 1 means belonging to the cluster. And also, any number between these two values indicates the membership degree or partial membership of the object in the set. The degree of belonging to the set may be described by standard functions such as bell shaped, trapezoid, sigmoidal, triangle and Gaussian curve or it can be created by using many different functions (Başlıgil, 2005; Başkaya, 2011).

The difference of fuzzy logic from similar approaches is that it can use verbal variables (Şengül et al., 2012). Verbal variables enable the concepts that cannot be expressed openly to be described approximately. In this way, the use of fuzzy sets becomes a tool to express linguistic expressions mathematically (Şengül et al., 2012).

5.4.1. Fuzzy Set Theory

Zadeh's (1965) fuzzy set theory is a mathematical theory created to eliminate the uncertainty of human cognitive processes. Fuzzy set theory refers to mathematically ambiguous or imprecise judgments. Fuzzy set theory is designed to arrive at the primary possible conclusion from a large number of uncertain knowledges. Fuzzy set theory considers uncertain data as probability dispersions in terms of set membership (Alinezad et al., 2013). A fuzzy set enables the identification of intermediate values between traditional evaluations such as yes / no, true / false, high / low. Concepts like quite true, very true, mostly false, fairly long or very quick can be mathematically formulated and processed by computers (Zadeh, 1985).

A fuzzy set may be described mathematically by assigning to every likely item in the universe of discourse a worth representing its grade of membership to the fuzzy set (Kozanoğlu, 2009). In fuzzy sets, an item can be a partial member of a set. The degree of membership is defined by a generalized typical function named the membership function (Kasabov, 1995).

In the fuzzy approximation, cluster elements are defined with the help of a membership degree function μ (x), which indicates their degree of belonging to their cluster. Elements may belong to different sets to different degrees. If the membership degree of the set A ∈ X is considered as real numbers in the range [0,1], the set A is called a fuzzy set and is denoted as Ã. Zade (1965) defined the fuzzy set Ã as follows:

$$\tilde{A} = \{ (x, \mu\tilde{A}(x)) \mid x \in X \} \quad (1)$$

5.4.2. Fuzzy Numbers

Fuzzy numbers, which are elements of fuzzy sets, are used to describe linguistic expressions and variables. Linguistic expressions can be converted into fuzzy numbers and processed numerically. Linguistic expressions in this form can be exemplified as "temperature around 20 degrees", "distance about 50 meters". In such cases, the fuzzy numbers represent evaluations that cannot be expressed precisely. The aim here is to perform numerical operations with ambiguous linguistic expressions (Akkoyun, 2016).

In this study, the triangular membership function is used. Because, triangle fuzzy numbers (TFNs) are widely used due to their simplicity, computational efficiency and popularity among fuzzy logic practitioners (Yen & Langari, 1999). The triangle membership function is defined by three parameters. If these parameters are taken as L, M, U, the components shape of the triangular membership function are given Figure 2.

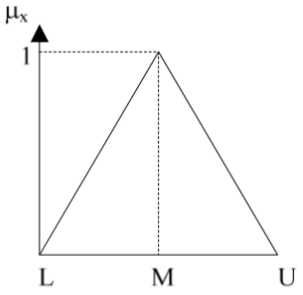

Figure 2. Membership function for a TFNs

A triangular fuzzy number is a private class of fuzzy numbers whose membership described by three real numbers, expressed as (l, m, u). The triangular fuzzy numbers are shown as follows (Kozanoğlu, 2009).

$$\mu_{\tilde{M}}(x) = \begin{cases} 0, & x < l \\ \dfrac{x-l}{m-l}, & l \le x \le m \\ \dfrac{u-x}{u-m}, & m \le x \le u \\ 0, & x > u \end{cases} \tag{2}$$

In various applications, it is necessary to convert the fuzzy results that occur as a result of the operations with fuzzy numbers to crisp values in order to obtain an understandable result (Akkoyun, 2016). Kwong and Bai (2003) revealed that triangular fuzzy numbers can be defuzzification by the following formula. A triangular fuzzy number, denoted as M = (l, m, u), can be defuzzified to a crisp number as follows (Kwong & Bai, 2003):

$$M\ crisp = (4m + l + u)/6 \quad (3)$$

5.5. Fuzzy Logic and Quality Function Deployment Relationship

In traditional QFD, most input variables are considered to be exact and thought of as numerical data. Besides, QFD; as an approach that transforms customer needs into product features, it needs linguistic data in situations of uncertainty. In addition, customer preferences are often blurred and uncertain (Akkoyun, 2016). Fuzzy logic approach is a method used to eliminate the uncertainties caused by such intellectual concepts.

Quality house, the application method of QFD, is a matrix system that reveals the relationship between the requirements determined to meet the demands of the customers. Building the quality house with fuzzy logic approach is frequently used to eliminate uncertainties in consumer demands. The data obtained from the consumers constitute the inputs of the quality house and the process steps are continued by converting these data into fuzzy numbers.

In the study, customer expectations were considered as the expectations of the maritime labor force. The uncertainties in the demands of the maritime labor force were eliminated by making transactions with fuzzy numbers between expectations and requirements in the relationship matrix.

5.6. Fuzzy Analytic Hierarchy Process (FAHP)

The FAHP technique can be seen as a more advanced analytical method developed from AHP (Kozanoğlu, 2009). Although the AHP method handles the knowledge of experts, it does not reflect the human way of thinking. Unlike AHP where net values are used, in FAHP comparison rates are given in a range of values (Ertuğrul, 2007). AHP does not consider the uncertainties that may exist concerning the options or the decision in the assessments accomplished, and this situation importantly impacts the decision to be made (Cheng, 1996). Since the Analytical Hierarchical Process (AHP), which is one of the multi-criteria decision making methods, is not fully suitable for decision making in the case of uncertainty, the Fuzzy Analytic Hierarchical Process has been introduced by combining AHP with fuzzy logic (Göksu & Güngör, 2008). It would be more appropriate for experts to give their opinions on a subject through verbal evaluations instead of a definite number. These verbal evaluations are triangular fuzzy numbers that indicate the range of judgment (Alp & Gündoğdu, 2012). There are many FAHP applications in the literature. In FAHP applications, researchers have presented various methods using fuzzy set theory to determine the best option or to rank options in a multi-criteria environment (Şengül et al., 2012). Among them, Buckley (1985) developed a model using trapezoidal membership functions, Boender, et al. (1989) worked on local priority normalization, and the extended fuzzy AHP method proposed by Chang (1996) was used. In addition to using artificial degree values, this method is distinguished by simple level ranking and mixed total ranking. The most advantageous aspect of this method is that the account requirement is minimal and does not require additional processing by following the steps of the classic AHP. The disadvantage is that it only uses fuzzy triangular numbers (Göksu & Güngör, 2008). In the literature, it is seen that Chang's extent analysis method is used in many studies. Göksu&Güngör (2008) applied the Chang's extent analysis method for university preference ranking in a fuzzy analytical hierarchical process. Bali&Gencer (2005) used FAHP Chang's extent analysis together with other methods in their work on personnel selection (Bali & Gencer, 2005). Kwong & Bai (2003) applied the Chang method in QFD to prioritize customer requirements. Şengül et al. (2012) They also used this method on vehicle selection in public transport. In this study, Chang's extent analysis method was used to determine the weights of the

expectations of the maritime labor force. The steps of this method can be summarized as follows (Chang, 1996):

Step 1: The value of fuzzy synthetic extent with respect to the i. object is calculated as:

$$S_i = \sum_{j=1}^{m} M_{g_i}^{j} \otimes \left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^{j} \right]^{-1} \tag{4}$$

To defuzzify weights calculated from equality (6), the degree of possibility method is used. Pairwise comparison is performed for each fuzzy weight with the other fuzzy weights to evaluate the degree of possibility of being greater than the other fuzzy weights.

In order to acquire $\sum_{j=1}^{m} M_{g_i}^{j}$, the fuzzy addition operation of m extent analysis values is performed for a specific matrix as below.

$$\sum_{j=1}^{m} M_{g_i}^{j} = \left(\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_j \right) \tag{5}$$

And to obtain $\left(\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^{j} \right)^{-1}$, the fuzzy addition operation of $M_{g_i}^{j}$ (j= 1,2, .., m) values is performed as below.

$$\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^{j} = \left(\sum_{i=1}^{n} l_i, \sum_{i=1}^{n} m_i, \sum_{i=1}^{n} u_i \right) \tag{6}$$

and then the inverse of the vector in equality (6) is calculated as below.

$$\left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^{j} \right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i} \right) \tag{7}$$

Step 2: The degree of possibility of $M_2 \geq M_1$ is defined as

$$V\left(M_2 \geq M_1\right) = \sup_{y \geq x} \lfloor \min\left(\mu_{M_1}(x), \mu_{M_2}(y)\right) \rfloor \tag{8}$$

It can be similarly defined as follows.

$$V\left(M_2 \geq M_1\right) = hgt(M_1 \cap M_2) = \mu_{M_2}(d)$$

$$= \begin{cases} 1, & \text{if } m_2 \geq m_1, \\ 0, & \text{if } l_1 \geq u_2, \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & \textit{otherwise}, \end{cases} \tag{9}$$

where *hgt* is the height and *d* is the ordinate of the highest intersection point between μ_{M_1} and μ_{M_2} (See Figure 3).

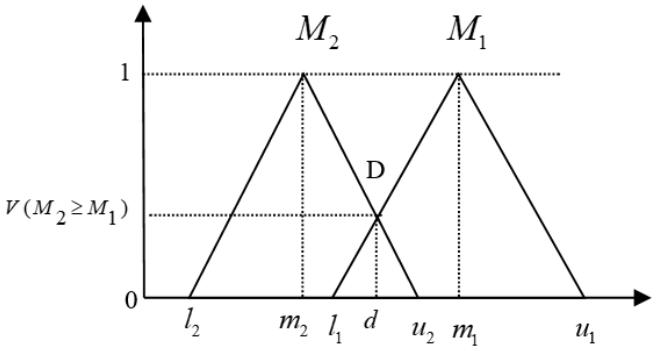

Figure 3. Intersection between *M1* and *M2* (Chang, 1996).

Both the values of $V\left(M_2 \geq M_1\right)$ and $V\left(M_1 \geq M_2\right)$ are needed to compare M_1 and M_2.

Step 3: The degree of possibility for a convex fuzzy number to be greater than *k* convex fuzzy numbers M_i *(i= 1,2,3…,k)* can be defined by

$$V\left(M \geq M_1, M_2, ..., M_k\right) = V\left[\left(M \geq M_1\right) \text{ and } (M \geq M_2) \text{ and } ... \text{ and } (M \geq M_k)\right], \\ = \min V(M \geq M_i),\ i = 1, 2, 3, ..., k. \tag{10}$$

Supposing that $d'(A_i) = \min V(S_i \geq S_k),\ k = 1,\ 2, ..., n;\ k \neq i$ (11)

Then the weight vector is defined as follows:

$$W' = (d'(A_1), d'(A_2), ..., d'(A_n))^T, \quad (12)$$

where A_i (i=1, 2, ..., n) are n elements.

Step 4: Via normalization, the normalized weight vectors are

$$W = (d(A_1), d(A_2), ..., d(A_n))^T \quad (13)$$

where W is a non-fuzzy number.

5.7. Fuzzy AHP and Quality House Relationship

Although AHP method is based on people's knowledge, it cannot reflect people's thoughts clearly. Therefore, AHP is combined with fuzzy logic to get clearer results. Unlike AHP where net values are used, comparison rates are given in a range of values in FAHP (Ertuğrul, 2007).

FAHP applications offer various methods for sorting options in a multi-criteria environment using fuzzy sets theory and hierarchical structure. For this reason, in the study, in ordering the importance levels of the expectations that constitute the input part of the quality house, the ambiguities that may arise in the opinions of the experts were tried to be removed by using the AHP method with fuzzy logic.

5.8. House of Quality (HoQ)

Quality Function Deployment; thanks to a matrix called the "house of quality", customer requests and needs; it serves to transform them into technical characteristics that best correspond to them (Yenginol, 2008). It is a complex group of matrices that form the

central structure of the QFD, that is, it is the basic tool of the QFD, and the QFD is applied on this group of matrices. The quality house got this name because it consists of various parts and a roof (Hauser & Clausing, 1988). The quality house is a popular design tool that supports decision making and knowledge processing in the design process (Olewnik & Lewis, 2008). The quality house consists of two basic components, the customer expectations on the left and the needs that may be able to offer solutions to them. First, basic customer needs are determined in the input section on the left side of the house. The next step is to determine the priority levels of customer needs. Customer evaluations are applied to the right of the house. The part just under the roof specifies the technical requirements used to meet consumer needs and expectations. The relationship matrix between customer needs and requirements forms the key structure of the quality house. The roof of the quality house describes the relationship between technical requirements. In the lower part of the quality house, technical requirements are evaluated and strategic goals are described in this matrix (Tan & Pawitra, 2001).

In applications made with the quality house, which basically consists of six parts, different processes are carried out in each part and then these parts are combined (Akkoyun, 2016). The parts of the quality house are shown and explained in Figure 4 below.

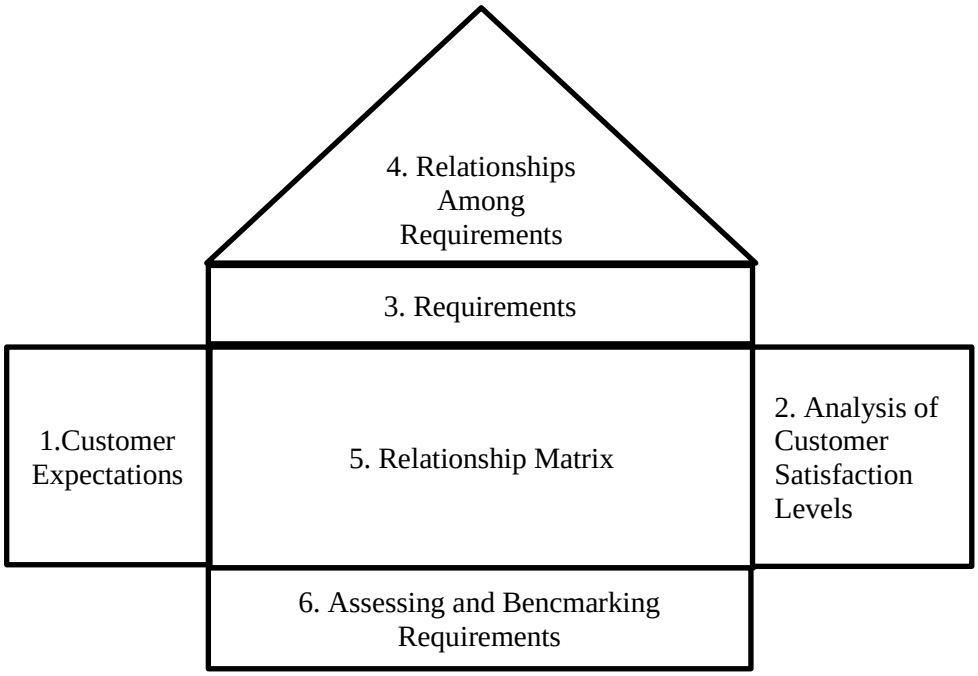

Figure 4. The parts of House of Quality, adapted from Kelesbayev (2014).

These basic elements that make up the Quality House are explained below. (Kelesbayev, 2014 ; Akkoyun, 2016 ; Güllü & Ulcay, 2002 ; Guinta & Praizler, 1993).

1. Costumer Expectations: Customer voice, also expressed as customer needs and expectations, is the starting point of QFD process. While consumer demands constitute the inputs of the quality house in the classical quality house approach, the expectations of the sustainable maritime labor force are considered as inputs in this study. In the thesis, the expectations of the maritime labor force, which are expressed as customer requests, were created with the optimal sort method after data collection and prioritized with the FAHP method. These indicators are explained in the previous section.

2. Analysis of Customer Satisfaction Levels: It consists of columns on the right side of the quality house. This matrix includes numerical data about each customer need. This section includes information such as comparisons of the firm's services with competitors, evaluations on target value and point of sale, improvement rates.

The thoughts and desires of the customers alone are not enough to make optimum planning in terms of better development of products or services. At the same time, the status of the product or service and the status of competing products should be investigated. If customer requests are met, it should be determined how this affects the salability of the product and how much improvement is needed on the product (Güllü & Ulcay, 2002).

In this section, target values are discussed for 9 criteria submitted for the evaluation of experts; with the information received and the exchange of ideas, the improvement rates were calculated for each expectation item in the quality house. Important parameters in detecting customer requests are as follows (Güllü & Ulcay, 2002);

Improvement rate: According to consumer expectations, how well the targeted new product or system is compared to the old one.

Sales advantage: It determines the effect of the improvement made on the return of the product. It usually takes the following values in the literature.

1.5: “Much increases the sales potential”

1.2: “Increases sales potential”

1.0: “Does not affect sales potential”

In general, the formulas below can be used for calculations that need to be made at this stage.

Improvement Rate = Planned Quality Level / Company Satisfaction with QFD Study (14)

Absolute Weight = Importance Rating x Improvement Rate x Sales Advantage (15)

Relative Weight (%) = (Absolute Weight of Any Line / Total Absolute Weight) x 100 (16)

If generalization is made here (Güllü & Ulcay, 2002):

$$\text{Improvement Rate: } Y_{i6} = \frac{P_{i5}}{R_{i2}} \quad (17)$$

i: line number, n: number of rows, j: column number

P_{i5} = Planned quality level of row i, column 5

R_{i2} = i. row, 2. column; expresses the satisfaction of the company doing QFD work

$$\text{Absolute Weight: } AW_i = \prod_{i=1}^{n} X_{i1.}\ Y_{i6.} Z_{i7} \quad (18)$$

$X_{i1.}$ = i. row, 1. column importance level

$Y_{i6.}$ = i. row, 6. column improvement rate

Z_{i7} = i. row, 7. column should be understood as a sales advantage.

$$\text{Relative Weight (\%): } RW_i = \frac{AW_{i8}}{\sum_{i=1}^{n} AW_{i8}}\ x\ 100 \quad (19)$$

It was shown in the previous section that the improvement rate is the ratio of the planned quality level to the company's satisfaction with the QFD study. In this application, it is assumed that the planned quality level is equivalent to the importance of the maritime labor force. Similarly, the assumption was made that the satisfaction level of the company is equivalent to the adequacy of the practices to meet the expectations. As a result, the ratio

of the degree of importance to the degree of satisfaction will be used to achieve the improvement rate. The effect of the improvement in the QFD on the yield of the product is expressed by its sales advantage. The sales advantage, on the other hand, determines how it will impact the sustainable maritime labor force by meeting the expectations of the maritime labor force. The above formulas used in QFD were revised according to the study and created as follows.

Improvement Rate = Importance Rating / Satisfaction Degree (20)

Absolute Weight = Importance Rating x Improvement Rate x Impact Degree (21)

Relative Weight (%) = (Absolute Weight of Any Line / Total Absolute Weight) x 100 (22)

For each expectation, Improvement Rates, Absolute and Relative Weight values and Impact Degree are calculated and placed in the relevant part of the quality house.

3. Requirements: It is located under the roof in the quality house. They are the design features that are put forward to meet the specified customer requests. The basic idea here is to include at least one technical feature in the matrix that will enable each customer to fulfill their wishes and needs.

In the thesis, the requirements are the solution proposals created by examining the sustainability reports of the ship operators and then included in the optimal sort method and that will meet the expectations of the maritime labor force. These indicators are explained in the previous section.

4. Relationships Among Requirements: It is the roof part of the quality house and the bilateral relationships between requirements are determined. One requirement may be related to others. The aim here is to observe the positive or negative effects of the improvements made in the requirements on other requirements. In this section, whether the solution proposals that can meet the expectations are related or not is determined. If there is a relationship, the direction and degree of the relationship are determined. Four options are generally used in determining relationships. These are “strongly positive” and “positive” for

positive relationships and “strong negative” and “negative” for negative relationships. The determined relationships are placed on the roof of the quality house, if there is no relationship, the related cells are left blank.

5. Relationship Matrix: It forms the center of the house of quality. In this section, the degree to which the requirements meet the expectations of the maritime labor force is determined one by one. If there is no relationship, the relevant cell is left blank. Here, experts were asked whether each expectation was related to each requirement or not, if any, the degree of the relationship was asked to be determined. The purpose of determining relationships is to highlight requirements that are significantly associated with expectations. Then the filled matrix is analyzed to identify the priority of customer thoughts (Güllü & Ulcay, 2002).

6. Assessing and Benchmarking Requirements: It is the conclusion part of the quality house. It is the section where the requirements are weighted in a way that will maximize customer satisfaction. Thus, strategic goals are determined by deciding which requirements should be given importance. The absolute and relative importance of each requirement in meeting the maritime labor force expectations are calculated with the formulas given below (Güllü & Ulcay, 2002).

Absolute Importance: *Mj* = Σ (Absolute Weight) x (Power of the Relation for that Row)

$$M_J = \sum_J AW_{1J.}\ I_{1j} \tag{23}$$

$$G_j = \frac{Absolute\ \text{Importance}}{\text{Total Absolute Importance}}\ x\ 100$$

$$G_j = \frac{MJ}{\sum_j MJ}\ x\ 100 \tag{24}$$

As a result of the calculations made here, the absolute importance of each column is determined. If the requirements for which columns have a higher degree of absolute importance, strategic goals are determined by focusing more on those requirements.

6. APPLICATION AND FINDINGS

In various studies in the literature, different types of quality houses are encountered. The structure of the quality house related to the social sustainability model of the maritime labor force was formed in 6 parts as shown in the previous chapter, and the implementation steps were carried out in such a way as to take these parts into account.

In the QFD application section, the experts were first asked about the importance of expectations and then analyzed with FAHP. In the next step, experts were asked to prioritize satisfaction degrees and impact degrees. The next step was to determine the matrix of relationships between expectations and requirements, which is the main part of the quality house method used as the application area of the QFD method. Here, experts were asked whether each expectation is related to each requirement, if any, they were asked to determine the degree of the relationship. In other words, only in the relations matrix, each expert made 9x25=225 evaluations. Finally, absolute and relative weights were calculated as a result of calculations in which the degree of impact and importance were included, along with the rate of improvement obtained by dividing the degree of importance by the degree of satisfaction. Formulas have been created in excel for these calculations.

6.1. Maritime Labor Force Expectations

In the classic quality house approach, customer requests constitute the inputs of the quality house, while the expectations of the maritime labor force are accepted as inputs in this study. In order to determine the expectations, the sustainability reports of companies with significant shares in maritime transport were examined. It is the degree of importance of each item that belongs to the expectations of the maritime labor force, which was previously created with the “Optimal Card Sorting” program.

6.2. Application of Optimal Card Sorting Program

Indicators related to expectations (categories) and requirements (Cards) set in the previous section are entered into the Optimal Card Sorting (URL-2) program one by one. Descriptions of both categories and what the cards stand for were added at this stage. Of the three types of card sorting included in the program, hybrids were used. Thanks to the hybrid card sort, experts are allowed to create a new category (expectation). Because, according to experts, one or some of the cards can be considered to be a category. After the final checks on the draft study were made, the link produced by the program was forwarded to the experts. Each expert was reached individually and explained both about the program and the indicators. The screenshot of the card sorting made by the experts is given in Figure 5 In the transaction, which ended with the participation of all experts, the cards were formed under categories. Indicators are analyzed by the program as Similar Matrix, Dendrograms, 3D Cluster View.

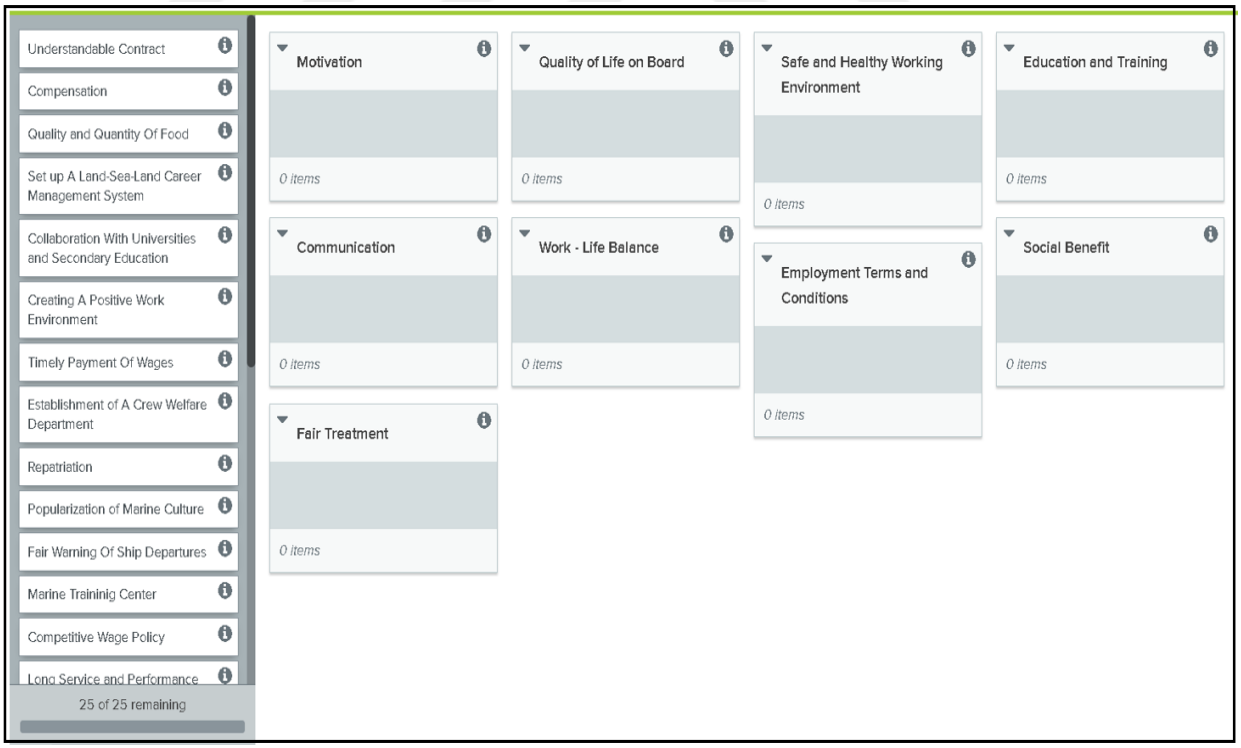

Figure 5. Screenshot of the card sorting program.

6.2.1. Optimal Card Sorting Program Results

In the thesis, Optimal Workshop Software (URL-2) was used to analyze the indicators of expectations and requirements obtained in the previous section. The software teaches participants how to sort cards with a simple drag and drop function. Screenshots of the results of the card sorting software used are given. Below are the analysis methods obtained with the optimal workshop software (URL-2).

6.2.1.1. Similarity Matrix

An algorithm similar to the dendrogram algorithm works, clustering similar cards on the right side. Here, the strongest pair is grouped next to the second strongest pair that any of the first cards has. Clusters are shown in the same shade of blue. As a result of card sorting done by experts, the grouping of cards has shown by the similarity matrix. Figure 6 shows that 60% of the participants grouped together "establishment of a crew welfare department" and "quality and quantity of food" indicators.

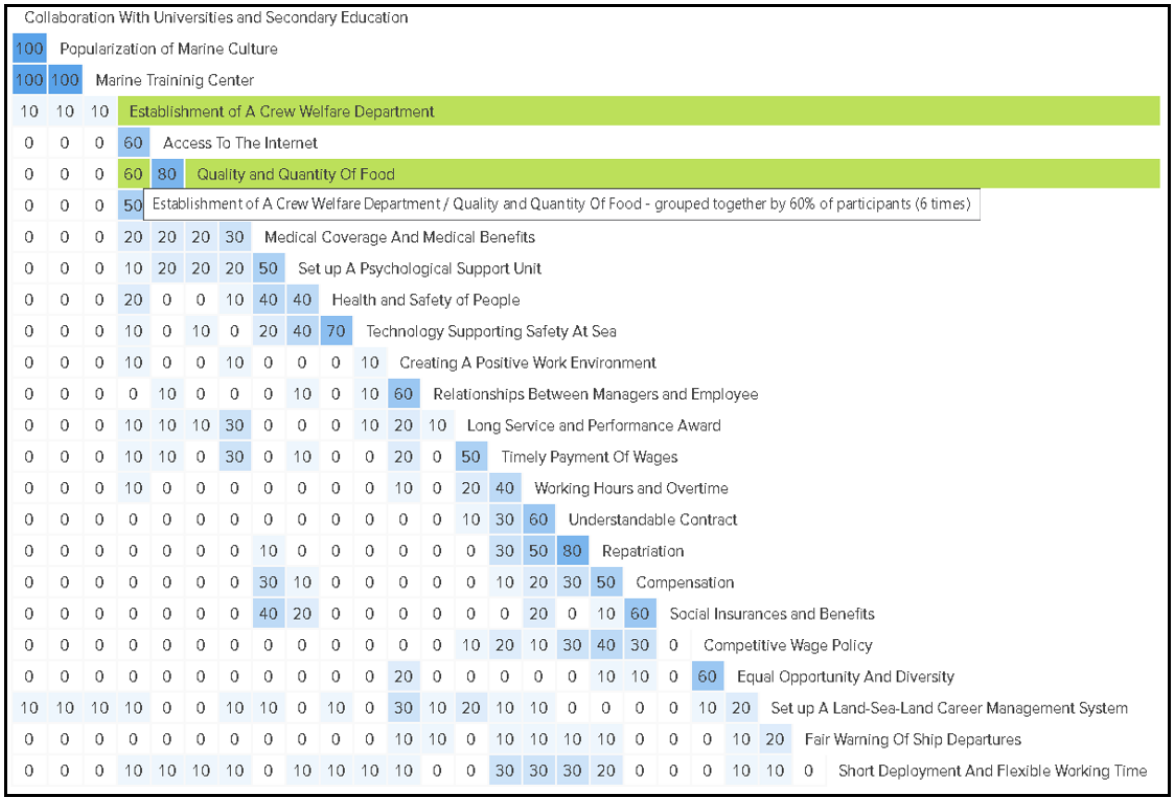

Figure 6. Representation of sorted cards with similarity matrix.

6.2.1.2. Display of Indicators by Dendrograms

As a result of card sorting done by experts, the grouping of cards has shown by the BMM dendrogram. Such as, in the Figure 7, it is seen that 100% of the sorted Collaboration with Universities and Secondary Education, Popularization of Marine Culture and Marine Training Center in the “Education and Training” category.

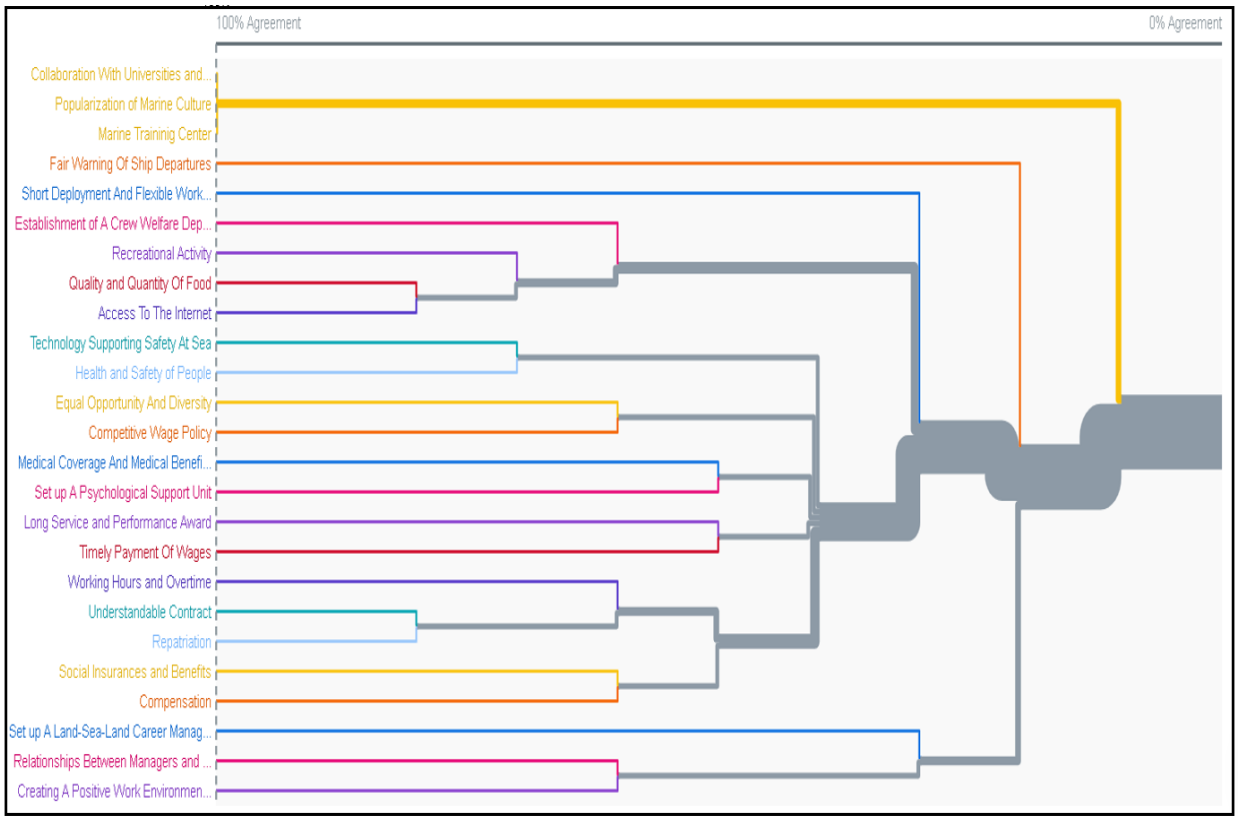

Figure 7. Representation of sorted cards with dendrogram.

6.2.1.3. Display of Indicators by 3D Cluster View

In the Figure 8, as a result of card sorting done by experts, the grouping of cards has shown by the 3D cluster view. When the requirements (cards) are analyzed with 3-dimensional cluster representation, it is seen that they are categorized under 9 expectations. And also, in the Optimal Card Sorting application, experts were given the opportunity to create a new category (expectations) by using the hybrid card sort method.

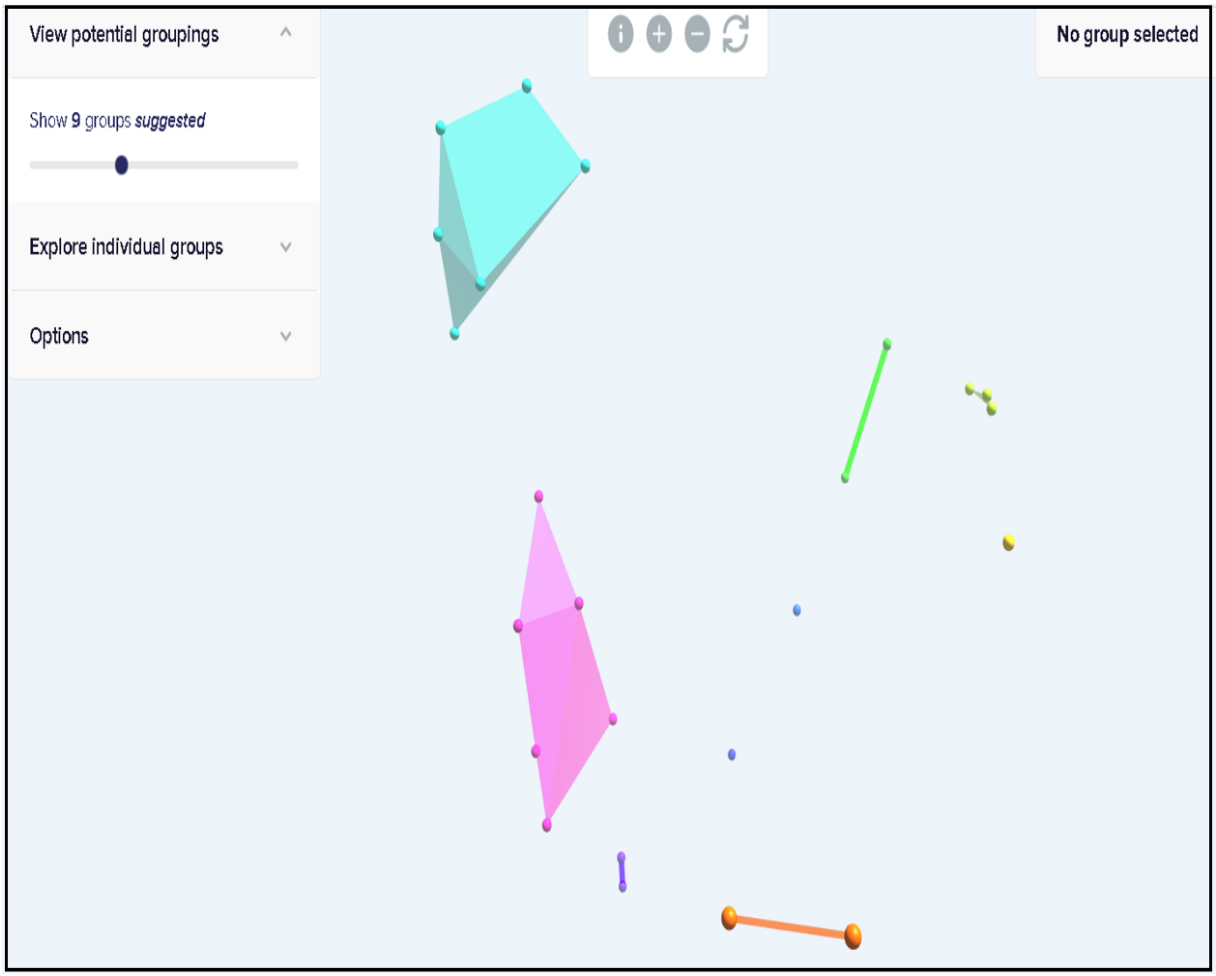

Figure 8. Displaying categories with 3 D cluster view.

The explanation of each Group is shown in the figures below.

The cards (requirements) in Group 1 resulting from optimal card sorting are shown in Figure 9. It shows that the requirements of “Collaboration with Universities and Secondary Education”, “Marine Training Center” and “Popularization of Marine Culture” are clustered together. All of the experts have gathered these requirements (cards) clustered together under “Education and Training”.

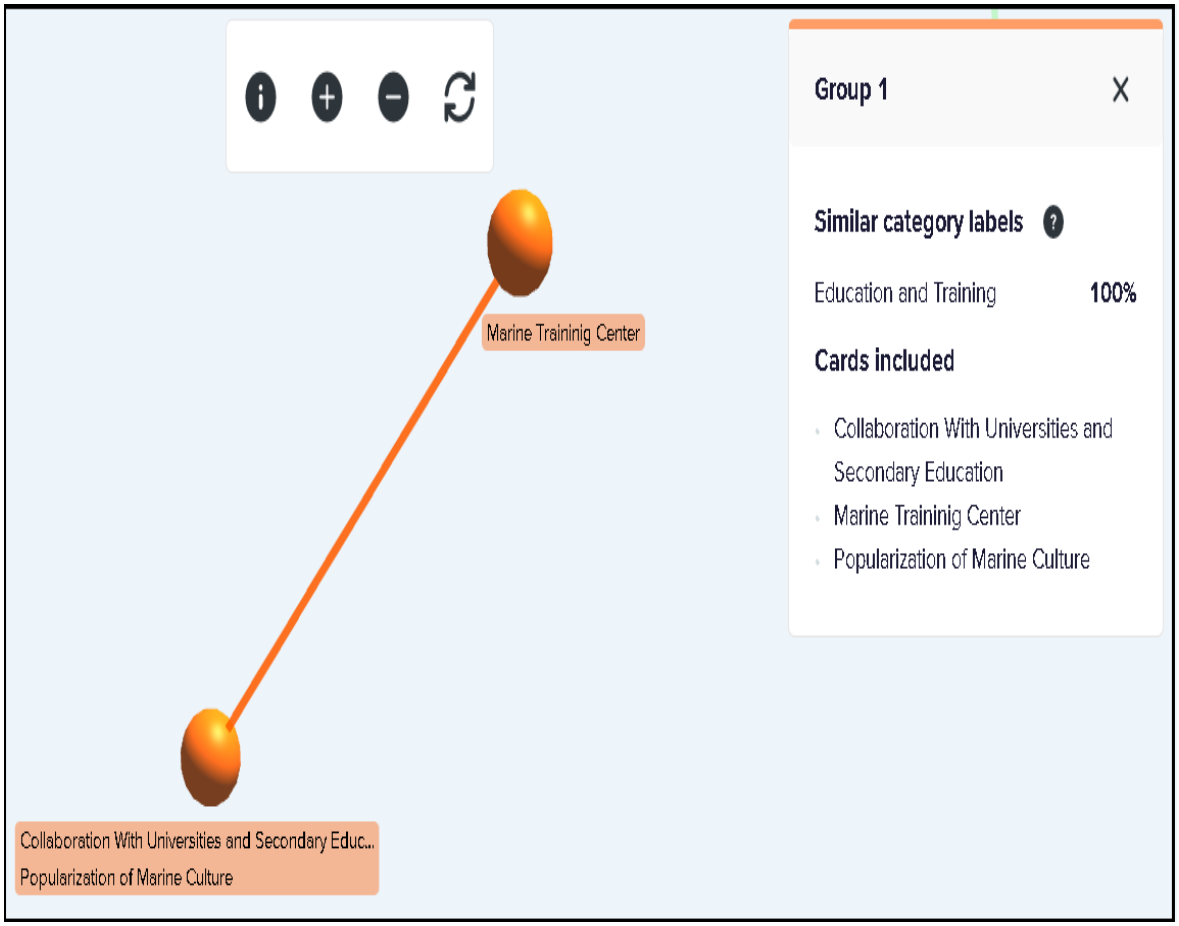

Figure 9. Cards formed in Group 1.

The cards (requirements) in Group 2 resulting from optimal card sorting are shown in Figure 10. It shows that the requirements of "Establishment of A Crew Welfare Department" is clustered under "Safe and Healthy Working Environment". And also, 50% of experts think these requirements should be under "Safe and Healthy Working Environment".

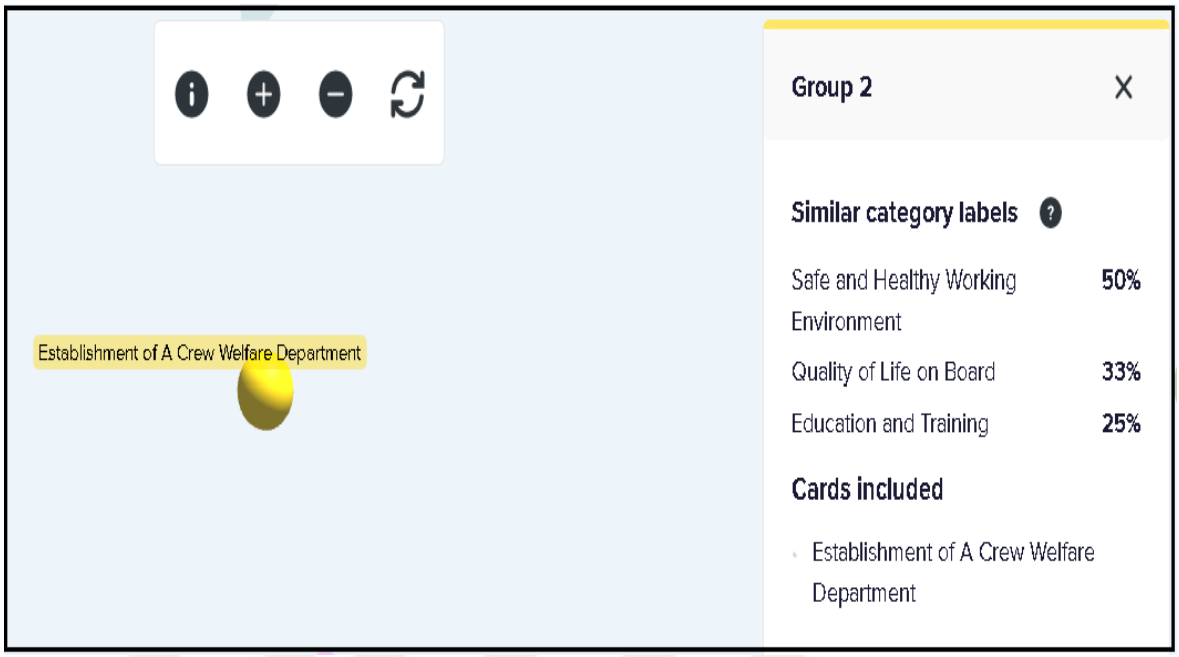

Figure 10. Cards formed in Group 2.

The cards (requirements) in Group 3 resulting from optimal card sorting are shown in Figure 11. It shows that the requirements of "Access to the Internet", "Quality and Quantity of Food", and "Recreational Activity" are clustered together. And also, 75% of experts think these requirements should be under "Quality of Life on Board".

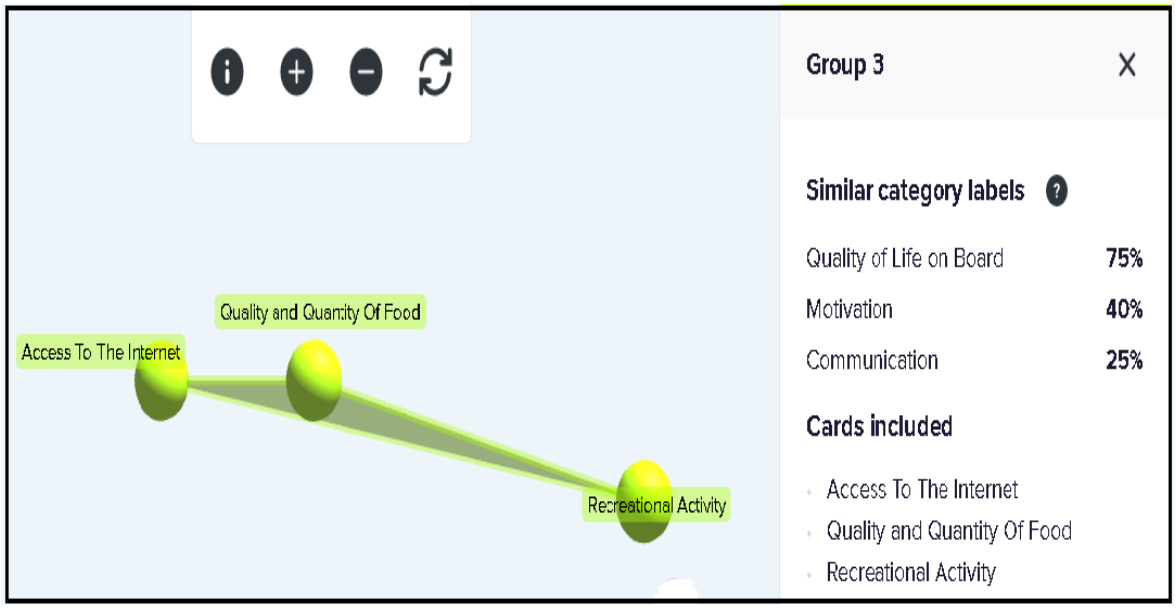

Figure 11. Cards formed in Group 3.

The cards (requirements) in Group 4 resulting from optimal card sorting are shown in Figure 12. It shows that the requirements of “Medical Coverage and Medical Benefits” and “Set up a Psychological Support Unit” are clustered together. And also, 67% of experts think these requirements should be under “Social Benefit”.

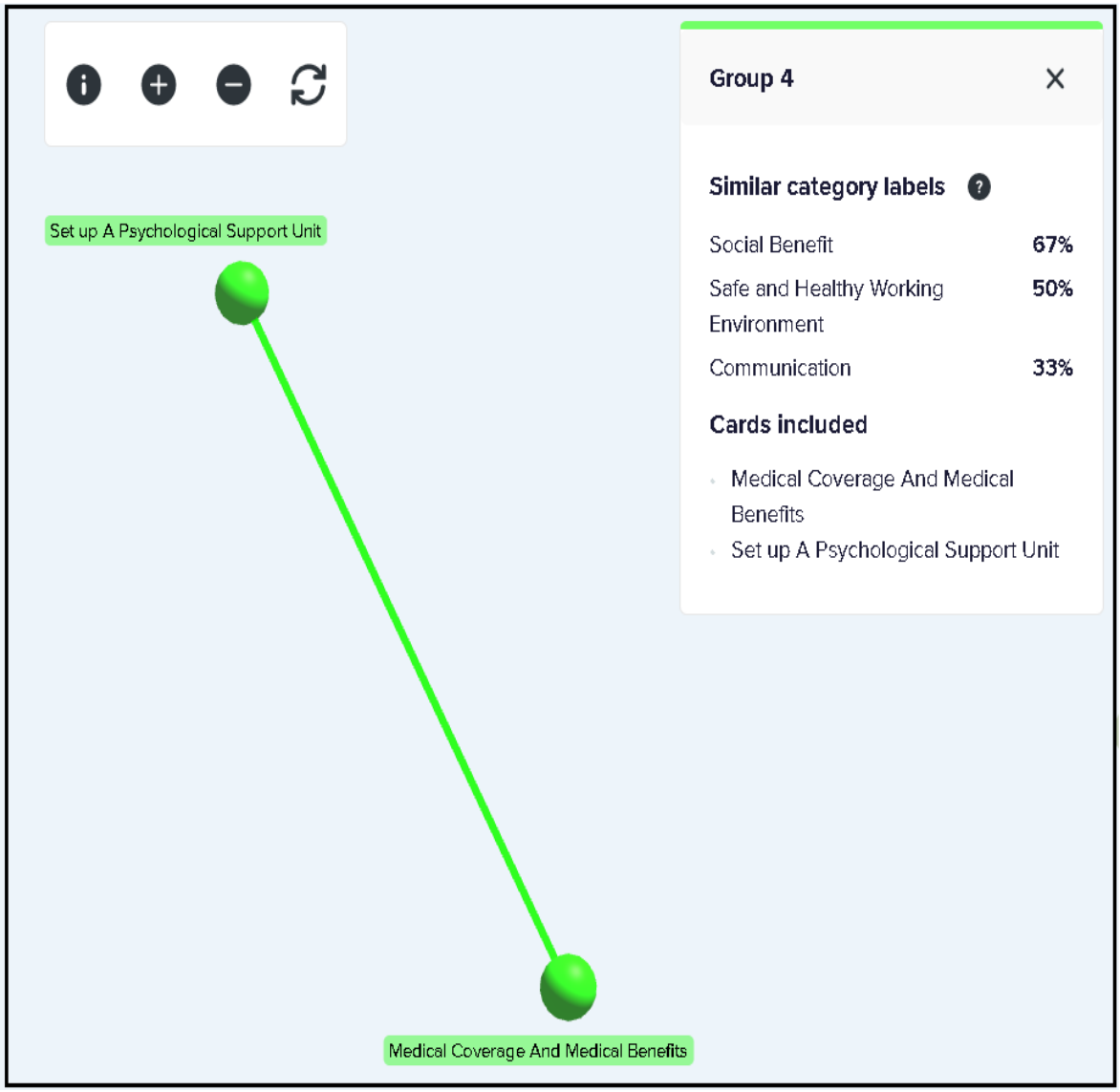

Figure 12. Cards formed in Group 4.

The cards (requirements) in Group 5 resulting from optimal card sorting are shown in Figure 13. It shows that the requirements of “Compensation”, “Competitive Wage Policy”, “Repatriation”, “Social Insurances and Benefits”, “Understandable Contract” and “Working Hours and Overtime” are clustered together. And also, 71% of experts think these requirements should be under “Employment Terms and Conditions”.

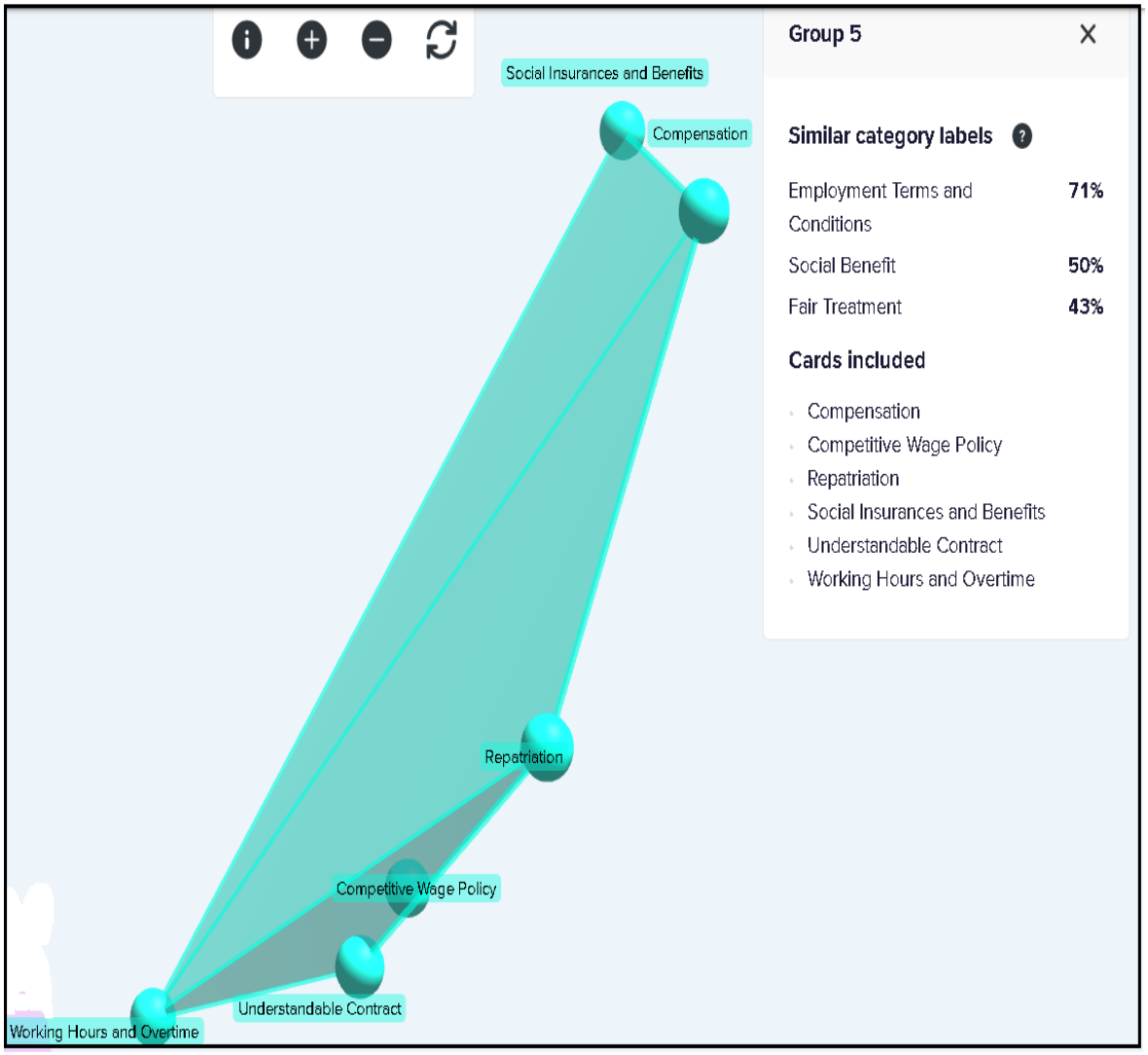

Figure 13. Cards formed in Group 5.

The cards (requirements) in Group 6 resulting from optimal card sorting are shown in Figure 14. It shows that the requirements of “Health and Safety of People” is clustered under the “Safe and Healthy Working Environment”. And also, 50% of experts think these requirements should be under a “Safe and Healthy Working Environment”.

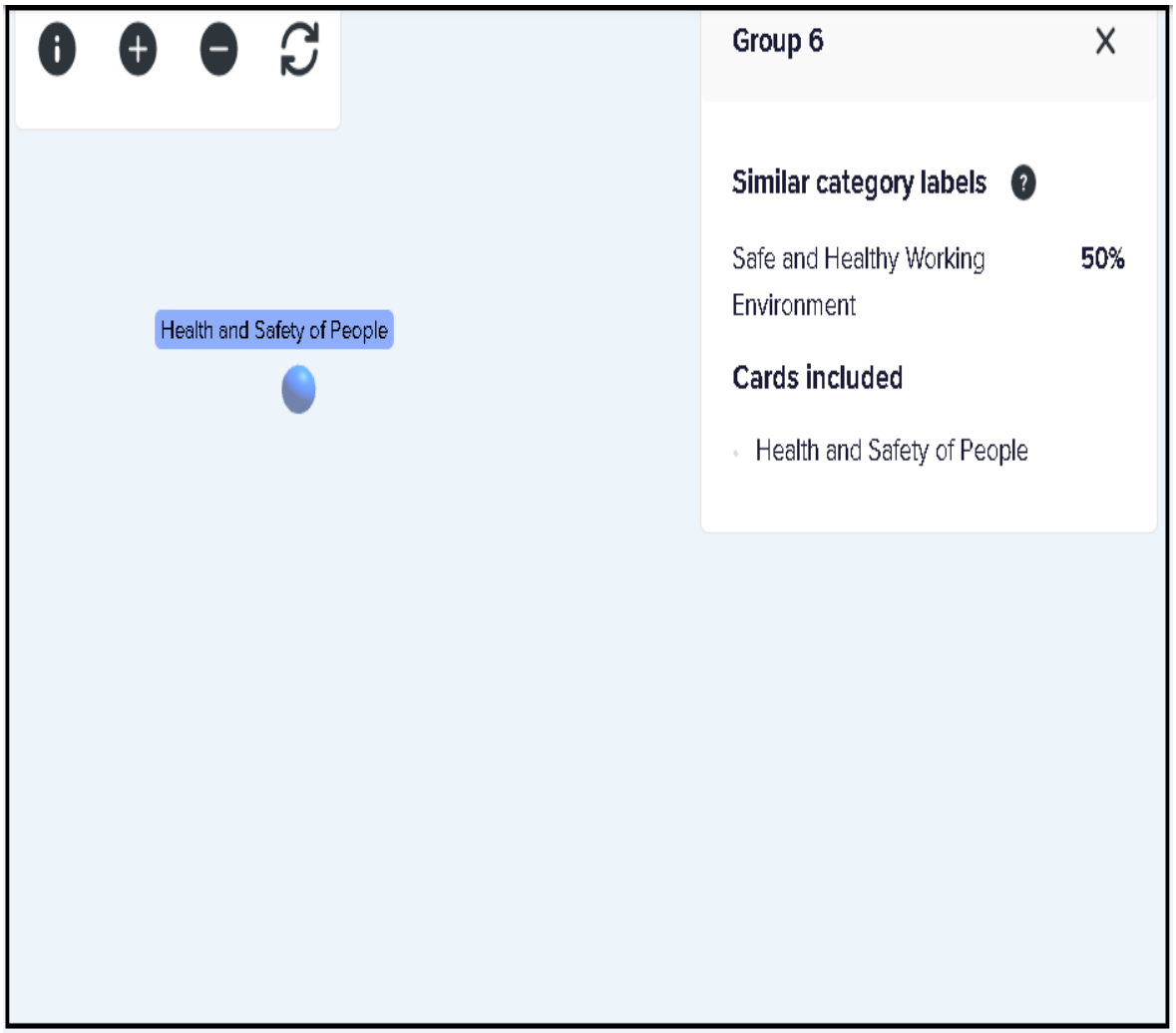

Figure 14. Cards formed in Group 6.

The cards (requirements) in Group 7 resulting from optimal card sorting are shown in Figure 15. It shows that the requirements of “Technology Supporting Safety At Sea” is clustered under “Safe and Healthy Working Environment”. And also, 50% of experts think these requirements should be under “Safe and Healthy Working Environment”. A new category called "technology" was created for Group 7 by only one expert. However, other

experts have used the "Safe and Healthy Working Environment" category. Therefore, this category is chosen here.

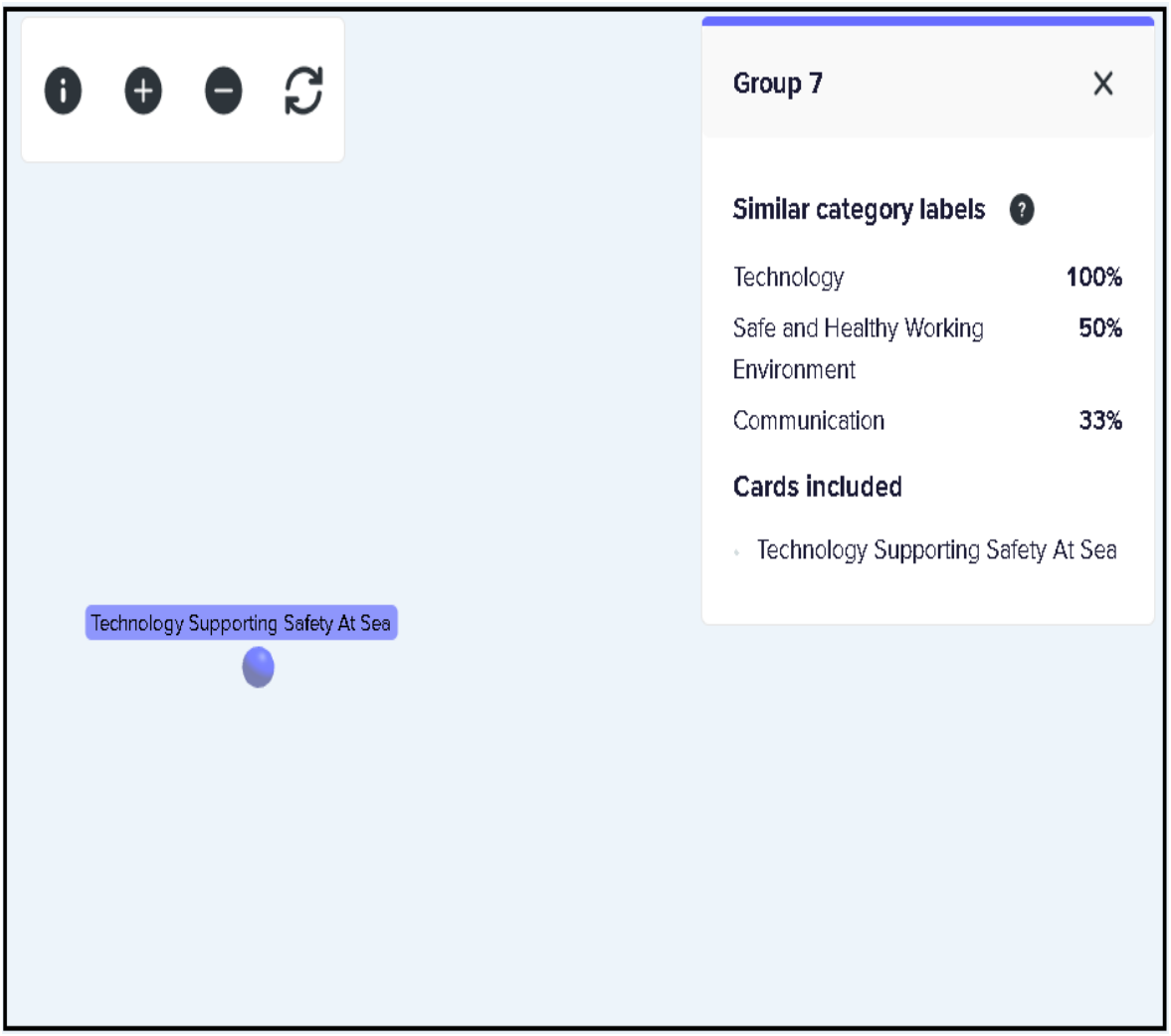

Figure 15. Cards formed in Group 7.

The cards (requirements) in Group 8 resulting from optimal card sorting are shown in Figure 16. It shows that the requirements of “Creating a Positive Work Environment” and “Relationships Between Managers and Employees” are clustered together. And also, all of the experts think these requirements should be under “Communication”.

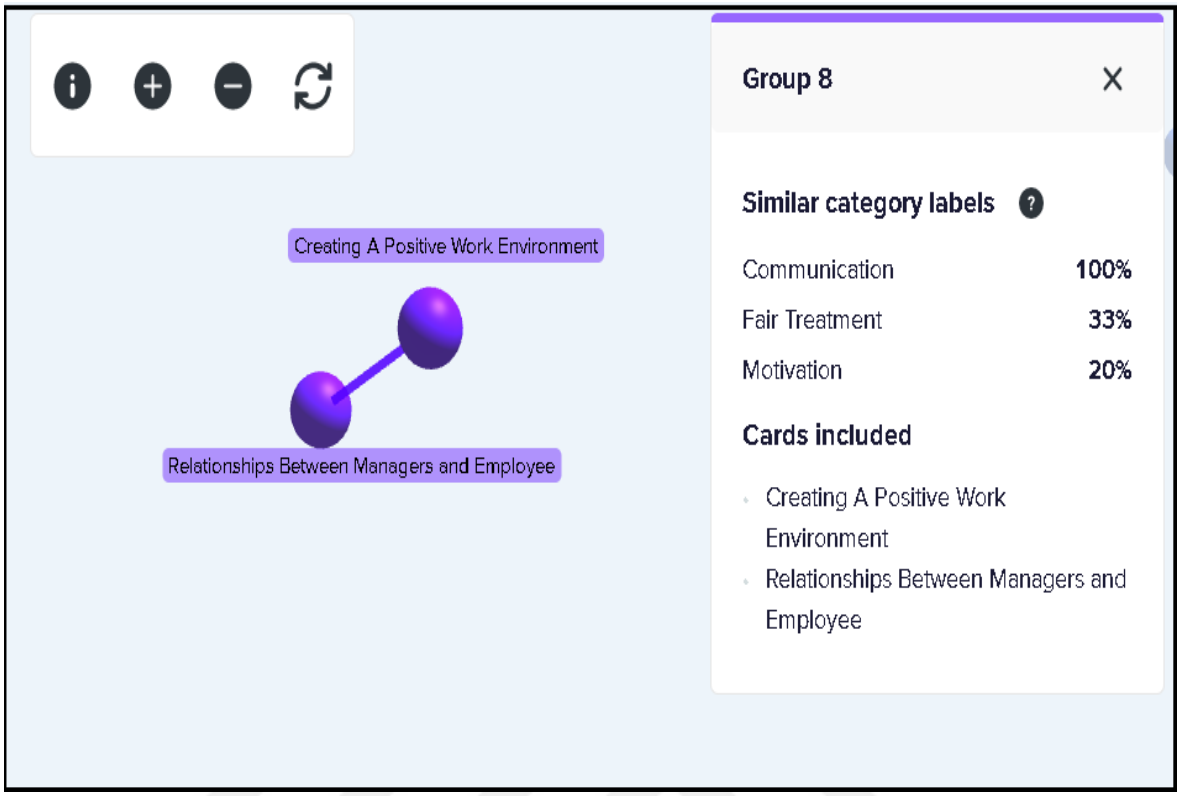

Figure 16. Cards formed in Group 8.

The cards (requirements) in Group 9 resulting from optimal card sorting are shown in Figure 17. It shows that the requirements of “Equal Opportunity and Diversity”, “Fair Warning of Ship Departures”, “Long Service and Performance Award”, “Set up a Land-Sea-Land Career Management System”, “Short Deployment and Flexible Working Time” and “Timely Payment of Wages” are clustered together. And also, 43% of experts think these requirements should be under “Motivation”.

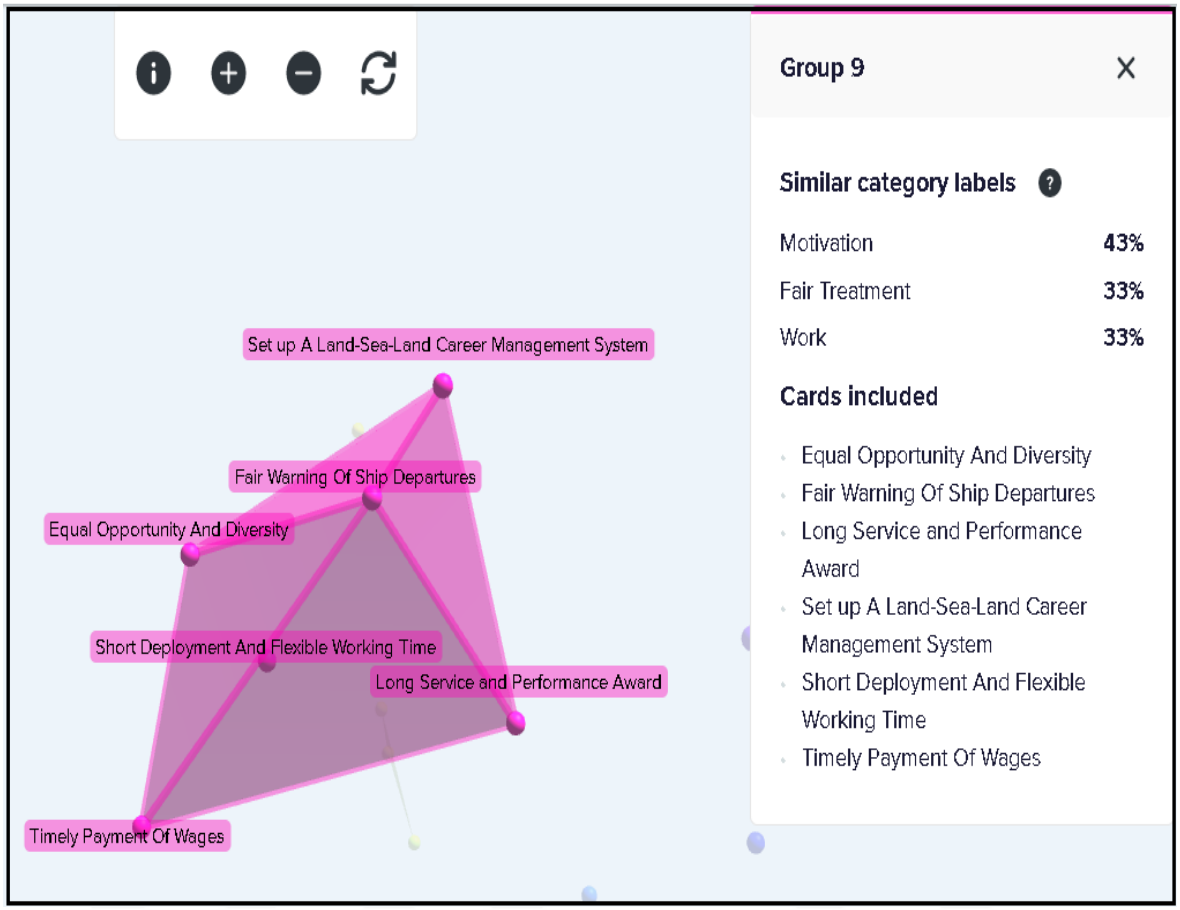

Figure 17. Cards formed in Group 9.

6.2.2. Conclusion of Optimal Card Sorting

As a result of card sorting, it is seen that “Health and Safety of People”, “Establishment of a Crew Welfare Department” and “Technology Supporting Safety At Sea” cards (requirements) are formed in separate groups (categories) under “Safe and Healthy Working Environment”. That is, an expectation (category) is grouped more than once. In order to eliminate these inconsistencies in the analysis, experts were contacted again and their opinions were taken about the subject that was thought to be inconsistent. As a result of the opinions of the experts, they expressed a consensus on the clustering of “Health and Safety of People”, “Establishment of a Crew Welfare Department” and “Technology Supporting Safety at Sea” cards (requirements) under “Safe and Healthy Working Environment”. In addition, a consensus was reached to cluster the "Short Deployment and Flexible Working Time" and "Set up a Land-Sea-Land Career Management System" cards

(requirements) under "Work-Life Balance" among the cards (requirements) in group 9. The "Equal Opportunity and Diversity" card (requirement) in group 9 is clustered under "Fair Treatment".

As a result, 25 requirements are clustered under 9 expectations. These 9 expectations are defined as "Work-Life Balance", "Fair Treatment", "Social Benefit", "Safe and Healty Working Environment", "Education and Training", "Communication", "Quality of Life on Board", "Motivation", "Employment Terms and Conditions".

6.3. Determination of Expectations Importance Degrees by Using FAHP

At the beginning of the transactions made in the quality house comes the prioritization of expectations. In order to determine the importance degree of expectations, which constitute the “what” part of the quality house and described in the previous section a survey was conducted to the experts. Calculation steps are described below.

The questionnaires from each participant were enumerated and the consistency analysis of each questionnaire was made with the AHP online calculator. For this, the pairwise comparison of the given answers was made. In the next stage, pairwise comparison matrices were created for each decision-maker using Fuzzy numbers in excel. After the comparison matrix was created for each decision-maker, a single comparison matrix was created by taking the geometric averages. A single pairwise matrix obtained was calculated using formulas entered in the excel file using Chang's (1996) extent analysis method to obtain normalized weight vectors. The answers given by the experts has shown in Table 2.

Table 2. The answers given by the experts for importance degree.

Expectations of Maritime Labor Force	**Importance Degree**
Work - Life Balance	8, 9, 7, 9, 8, 9, 9, 9, 7, 9
Fair Treatment	7, 8, 2, 7, 8, 9, 9, 7, 5, 9
Social Benefit	8, 5, 6, 9, 7, 9, 9, 9, 7, 9
Safe and Healthy Working Environment	8, 9, 8, 7, 9, 9, 9, 9, 7, 9
Education and Training	6, 6, 9, 9, 9, 9, 9, 9, 9, 9
Communication	8, 5, 5, 5, 8, 9, 9, 7, 8, 9
Quality of Life on Board	8, 7, 4, 9, 9, 9, 9, 9, 7, 9
Motivation	7, 7, 3, 5, 7, 9, 9, 5, 5, 9
Employment Terms and Conditions	9, 9, 1, 5, 9, 9, 9, 7, 6, 8

The scale used in the creation of these matrices was adapted from the scale suggested by Saaty (1986). Table 3 explains importance scale values and meanings.

Table 3. Importance scale values.

Importance Degree	
Equal importance	1
Weak or slight	2
Moderate importance	3
Moderate plus	4
Strong importance	5
Strong plus	6
Very strong importance	7
Very, very strong	8
Extremely importance	9

The answers given by 10 experts in total were converted into fuzzy numbers by taking geometric averages. For this, Fuzzy evaluation scale shown in the Table 4 are used.

Table 4. Fuzzy evaluation scale (Yuen&Lau, 2011) .

Crisp Numbers	TFNs
9,00	(8, 9, 9)
8,00	(7, 8, 9)
7,00	(6, 7, 8)
6,00	(5, 6, 7)
5,00	(4, 5, 6)
4,00	(3, 4, 5)
3,00	(2, 3, 4)
2,00	(1, 2, 3)
1,00	(1, 1, 1)
2,00	(1/3, 1/2, 1)
3,00	(1/4, 1/3, 1/2)
4,00	(1/5, 1/4, 1/3)
5,00	(1/6, 1/5, 1/4)
6,00	(1/7, 1/6, 1/5)
7,00	(1/8, 1/7, 1/6)
8,00	(1/9, 1/8, 1/7)
9,00	(1/9, 1/9, 1/8)

The importance degree determined by the first expert is shown in the Table 5.

Table 5. First expert's assessment of expectations

Expectations			TFNs
Work - Life Balance	E1	7	(6, 7, 8)
Fair Treatment	E2	2	(1, 2, 3)
Social Benefit	E3	6	(5, 6, 7)
Safe and Healthy Working Environment	E4	8	(7, 8, 9)
Education and Training	E5	9	(8, 9, 9)
Communication	E6	5	(4, 5, 6)
Quality of Life on Board	E7	4	(3, 4, 5)
Motivation	E8	3	(2, 3, 4)
Employment Terms and Conditions	E9	1	(1, 1, 1)

A pairwise comparison matrix was created for each decision-maker using Fuzyy numbers in excel. The pairwise comparison matrix of an expert is given in the Table 6.

Table 6. The pairwise comparison matrix of the Expert one.

		E1			E2			E3			E4			E5			E6			E7			E8			E9		
Work - Life Balance	E1	1,00	1,00	1,00	2,00	3,50	8,00	0,86	1,17	1,60	0,67	0,88	1,14	0,67	0,78	1,00	1,00	1,40	2,00	1,20	1,75	2,67	1,50	2,33	4,00	6,00	7,00	8,00
	E2	0,13	0,29	0,50	1,00	1,00	1,00	0,14	0,33	0,60	0,11	0,25	0,43	0,11	0,22	0,38	0,17	0,40	0,75	0,20	0,50	1,00	0,25	0,67	1,50	1,00	2,00	3,00
Fair Treatment	E3	0,63	0,86	1,17	1,67	3,00	7,00	1,00	1,00	1,00	0,56	0,75	1,00	0,56	0,67	0,88	0,83	1,20	1,75	1,00	1,50	2,33	1,25	2,00	3,50	5,00	6,00	7,00
	E4	0,88	1,14	1,50	2,33	4,00	9,00	1,00	1,33	1,80	1,00	1,00	1,00	0,78	0,89	1,13	1,17	1,60	2,25	1,40	2,00	3,00	1,75	2,67	4,50	7,00	8,00	9,00
Social Benefit	E5	1,00	1,29	1,50	2,67	4,50	9,00	1,14	1,50	1,80	0,89	1,13	1,29	1,00	1,00	1,00	1,33	1,80	2,25	1,60	2,25	3,00	2,00	3,00	4,50	8,00	9,00	9,00
	E6	0,50	0,71	1,00	1,33	2,50	6,00	0,57	0,83	1,20	0,44	0,63	0,86	0,44	0,56	0,75	1,00	1,00	1,00	0,80	1,25	2,00	1,00	1,67	3,00	4,00	5,00	6,00
Safe and Healthy Working Environment	E7	0,38	0,57	0,83	1,00	2,00	5,00	0,43	0,67	1,00	0,33	0,50	0,71	0,33	0,44	0,63	0,50	0,80	1,25	1,00	1,00	1,00	0,75	1,33	2,50	3,00	4,00	5,00
	E8	0,25	0,43	0,67	0,67	1,50	4,00	0,29	0,50	0,80	0,22	0,38	0,57	0,22	0,33	0,50	0,33	0,60	1,00	0,40	0,75	1,33	1,00	1,00	1,00	2,00	3,00	4,00
Education and Training	E9	0,13	0,14	0,17	0,33	0,50	1,00	0,14	0,17	0,20	0,11	0,13	0,14	0,11	0,11	0,13	0,17	0,20	0,25	0,20	0,25	0,33	0,25	0,33	0,50	1,00	1,00	1,00
Communication																												
Quality of Life on Board																												
Motivation																												
Employment Terms and Conditions																												

The consistency and comparison matrix in Table 6 was created for each decision-maker, and a single comparison matrix was created by taking geometric averages in Table 7.

Table 7. The single comparison matrix for all Experts.

		E1			E2			E3			E4			E5			E6			E7			E8			E9		
Work - Life Balance	E1	1,00	1,00	1,00	1,05	1,26	1,53	1,00	1,09	1,18	0,94	1,00	1,07	0,91	1,01	1,14	1,02	1,18	1,33	0,99	1,07	1,16	1,07	1,33	1,64	1,14	1,33	1,53
	E2	0,65	0,79	0,96	1,00	1,00	1,00	0,68	0,86	1,09	0,66	0,79	0,95	0,66	0,80	0,99	0,75	0,93	1,13	0,68	0,85	1,07	0,85	1,05	1,30	0,85	1,05	1,28
Fair Treatment	E3	0,84	0,92	1,00	0,92	1,16	1,47	1,00	1,00	1,00	0,83	0,92	1,01	0,82	0,92	1,07	0,93	1,08	1,23	0,90	0,98	1,09	1,00	1,22	1,49	1,02	1,21	1,45
	E4	0,94	1,00	1,07	1,05	1,26	1,52	0,99	1,09	1,20	1,00	1,00	1,00	0,91	1,01	1,14	0,99	1,18	1,36	0,99	1,07	1,16	1,07	1,33	1,64	1,15	1,33	1,51
Social Benefit	E5	0,88	0,99	1,10	1,01	1,25	1,53	0,94	1,08	1,22	0,88	0,99	1,10	1,00	1,00	1,00	0,96	1,17	1,36	0,94	1,06	1,18	1,06	1,32	1,59	1,13	1,32	1,49
	E6	0,75	0,85	0,98	0,89	1,07	1,33	0,82	0,93	1,07	0,73	0,85	1,01	0,73	0,86	1,04	1,00	1,00	1,00	0,78	0,91	1,10	0,92	1,13	1,41	1,00	1,13	1,29
Safe and Healthy Working Environment	E7	0,86	0,93	1,01	0,94	1,18	1,48	0,92	1,02	1,12	0,86	0,93	1,01	0,85	0,94	1,06	0,91	1,10	1,29	1,00	1,00	1,00	1,02	1,24	1,50	1,05	1,24	1,44
	E8	0,61	0,75	0,93	0,77	0,95	1,18	0,67	0,82	1,00	0,61	0,75	0,93	0,63	0,76	0,94	0,71	0,88	1,08	0,67	0,80	0,98	0,85	1,00	1,00	0,83	0,99	1,20
Education and Training	E9	0,65	0,75	0,88	0,78	0,95	1,17	0,69	0,82	0,98	0,66	0,75	0,87	0,67	0,76	0,89	0,77	0,89	1,00	0,69	0,81	0,96	0,83	1,01	1,21	1,00	1,00	1,00

Communication

Quality of Life on Board

Motivation

Employment Terms and Conditions

A single pairwise matrix obtained was calculated using formulas entered in the excel file using Chang's (1996) extent analysis method to obtain normalized weight vectors. After the synthetic dimension values of the pairwise comparison were obtained from the fuzzy evaluation matrix, the comparison of these vectors was done in Table 8.

Table 8. Comparison of vectors.

V(E1≥E2)=1 V(E1≥E3)=1 V(E1≥E4)=1 V(E1≥E5)=1 V(E1≥E6)=1 V(E1≥E7)=1 V(E1≥E8)=1 V(E1≥E9)=1
V(E2≥S1)=0,72 V(E2≥S3)=0,83 V(E2≥E4)=0,72 V(E2≥E5)=0,73 V(E2≥E6)=0,92 V(E2≥S7)=0,81 V(E2≥S8)=1 V(E2≥E9)=1
V(E3≥E1)=0,89 V(E3≥E2)=1 V(E3≥E4)=0,89 V(E3≥E5)=0,90 V(E3≥E6)=1 V(E3≥E7)=0,98 V(E3≥E8)=1 V(E3≥E9)=1
V(E4≥E1)=1 V(E4≥E2)=1 V(E4≥E3)=1 V(E4≥E5)=1 V(E4≥E6)=1 V(E4≥E7)=1 V(E4≥E8)=1 V(E4≥E9)=1
V(E5≥E1)=0,99 V(E5≥E2)=1 V(E5≥E3)=1 V(E5≥E4)=0,99 V(E5≥E6)=1 V(E5≥E7)=1 V(E5≥E8)=1 V(E5≥E9)=1
V(E6≥E1)=0,81 V(E6≥E2)=1 V(E6≥E3)=0,91 V(E6≥E4)=0,81 V(E6≥E5)=0,81 V(E6≥E7)=0,89 V(E6≥E8)=1 V(E6≥E9)=1
V(E7≥E1)=0,91 V(E7≥E2)=1 V(E7≥E3)=1 V(E7≥E4)=0,91 V(E7≥E5)=0,92 V(E7≥E6)=1 V(E7≥E8)=1 V(E7≥E9)=1
V(E8≥E1)=0,66 V(E8≥E2)=0,94 V(E8≥E3)=0,77 V(E8≥E4)=0,66 V(E8≥E5)=0,67 V(E8≥E6)=0,86 V(E8≥E7)=0,74 V(E8≥E9)=0,99
V(E9≥E1)=0,64 V(E9≥E2)=0,94 V(E9≥E3)=0,75 V(E9≥E4)=0,64 V(E9≥E5)=0,65 V(E9≥E6)=0,85 V(E9≥E7)=0,73 V(E9≥E8)=1

Other stage

$W' = (d'(A_1), d'(A_2),\ldots, d'(A_n))^T$ A_i (i=1,2…n)

$W' = (1; 0,72;0,89;1;0,99;0,81;0,91;0,66;0,64)^T$

Final stage; After the normalization process, the weight vector is as follows.

$W = (0,131; 0,095; 0,117; 0,131; 0,130; 0,106; 0,120; 0,086; 0,084)^T$

The normalization process is performed by summing all the elements of the vector and dividing each element by this sum. In this way, the normalized weight vector is computed. The normalized weight vector W is obtained by normalization, where W is not a fuzzy number. The normalized weight vector of the expectations obtained as a result of the Chang's (1996) extent analysis method has shown in Table 9.

Table 9. Normalized weight vectors of expectations.

Expectations of Maritime Labor Force	**Normalized weight vectors**
Work-Life Balance	0,131
Fair Treatment	0,095
Social Benefit	0,117
Safe and Healthy Working Environment	0,131
Education and Training	0,130
Communication	0,106
Quality of Life on Board	0,120
Motivation	0,086
Employment Terms and Conditions	0,084
TOTAL	1,00

According to these results, “Work-Life Balance”, “Safe and Healthy Working Environment” and “Education and Training” appeared as the most important expectations. On the other hand, “Employment Terms and Conditions” and “Motivation” were the least important expectations.

6.4. Analysis of Maritime Labor Force Satisfaction Levels

6.4.1. Determination of Satisfaction Degree

Satisfaction degree is explained how adequate the current practices regarding the expectations of the maritime labor force, which was previously created with the “Optimal Card Sorting” program. In order to determine the importance satisfaction level of these 9

expectations, which constitute the “what” part of the quality house and described in the previous section a survey was conducted to the experts. The answers given by the experts have shown in Table 10.

Table 10. The answers given by the experts for satisfaction degree.

Expectations of Maritime Labor Force	**Satisfaction Degree**
Work-Life Balance	7, 5, 3, 3, 4, 6, 5, 1, 3, 9
Fair Treatment	7, 6, 2, 5, 6, 6, 5, 3, 4, 8
Social Benefit	7, 1, 1, 5, 2, 6, 4, 5, 5, 9
Safe and Healthy Working Environment	6, 7, 5, 7, 6, 6, 5, 7, 6, 9
Education and Training	7, 5, 4, 7, 6, 7, 7, 5, 4, 9
Communication	7, 5, 2, 7, 9, 7, 8, 6, 5, 9
Quality of Life on Board	6, 5, 4, 5, 4, 9, 7, 7, 5, 8
Motivation	7, 5, 2, 3, 4, 7, 7, 4, 5, 8
Employment Terms and Conditions	8, 5, 7, 5, 7, 5, 5, 5, 5, 8

Satisfaction Degree Scale: 1-Very very weak, 2- Weak or slight, 3- Moderate, 4- Moderate plus, 5- Strong importance, 6- Strong plus, 7- Very strong, 8- Very, very strong, 9- Extremely.

In total, the answers given by 10 experts were converted to fuzzy numbers and geometric averages were taken. For this, fuzzy evaluation scale shown in the Table 4 are used. The severity levels determined are given in the Table 11.

Table 11. Fuzzy numbers for satisfaction degree.

Expectations of Maritime Labor Force	**Satisfaction Degree Fuzzy**
Work - Life Balance	3,14; 3,99; 4,75
Fair Treatment	3,72; 4,85; 5,93
Social Benefit	2,93; 3,61; 4,18
Safe and Healthy Working Environment	5,29; 6,31; 7,24
Education and Training	4,87; 5,91; 6,86
Communication	4,88; 6,06; 7,00
Quality of Life on Board	4,75; 5,79; 6,75
Motivation	3,66; 4,81; 5,88
Employment Terms and Conditions	4,86; 5,88; 6,89

Accordingly, it has been observed that the degrees of satisfaction with the highest absolute weight are "Safe and Healthy Working Environment" and "Communication". On the other hand, it is understood that the satisfaction degree of "Social Benefits" and "Work-Life Balance" are lower than the others.

It was shown in the previous chapter that the improvement rate is the ratio of the planned quality level to the company's satisfaction with the QFD study. In this application, it is assumed that the planned quality level is equivalent to the importance of the maritime labor force. Similarly, the assumption was made that the satisfaction level of the company is equivalent to the adequacy of the practices to meet the expectations. As a result, the ratio of the degree of importance to the degree of satisfaction was used to achieve the improvement rate. Transactions are made by converting fuzzy numbers into exact numbers. The results achieved are shown in Table 12.

Table 12. Improvement rate with non-fuzzy values.

Expectations	Importance Degree	Satisfaction Degree	Improvement Rate
Work-Life Balance	0,131	3,98	0,033
Fair Treatment	0,095	4,84	0,020
Social Benefit	0,117	3,59	0,033
Safe and Healthy Working Environment	0,131	6,3	0,021
Education and Training	0,130	5,9	0,022
Communication	0,106	6,02	0,018
Quality of Life on Board	0,120	5,78	0,021
Motivation	0,086	4,8	0,018
Employment Terms and Conditions	0,084	5,88	0,014

6.4.2. Determination of Impact Degree

Impact Rating has been used to determine how the maritime labor force will affect sustainability if the expectations of the maritime labor force are met. Experts were asked to evaluate the questionnaire after explanations about the degree of Impact were made. The answers given by the participants are detailed in Table 13.

Table 13. The answers given by the experts for impact degree.

Expectations of Maritime Labor Force	Impact Degree
Work-Life Balance	7, 9, 4, 9, 7, 7, 7, 9, 7, 9
Fair Treatment	7, 7, 5, 5, 6, 7, 8, 5, 5, 8
Social Benefit	7, 5, 6, 8, 7, 8, 7, 7, 7, 9
Safe and Healthy Working Environment	8, 9, 6, 9, 7, 8, 8, 9, 9, 9
Education and Training	7, 7, 8, 7, 8, 7, 8, 9, 9, 9
Communication	7, 7, 6, 5, 7, 7, 7, 5, 5, 9
Quality of Life on Board	8, 9, 6, 9, 9, 7, 8, 9, 8, 8
Motivation	7, 5, 7, 8, 5, 8, 7, 7, 8, 8
Employment Terms and Conditions	8, 9, 3, 7, 6, 8, 8, 8, 6, 8

Impact Degree Scale: 1-Very very weak, 2- Weak or slight, 3- Moderate, 4- Moderate plus, 5- Strong importance, 6- Strong plus, 7- Very strong, 8- Very, very strong, 9- Extremely.

The fuzzy evaluation scale of the triangular fuzzy numbers used to determine the degree of impact are shown in Table 4. Geometric averages were calculated by converting the answers of the experts into fuzzy numbers one by one. The impact degree is shown in Table 14 with fuzzy numbers.

Table 14. Fuzzy numbers for impact degree.

Expectations of Maritime Labor Force	**Impact Degree Fuzzy**
Work-Life Balance	6,28; 7,32; 8,00
Fair Treatment	5,17; 6,19; 7,20
Social Benefit	6,00; 7,02; 7,95
Safe and Healthy Working Environment	7,13; 8,14; 8,67
Education and Training	6,85; 7,86; 8,59
Communication	5,37; 6,39; 7,33
Quality of Life on Board	7,03; 8,04; 8,67
Motivation	5,88; 6,90; 7,92
Employment Terms and Conditions	5,76; 6,84; 7,80

Accordingly, it is seen that the impact of "Safe and Healthy Working Environment" and "Quality of Life on Board" items will be higher than the others if the expectations are met. On the other hand, it is seen that the degree of the "Fair Treatment" effect will be the least compared to others if the expectations are met.

The impact degree of each expectation obtained as a fuzzy number has been transformed into crisp values. In Table 15 the non-fuzzy values of the degree of impact are shown.

Table 15. Finding impact degree with non-fuzzy values.

Expectations of Maritime Labor Force	Impact Degree Defuzzification
Work-Life Balance	7,26
Fair Treatment	6,19
Social Benefit	7,01
Safe and Healthy Working Environment	8,06
Education and Training	7,81
Communication	6,38
Quality of Life on Board	7,98
Motivation	6,90
Employment Terms and Conditions	6,82

Calculations results of parameters related to expert evaluations are shown in the Table 16. The absolute weights regarding the expectations of the maritime labor force are given in the Table 16. Accordingly, it has been observed that the highest absolute weighted expectations are “E1. Work-Life Balance” and “E3. Social Benefit”. On the other hand, it was understood that the absolute weights of “E9. Employment Terms and Conditions” and “E8. Motivation” expectations were lower than the others.

Table 16. Results of expert evaluations.

Expectations	Importance Degree	Improvement Rate	Impact Degree	Absolute Weight	Relative Weight
E1	0,131	0,033	7,26	0,0313	19,03
E2	0,095	0,020	6,19	0,0115	7,02
E3	0,117	0,033	7,01	0,0267	16,24
E4	0,131	0,021	8,06	0,0220	13,35
E5	0,13	0,022	7,81	0,0224	13,61
E6	0,106	0,018	6,38	0,0119	7,24
E7	0,12	0,021	7,98	0,0199	12,08
E8	0,086	0,018	6,90	0,0106	6,46
E9	0,084	0,014	6,82	0,0082	4,98

6.5. Requirements

The requirements that make up the “how” part of the quality house were created in order to meet the expectations of the maritime labor force. The requirements put forward to ensure the sustainability of the maritime labor force were created as a result of examining and analyzing the sustainability reports of companies with significant shares in maritime transport. The requirements obtained at this stage were presented to the experts through the optimal sort program and their opinions were taken. These requirements are shown in Table 17 with the letter (R) and their descriptions are given in the Chapter 4.

Table 17. Requirements.

R1. Competitive Wage Policy
R2. Timely Payment Of Wages
R3. Long Service and Performance Award
R4. Health and Safety of people
R5. Working Hours and Overtime
R6. Relationships Between Managers and Employee
R7. Marine Training Center
R8. Technology Supporting Safety At Sea
R9. Equal Opportunity And Diversity
R10. Establishment of A Crew Welfare Department
R11. Understandable Contract
R12. Medical Coverage And Medical Benefits
R13. Social Insurances and Benefits
R14. Access To The Internet
R15. Collaboration With Universities and Secondary Education
R16. Set up A Land-Sea-Land Career Management System
R17. Set up A Psychological Support Unit
R18. Recreational Activity
R19. Short Deployment And Flexible Working Time
R20. Quality and Quantity Of Food
R21. Creating A Positive Work Environment
R22. Repatriation
R23. Fair Warning Of Ship Departures
R24. Compensation
R25. Popularization of Marine Culture

6.6. Relationships Among Requirements

The common opinions of the same group of 10 experts were used to determine the relationships between requirements. Numerical expressions were used to determine the relationships at four levels. These;

Strong positive relationship 2,

Positive relationship 1,

Strong negative relationship -2,

Negative relationship -1

The roof of the quality house where the relationships between requirements are determined is shown in figure 18.

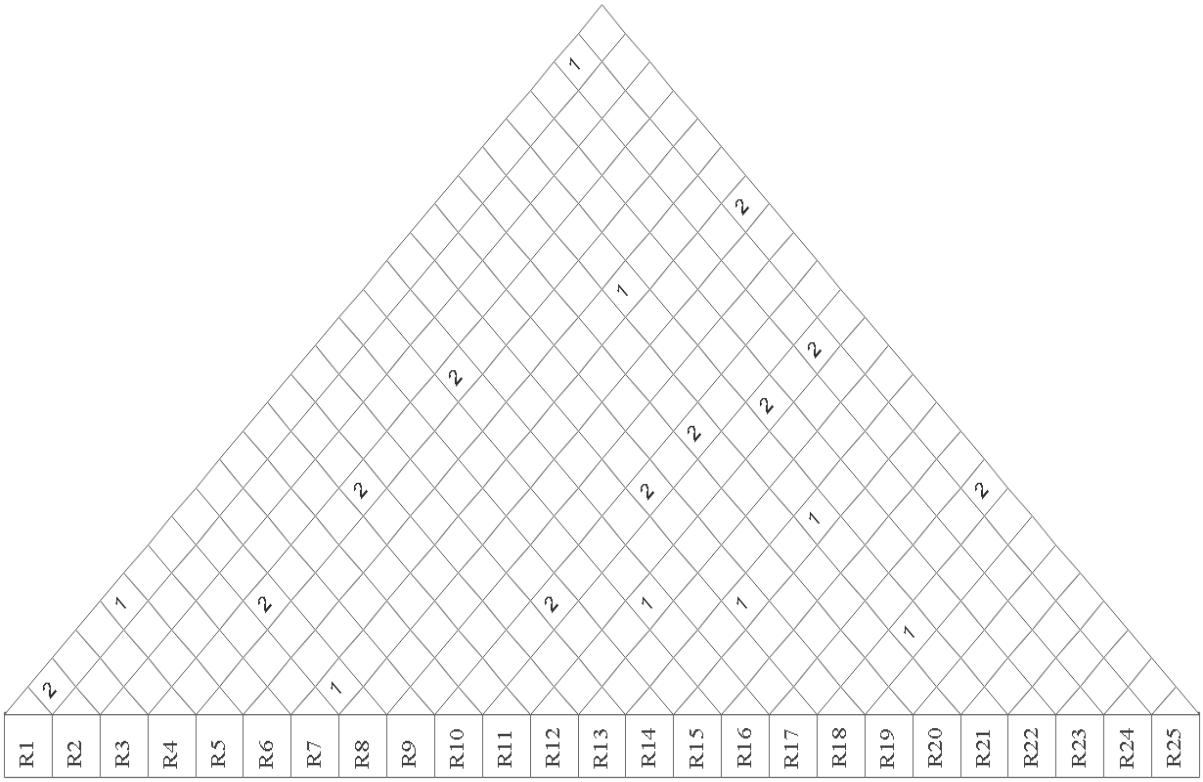

Figure 18. Relationships between requirements.

The absence of -1 and -2 values in the roof indicates that the requirements have a positive relationship with each other. The requirements are not capable of adversely affecting each other, as they are aimed at providing solutions to the sustainability of the maritime labor force while determining the requirements.

6.7. Relationships Matrix

The relationship between the expectations of the maritime labor force and the requirements was determined at this stage. For this purpose, the opinions of ten experts were used. Here, the experts were asked whether each expectation was related to each requirement. So each expert made 9x25 = 225 evaluations. The total number of evaluations from 10 experts is 2250. The total evaluations made by the experts are included in Appendix-A.

The fuzzy evaluation scale of the triangular fuzzy numbers used to determine the relationships matrix are shown in Table 4. The values obtained as a result of the survey were translated into fuzzy numbers according to the membership degrees shown and their geometric mean was taken.

6.8. Assessing and Benchmarking Requirements

After creating the relationships matrix, the absolute importance of each requirement is found by summing the precalculated defuzzification absolute weight values, and the defuzzification relationship values in each column. As a result of the calculations made here, the degrees of Absolute Importance of each column is determined. If the requirements of the columns have higher degrees of absolute importance, more attention will be given to those requirements.

By combining the data and findings obtained from all stages, a quality house was created regarding the sustainability of the maritime labor force shown in Figure 19. Regarding the expectations calculated in the previous stages, the Satisfaction Degree (S.D.), Improvement Rate (I.R.), Impact Degree (I.D.), Absolute Weights (A.W.) and Relative Weights (R.W.) are located on the right side of the quality house. The Importance Degree of the expectations calculated in the previous stages is on the left side of the quality house. The Absolute and Relative Importance of the requirements is calculated and placed in the lower left part of the quality house. The requirements are listed according to their weight in

Absolute Importance. The calculations and results made are seen in figure 19. Accordingly, the most important requirements, respectively “R4. Health and Safety of people”, “R13. Social Insurances and Benefits” and “R12. Medical Coverage And Medical Benefits”. The least important respectively are “R23. Fair Warning of Ship Departures”, “R25. Popularization of Marine Culture” and “R15. Collaboration With Universities and Secondary Education”.

According to quality house the Absolute Weights (A.W.) of the expectations of the maritime labor force are listed in the Table 18 from large to small.

Table 18. The absolute weights of the expectations.

Expectations	**Absolute Weight**
E1. Work-Life Balance	0,0313
E3. Social Benefit	0,0267
E5. Education and Training	0,0224
E4. Safe and Healthy Working Environment	0,0220
E7. Quality of Life on Board	0,0199
E6. Communication	0,0119
E2. Fair Treatment	0,0115
E8. Motivation	0,0106
E9. Employment Terms and Conditions	0,0082

	Importance D.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	S.D.	I.R.	I.D.	A.W.	R. W.
E1	0,131	5,72	4,25	3,86	5,87	4,54	4,88	5,40	2,92	2,57	3,76	5,47	4,98	4,89	4,21	4,56	4,20	5,56	4,94	5,73	3,32	3,60	6,57	4,43	3,51	3,31	3,98	0,033	7,26	0,0313	19,03
E2	0,095	5,45	5,21	4,86	3,34	6,60	4,94	2,93	5,10	6,94	4,02	5,13	4,19	4,44	3,56	4,56	3,77	3,17	3,23	4,27	5,42	3,65	4,52	2,90	3,90	3,46	4,84	0,020	6,19	0,0115	7,02
E3	0,117	3,19	3,72	3,33	5,12	5,05	4,44	2,68	4,81	4,40	4,77	3,57	6,86	7,98	4,01	2,78	5,89	2,74	3,96	4,03	5,12	4,06	4,72	2,77	5,66	3,29	3,59	0,033	7,01	0,0267	16,24
E4	0,131	5,55	5,28	3,45	7,71	2,34	5,44	4,63	6,01	4,17	6,34	5,88	6,53	5,90	2,84	3,05	6,31	3,55	3,57	5,22	5,97	6,24	6,06	2,27	4,70	4,42	6,3	0,021	8,06	0,0220	13,35
E5	0,13	3,34	5,38	3,69	6,45	6,21	5,37	5,03	5,43	5,05	4,32	5,37	4,67	4,09	4,46	4,07	3,81	5,63	3,14	4,77	5,55	6,00	4,51	2,62	4,81	5,20	5,9	0,022	7,81	0,0224	13,61
E6	0,106	2,95	2,36	4,06	4,23	4,31	5,65	3,60	5,30	3,43	4,07	3,45	2,36	3,21	5,19	3,43	4,09	3,45	3,54	3,62	3,98	3,95	3,08	2,88	3,12	2,28	6,02	0,018	6,38	0,0119	7,24
E7	0,12	4,29	3,50	3,76	6,20	5,32	2,61	3,93	5,74	5,30	6,22	6,17	6,14	4,90	6,07	3,17	5,22	2,95	4,21	5,28	6,99	4,55	5,03	2,97	3,53	3,92	5,78	0,021	7,98	0,0199	12,08
E8	0,086	5,19	5,93	6,38	5,47	3,84	4,06	4,08	4,62	6,27	5,87	4,48	3,41	6,07	5,92	5,47	5,06	3,29	5,64	5,64	6,36	6,19	4,65	4,55	5,01	4,44	4,8	0,018	6,90	0,0106	6,46
E9	0,084	6,78	6,42	3,96	3,65	5,17	5,21	2,66	3,21	3,67	3,63	6,71	4,34	4,51	2,96	3,89	4,88	3,36	2,62	4,42	2,90	2,89	5,12	4,65	5,52	2,70	5,88	0,014	6,82	0,0082	4,98
Absolute I.		0,7549	0,7419	0,6474	0,9341	0,7834	0,7729	0,6746	0,7847	0,7252	0,7912	0,8412	0,8572	0,8754	0,7116	0,6216	0,8018	0,6497	0,6537	0,8013	0,8362	0,7613	0,8460	0,5341	0,7226	0,6191					
Relative I.		4,0278	3,9382	3,4539	4,9838	4,1794	4,1238	3,5991	4,1866	3,8692	4,2212	4,4879	4,5734	4,6707	3,7967	3,3163	4,2778	3,4666	3,4875	4,2754	4,4615	4,0618	4,5137	2,8493	3,8551	3,3032					
Ranking		14	15	22	1	11	12	19	10	16	9	5	3	2	18	23	7	21	20	8	6	13	4	25	17	24					

Figure 19. Quality House created for the maritime labor force.

According to the quality house in Figure 19, the Absolute Importance levels of the requirements, which are designed to meet the expectations of the maritime labor force and which are requirements, are listed in the Table 19 from large to small.

Table 19. The absolute importance levels of the requirements.

Requirements	**Absolute Importance**
R4. Health and Safety of People	0,934
R13. Social Insurances and Benefits	0,875
R12. Medical Coverage And Medical Benefits	0,857
R22. Repatriation	0,846
R11. Understandable Contract	0,841
R20. Quality and Quantity of Food	0,836
R16. Set up A Land-Sea-Land Career Management System	0,802
R19. Short Deployment And Flexible Working Time	0,801
R10. Establishment of A Crew Welfare Department	0,791
R8. Technology Supporting Safety At Sea	0,785
R5. Working Hours and Overtime	0,783
R6. Relationships Between Managers and Employee	0,773
R21. Creating A Positive Work Environment	0,761
R1. Competitive Wage Policy	0,755
R2. Timely Payment Of Wages	0,742
R9. Equal Opportunity And Diversity	0,725
R24. Compensation	0,723
R14. Access To The Internet	0,712
R7. Marine Training Center	0,675
R18. Recreational Activity	0,654
R17. Set up A Psychological Support Unit	0,650
R3. Long Service and Performance Award	0,647
R15. Collaboration With Universities and Secondary Education	0,622
R25. Popularization of Marine Culture	0,619
R23. Fair Warning Of Ship Departures	0,534

7. RESULTS AND DISCUSSION

The sustainability reports of shipping companies, MLC convention, and the reports of institutions such as GRI were thoroughly analyzed and indicators were collected. After analyzing the obtained indicators, the possible expectations of the maritime labor force and the possible requirements corresponding to these expectations were revealed. These possible indicators were directed to experts through the Optimal Card Sorting program, allowing the cards (requirements) to be sorted into categories (expectations). In this method, by using the hybrid method, the opportunity to create a new category (expectation) related to the requirements has been given by the experts. In addition, the consistency of the experts was measured with the Card Sorting method. As a result of the analysis, it was seen that the expectations of the maritime labor force were formed in 9 Groups in 3D clustering methods. These are “Work-Life Balance (E1)”, “Fair Treatment (E2)”, “Social Benefit (E3)”, “Safe and Healthy Working Environment (E4)”, “Education and Training (E5)”, “Communication (E6)”, “Quality of Life on Board (E7)”, “Motivation (E8)” and “Employment Terms and Conditions (E9)”. And also, the requirements corresponding to the expectations as a result of Optimal Card sorting are shown in Table 20.

Table 20. Requirements corresponding to expectations.

Priority of Expectations	Expectations	Requirments
1.	E1. Work-Life Balance	- Short Deployment and Flexible Working Time (R19). - Set up a Land-Sea-Land Career Management System (R16).
2.	E3. Social Benefit	- Medical Coverage and Medical Benefits (R12). - Set up a Psychological Support Unit (R17).
3.	E5. Education and Training	- Collaboration with Universities and Secondary Education (R15). - Marine Training Center (R7). - Popularization of Marine Culture (R25).
4.	E4. Safe and Healthy Working Environment	- Establishment of A Crew Welfare Department (R10). - Health and Safety of People (R4). - Technology Supporting Safety At Sea (R8).
5.	E7. Quality of Life on Board	- Access to the Internet (R14). - Quality and Quantity of Food (R20). - Recreational Activity (R18).
6.	E6. Communication	- Creating a Positive Work Environment (R21). - Relationships Between Managers and Employees (R6).
7.	E2. Fair Treatment	- Equal Opportunity and Diversity (R9).
8.	E8. Motivation	- Equal Opportunity and Diversity (R9). - Fair Warning of Ship Departures (R23). - Long Service and Performance Award (R3). - Set up a Land-Sea-Land Career Management System (R16). - Short Deployment and Flexible Working Time (R19). - Timely Payment of Wages (R2).
9.	E9. Employment Terms and Conditions	- Compensation (R24). - Competitive Wage Policy (R1). - Repatriation (R22). - Social Insurances and Benefits (R13). - Understandable Contract (R11). - Working Hours and Overtime (R5).

These 9 categories, which constitute the input part of the Quality House, were prioritized by the FAHP method. According to these results, “Work-Life Balance (E1)”, “Safe and Healthy Working Environment (E4)” and “Education and Training (E5)” appeared as the most important expectations. On the other hand, “Employment Terms and Conditions (E9)” and “Motivation (E8)” were the least important expectations. Accordingly, with “Work-Life Balance (E1)”, which is the greatest expectation of the maritime labor force, is important for the sustainability of employees to be with their families without staying away from social life by organizing the working period at sea and creating flexible working periods. Likewise, it is seen that the “Safe and Healthy Working Environment (E4)” stands out due to the many risks it entails in maritime transport. Seafarers do not want to work on ships that do not meet the requirements of a safe working environment. Operations must be carried out in a safe working environment to prevent work-related dangers, health and safety risks, and to minimize injuries onboard. Of course, the realization of all these can be provided with “Education and Training (E5)”. When looking at it importance levels, it is seen that their importance is quite high in “Education and Training (E5)”. And also, education and training are important components of accident prevention. It is very important to provide compulsory training courses on both land and sea, distance training for personnel working at sea, special training courses for officers, regular exercises and simulator-supported training. It is observed that some companies that have important shares in maritime transport have opened schools to meet their workforce. In these courses, they give practical training from cook to officer. Thus, seafarers participate in the ship with the knowledge of their duties and responsibilities.

Satisfaction and impact degrees regarding experts evaluations on the right side of the quality house have been revealed. The degree of satisfaction used to understand how the current practices meet the expectations of the maritime labor force has been evaluated by experts again. Accordingly, it has been observed that the degrees of satisfaction with the highest absolute weight are “Safe and Healthy Working Environment (E4)” and “Communication (E6)”. On the other hand, it is understood that the satisfaction degree of “Social Benefits (E3)” and “Work-Life Balance (E1)” are lower than the others. In fact, this situation seems to support one of the biggest expectations, “Work-Life Balance (E1)”. Because it reveals the dissatisfaction of the maritime labor force in terms of the “Work-Life Balance (E1)” of the current practices. Also, it is revealed that the employees are relatively

satisfied with the “Safe and Healthy Working Environment (E4)” indicator, which is of high importance.

The impact degree has shown in what direction it will affect the sustainable maritime labor force by meeting the expectations of the employees. Accordingly, it is seen that the impact of “Safe and Healthy Working Environment (E4)” and “Quality of Life on Board (E7)” items will be higher than the others if the expectations are met. On the other hand, it is seen that the degree of the “Fair Treatment (E2)” effect will be the least compared to others if the expectations are met. The fact that the “Safe and Healthy Working Environment (E4)” and “Quality of Life on Board (E7)” indicators also have the highest values in weighing the expectations of the maritime labor force supports the situation here. In particular, the impact rating of the “Safe and Healthy Working Environment (E4)” indicator comes first. In other words, meeting the expectations associated with this indicator has the greatest impact on the sustainability of the maritime labor force. This indicator is also the most important expectation when look at the importance degree of expectations. This makes it the biggest factor in the sustainability of the maritime labor force in terms of importance and impact degree.

The relationship between requirements forms the roof of the Quality House. Relationships here can affect each other positively or negatively. The absence of -1 and -2 values in the relationships table indicates that the requirements have a positive relationship with each other. The requirements are not capable of adversely affecting each other, as they are aimed at providing solutions to the sustainability of the maritime labor force while determining the requirements. There were no indicators that negatively affected each other.

The absolute weights of the expectations and the absolute importance of the requirements were calculated in the relationships matrix, which forms the main part of the quality house. The absolute weights of expectations in the quality house are found by multiplying the degree of importance, improvement rate and degree of impact. When the values here are examined, as in the ranking of the importance of expectations, “Work-Life Balance (E1)”, “Safe and Healthy Working Environment (E4)”, “Education and Training (E5)”, “Social Benefit (E3)”, appeared at the top. Thus, it has been observed that both the

importance of the expectations as a result of FAHP and the weighted situations of expectations in the quality house support each other.

The top ten most important requirements that can meet the expectations in the study are; “Health and Safety of People (R4)”, “Social Insurances and Benefits (R13)”, “Medical Coverage and Medical Benefits (R12)”, “Repatriation (R22)”, “Understandable Contract (R11)”, “Quality and Quantity of Food (R20)”, “Set up a Land-Sea-Land Career Management System (R19)”, “Short Deployment And Flexible Working Time (R19)”, “Establishment of a Crew Welfare Department (R10)”, “Technology Supporting Safety At Sea (R8)”.

Looking at the absolute importance of requirements, it seems that the indicators in the top ten may be a solution to expectations with high absolute weights, such as “Work-Life Balance (E1)”, “Social Benefit (E3)”, “Safe and Healthy Working Environment (E4)”, and “Quality of Life on Board (E7)”. In addition, when look at the absolute weight of expectations, “Education and Training (E5)” comes in third place. But when look at the requirements, one of the most remarkable results of this study was that the requirements that could correspond to “Education and Training (E5)” were lower. This can be based on the high degree of satisfaction of education and training. In other words, satisfaction with today's practices related to “Education and Training (E5)” can be attributed to the fact that the absolute weight of requirements related to this indicator is lower than others.

Considering the weight of the requirements, it is seen that the indicators related to health and safety come first. Here, the most important requirements such as “Health and Safety (R4)”, “Medical Coverage and Medical Benefits (R12)” and “Technology Supporting Safety at Sea (R8)” can be said to be solutions for one of the most important expectations, the “Safe and Healthy Working Environment (E4)”.

The fact that the proposals for requirements related to “Social Benefits (E3)” of employee are again at the top can be attributed to the fact that seafarers want to provide social security for themselves and their families in maritime transport, which has many risks.

Requirements such as employment contracts and repatriation also come to the fore. These requirements correspond to the “Employment Terms and Conditions (E9)” from the expectations. Seafarers' need for standardized and “Understandable Contracts (R11)” is an important requirement, especially in maritime transport, which has a multinational and multicultural working environment. Also, seafarers' “Repatriation (R22)” is an important requirement for completing their contract or for compulsory reasons. At the same time, it is a necessity to plan the transportation safely when planning repatriation, as it may be possible to leave the ship from any part of the world.

The weight of the requirements for seafarers’ related to “Work-Life Balance (E1)” are also very high. Among these indicators, “Set up a Land-Sea-Land Career Management System (R16)” and “Short Deployment and Flexible Working Time (R19)” stand out. It can be ensured that seafarers do not stay away from social life by offering career opportunities both on land and at sea within the company and by creating shorter working periods.

“Quality and Quantity of Food (R20)” and “Establishment of a Crew Welfare Department (R10)” are the top ten requirements for improving the “Quality of Life on Board (E7)”. Creating a good working atmosphere is essential for the sustainability of the maritime labor force by providing seafarers with adequate standards quality of life on board, while they working pace and stress away from their families and social life.

8. CONCLUSION

In this thesis, a model has been created for the sustainability of the maritime labor force by using the quality house method, which is used to reflect the consumer demands to the product features, with Card Sorting, Fuzzy Logic and FAHP methods. It is important in terms of the modeling of the maritime labor force on the concept of sustainability.

The long-term continuity of the human factor, which is at the center of sustainability, has become an important topic in the maritime sector as in every sector. Today's conditions that direct the maritime labor force to be sustainable encourage shipping companies to take measures in this direction. Especially considering that recruiting new personnel is more costly than the cost of holding existing personnel, the principle of longevity, which is one of the main factors of sustainability, gains importance.

However, in addition to the natural difficulty of the maritime profession, due to factors such as staying away from family and social life, working on ships with weaknesses in safety and security measures, being deprived of their personal rights, difficulties in adapting to developing technologies, not being treated fairly and the stress of their job, it has been observed that seafarers work at sea for a very short time in their profession.

It is thought that the study will provide solutions for the longevity of the maritime labor force. And also provide an economic advantage for shipping companies. In addition, the expectations of the maritime labor force set out in the thesis and the suggestions of solutions for the seafarers' reaching both economic and social welfare can increase the interest in the maritime profession especially for younger generations. This situation is important in terms of meeting the demand for seafarers who provide economic returns to the countries.

Literature review was conducted and sustainability reports of shipping companies were examined on the determination of indicators for expectations and requirements of the maritime labor force. Indicators were carefully studied and analyzed. In addition, apart from the common indicators, the indicators that the companies emphasized within themselves were taken. In this way, indicators related to the sustainability of the maritime labor force were determined. A list of indicators was formed by evaluating these indicators with the Optimal Card Sorting program used in scientific studies. This list of indicators that can be taken as reference in future scientific studies is one of the important outputs of this study.

As a result of the review, it was found that the expectation with the greatest absolute weight is “Work-Life Balance (E1)”. It is possible to say that the requirements that can meet this expectation are “Short Deployment and Flexible Working Time (R19)” and “Set up a Land-Sea-Land Career Management System (R16)”. With these solution proposals, the most important source of motivation for the sustainability of the maritime labor force can be the arrangement of the working period of the employees at sea, being together with their families more often without staying away from social life, creating flexible working periods based on the special days of the employees, and even bringing their family members to the ship if possible. Especially by providing sea-land rotations of officers who have worked at sea for a certain period of time, the work flow between the parts of the company both on land and at sea can be made more understandable. In this way, it can be ensured that the personnel who have worked at sea for a certain period of time are assigned to the land and not to stay away from social life.

Another important expectation for seafarers is the “Social Benefit (E3)”. It is possible to say that the requirements that can meet this expectation are “Medical Coverage and Medical Benefits (R12) and “Set up a Psychological Support Unit (R17)”. It becomes clear that a multi-level insurance assistance system should be established to provide effective guarantees to employees and improve the integrity and solidarity of the team. In particular, general health insurance, life insurance, accident insurance, unemployment insurance, birth or death benefit may be the solution to the expectations of the maritime labor force in this direction. In addition, a psychological support unit can be established to prevent psycho-social risks such as workplace or sexual harassment or to assist employees returning from long-term absences.

“Education and Training (E5)” is also one of the important expectations. It is possible to say that the requirements that can meet expectation are “Marine Training Center (R7)”, “Collaboration with Universities and Secondary Education (R15)” and “Popularization of Marine Culture (R25)”. Establishing “Marine Training Centers (R7)” related to can offer companies the opportunity to create a highly efficient workforce pool. In addition, in order to keep maritime culture alive and pass it on to future generations, joint initiatives should be made with the sector to introduce the sea to young students from secondary education and to transform marine life into life style. These students can be invited to maritime faculties and higher schools to provide information about the maritime profession, and at the same time, students' motivation for the maritime profession can be increased by introducing simulation and laboratory facilities in these schools. And also, social activities related to maritime such as sailing camp can be organized for students to make them love the sea. It is necessary to tell these young people about their difficulties when talking about the good sides of seafaring, or even show them if possible. The important thing here will be to find idealistic people who have given their heart to this work, who can more easily adapt to maritime life, and direct them to the maritime profession.

Another important expectation for seafarers is the “Safe and Healthy Working Environment (E4)”. It is possible to say that the requirements that can meet this expectation are “Establishment of A Crew Welfare Department (R10)”, “Health and Safety of People (R4)” and “Technology Supporting Safety At Sea (R8)”. According to the MLC, special departments such as the Crew Welfare Department can be established to increase the welfare of the employees in order to ensure adequate standards and create a perfect working environment on board. Considering both the importance of expectations and their absolute weight in the quality house, it is revealed that the seafarers want to work on ships where safety measures are taken under healthy working conditions. For this, accident prevention departments can be established and inspections can be made within the company and also measures can be taken, especially thanks to near-miss reports. And also, ships have seafarers of different nationalities and cultures, so safety procedures must be of a certain standard. Ensuring the safety of life with the medical consultancy services to be established by the companies in case of possible emergencies at sea will also make seafarers feel safe in the environment where they work. Another important requirement regarding safety at sea is “Technology Supporting Safety At Sea (R8)”. Rapid technological developments in the

sector create uncertainties in employees. In order to adapt employees to these technological developments, it is important to detect technological changes on time and to provide support by companies related to these technological changes. For example, the provision of additional equipment to increase navigation safety outside of legal requirements. Also, by establishing fleet navigation centers within the company, ship captains can be helped by navigation assistance systems or decision-making systems for navigating in bad weather conditions. This offers safe sailing for the crew at sea.

"Quality of Life on Board (E7)" is another important expectation. It is possible to say that the requirements that can meet this expectation are "Quality and Quantity of Food R(20)", "Recreational Activity (R18)" and "Access to the Internet (R14)". One of the greatest pleasures for seafarers is food. There should be quality and sufficient food on board, and nutrition and meal planning can be made by following the instructions of the World Health Organization as much as possible. In addition, since people from various religions and cultures work on ships, making menus sensitive to religious-cultural choices and creating diet menus can play a significant role in improving the quality of life of seafarers. And also, recreational facilities to maintain both the mental health and physical of the crew, social activities where staff can have fun, and free high-speed internet are important factors for improving the quality of life on board. And also, consulting support can be obtained from a specialist sports and performance centre to optimize the health and physical performance of staff working at sea and decrease the accident ratio.

When considering the expectations related to "Communication (E6)" and corresponding solution proposals; the requirements for "Creating a Positive Work Environment (R21)" and "Relations Between Managers and Employees (R6)" come. Open communication should be encouraged, such as providing access to front-line management and clarity in all communications in order to create a positive work environment, establish constructive and productive working relationships between managers and employees. For example, providing clear communication and timely messaging about risks and precautions can prevent many risks.

Another expectation related to the sustainability of the maritime labor force is “Fair Treatment (E2)”. It is possible to say that the requirement that can meet this expectation is “Equal Opportunity and Diversity (R9)”. Companies should provide equal opportunities in recruitment, training, awards and promotion, regardless of gender, nationality, age, religious belief. Emphasis is placed on the necessity of gender equality, multiculturalism and intergenerationalism in order to enable mutual enrichment. And also, diversity plays a fundamental role in guiding businesses. In particular, IMO emphasized women empowerment and gender equality with many events in 2019. As a source of inspiration and innovation, it can help the company provide them with tailored shipping solutions and quality services. And also, diversity can be better for leadership and for teamwork.

The expectation of “Motivation (E8)” is also very important to ensure the sustainability of the maritime labor force. It is possible to say that the requirements that can meet this expectation are “Timely Payment of Wages (R2)”, “Equal Opportunity and Diversity (R9), “Long Service and Performance Award (R3)”, “Set up a Land-Sea-Land Career Management System (R16)”, “Short Deployment and Flexible Working Time (R19)” and “Fair Warning of Ship Departures (R23)”. When evaluate the expectation about “Motivation (E8)”; competitive and performance-based remuneration and timely payment of wages are the requirements for attracting new talent, retaining and motivating employees. In addition, companies awarding their employees awards based on their long service or performance can be also a source of motivation for the maritime labor force. And also, the travel of personnel who will join the ship, except in any emergency, must be planned in advance. Staff working at sea need a fair warning about ship departures so they can make family arrangements.

Looking at the weight of expectations, it seems that “Employment Terms and Conditions” is in last place. It is possible to say that the requirements that can meet this expectation are “Understandable Contract (R11)”, “Repatriation (R22)”, “Compensation (R24)”, “Competitive Wage Policy (R1)”, “Social Insurances and Benefits (R13)” and “Working Hours and Overtime (R5)”. The implementation of an understandable employment contract is important for the sustainability of employees. This indicates the necessity that contracts covering the rights and responsibilities of employees should be prepared clearly and understandably by seafarers of various nationalities. Seafarer's

Employment Agreement (SEA) should be drawn up on behalf of seafarers in accordance with the circumstances and conditions of the suitable collective bargaining agreement (CBA) negotiated by the ITF and its affiliates in line with the MLC, 2006. The fact that states follow and control these standard contract forms will play a significant role in preventing abuse of seafarers' rights such as personal and social security. Another important indicator appears to be repatriation. If seafarers need to complete their contracts or leave the ship for health reasons, providing medical support, and returning them to their homeland safely has also been an important indicator. In addition, compensation in the event of any injury or death related to the staff is also an important requirement. And also, working hours and overtime for staff must be determined according to applicable collective bargaining agreements (CBA) and regulatory requirements.

When briefly evaluate these indicators, it reveals that safety and healthy working conditions at sea, work-life balance and social benefit are the most important indicators for seafarers, and the wage policies are less important for seafarers. The sustainability of the maritime labor force shows that these requirements should be focused more on. Improving the working conditions of seafarers can transform the maritime profession from being a temporary job only for the purpose of high salaries, into a profession to be held for many years. At the same time, it will reduce all kinds of accidents that occur on ships as a result of the increase in productivity based on work satisfaction. A safe and healthy work environment should be provided on board. Seafarers' work-life balance should be established and long separation from social life and their families should be prevented. Improving the social security and personal rights of seafarers, increasing the quality of life on board and making it more attractive to work on the ship should be one of the basic requirements.

In this thesis, the sustainability of the maritime labor force is considered as a whole, not in various ship types. In future studies, it may be suggested to create a social sustainability model for seafarers working in companies that offer different types of services such as tanker, dry cargo, container and Ro-Ro. Also, studies can be carried out on solution proposals that may correspond to the economic and environmental expectations of the maritime labor force, which are other dimensions of sustainability. Furthermore, the experts in the study consist of people from the same nationality, therefore, different perspectives can be obtained by forming a multinational and multicultural expert team in future studies on

subject. In addition, countries are closing their borders or applying quarantine due to the emergence of epidemic diseases such as “COVID-19” in the current period. This creates difficulties in repatriating seafarers. The impact of these difficulties on the sustainability of the maritime labor force can be a source of inspiration for future studies. And also, with the emergence of autonomous ships in the future, how the maritime labor force will be affected may be another research subject.

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APPENDIX-A

Total evaluations made by the experts for Relationships Matrix.

Expectations \ Requirements	Competitive Wage Policy	Timely Payment of Wages	Long Service and Performance Award	Health and Safety of People	Working Hours and Overtime	Relationships Between Managers and Employee	Marine Training Center	Technology Supporting Safety at Sea	Equal Opportunity and Diversity	Establishment of A Crew Welfare Department	Understandable Contract	Medical Coverage and Medical Benefits	Social Insurances and Benefits	Access to The Internet	Set up A Land-Sea-Land Career Management System	Set up A Psychological Support Unit	Collaboration with Universities and Secondary Education	Recreational Activity	Short Deployment and Flexible Working Time	Quality and Quantity of Food	Creating A Positive Work Environment	Repatriation	Fair Warning of Ship Departures	Compensation	Popularization of Marine Culture
1 Work - Life Balance	2,5,0 0,0,8 7,8,0 ,8	1,5,5 0,0,8 8,2,0, 8	2,9,6, 0,0,8 8,1,0, 2	7,5,5 5,6,8, 8,3,6, 8	6,7,1 3,7,8, 7,5,8, 7	3,0,0, 0,4,8, 8,1,3, 8	3,0,4, 0,0,8, 8,0,0, 6	1,0,0, 1,5,8, 8,0,0, 2	1,0,1, 0,4,8, 8,3,0, 1	1,0,0, 5,6,8, 8,3,7, 1	3,0,7, 0,7,8, 8,0,2, 8	2,0,7, 0,9,8, 8,5,0, 2	2,0,7, 0,9,8, 7,5,0, 2	2,5,4, 3,8,8, 8,7,0, 1	3,0,4, 7,0,8, 8,9,4, 1	1,5,5, 3,3,8, 8,5,3, 8	1,0, 0,0, 5,8, 8,0, 0,3	2,0, 5,5, 0,8, 8,7, 4,4	1,0, 7,9, 3,8, 8,9, 8,8	2,0, 1,3, 5,8, 8,1, 0,8	1,0, 0,5, 5,8, 8,3, 3,2	3,0, 6,0, 0,8, 8,0, 8,9	1,7, 4,7, 3,8, 8,5, 8,2	1,0, 1,0, 5,8, 8,0, 3,7	1,0, 1,0, 7,8, 8,0, 2,5
2 Fair Treatment	1,0,8 7,0,7 7,7,4 ,8	0,0,3, 3,0,7, 6,5,7, 8	2,0,8, 0,0,7, 7,7,6 2	1,0,1, 0,0,7, 7,3,4 8	1,5,1, 5,6,7, 7,7,2, 7	3,7,6, 0,4,8, 5,0,6, 8	1,0,3 ,0,0,6 6,3,0 ,2	0,0,2, 0,0,7, 7,0,0, 7	4,3,9, 9,8,8, 7,9,9, 8	1,0,3, 3,0,8, 8,5,3, 8	3,0,4, 3,0,8, 7,3,6 8	2,0,2, 0,0,7, 7,5,3, 8	0,0,2, 0,0,7, 7,5,2, 8	1,0,0, 5,0,7, 7,3,2, 5	1,0,9, 7,0,7, 7,7,0, 2	2,0,0, 0,0,7, 7,1,0, 8	1,0, 7,0, 7,0, 7,1 0,3	2,0, 1,0, 0,7, 6,0, 4,3	0,0, 5,3, 0,7, 6,3, 2,7	1,0, 0,5, 0,6, 6,7, 2,7	1,0, 0,0, 0,6, 6,8, 2,8	1,0, 0,0, 0,6, 6,8, 2,3	1,0, 0,0, 0,6, 6,9, 1,9	1,0, 0,0, 0,7, 7,5, 4,9	1,0, 1,0, 0,8, 8,1, 2,2	1,0, 1,0, 0,7, 7,5, 8,7	2,0, 6,0, 0,7, 7,1, 0,3
3 Social Benefit	4,0,2, 3,0,6, 6,2,0, 2	4,0,1 ,0,3,7 ,7,8,1 ,8	6,0,3, 3,0,6, 6,2,2, 2	3,9,2, 0,0,6, 6,8,4, 8	2,0,2, 0,0,6, 7,7,5, 7	3,0,0, 0,0,6, 6,8,2, 8	1,0,0, 0,0,6, 6,2,0, 2	2,0,0 ,0,7,6 ,6,5,0 ,5	2,0,2 ,0,0,6 ,7,7,4 ,7	1,3,0, 7,7,6, 6,7,5, 7	3,0,1, 0,2,6, 6,8,2, 8	2,9,9, 9,9,6, 6,9,7, 9	7,9,9, 9,9,6, 6,9,9, 9	4,0,0, 3,9,6, 6,3,2, 3	4,0,1, 0,0,6, 7,2,2, 2	3,0,7, 0,5,6, 6,8,6, 8	2,0, 0,0, 0,1, 6,3, 4,3	3,0, 0,0, 0,6, 6,7, 4,3	3,0, 5,3, 0,7, 6,3, 2,7	2,0, 1,0, 0,7, 7,3, 4,8	2,0, 0,0, 0,6, 6,8, 2,8	4,0, 0,0, 0,6, 6,8, 2,8	4,0, 0,0, 0,6, 6,9, 1,9	1,0, 0,7, 0,8, 7,2, 0,2	1,7, 8,7, 7,6, 6,7, 7,7	1,0, 4,0, 0,6, 6,3, 0,3
4 Safe and Healthy Working Environment	0,0,3 ,0,0,6 ,6,7,0 ,7	1,0,0, 0,0,8, 8,8,0, 8	4,0,3, 0,0,6, 6,2,0, 2	6,9,9, 9,9,6, 6,8,9, 8	5,7,9, 5,7,6, 7,7,7, 7	2,0,8, 0,0,6, 6,8,2, 8	5,0,8, 7,5,6, 6,2,5, 2	2,7,8 9,5,8 ,8,5,8 ,5	1,0,3, 0,0,6 6,7,0, 7	4,0,8, 7,6,6 7,7,6, 7	3,0,6, 0,0,6 6,8,0, 8	3,0,7, 9,7,6 6,9,6, 9	3,0,6, 5,0,6 7,9,5, 9	1,0,4, 0,0,6 7,3,1, 3	1,0,5, 0,0,6 7,2,0, 2	4,0,8, 9,3,6 7,8,7, 8	1,0, 8,5, 0,6, 6,3 2,3	1,0, 4,7, 0,6, 6,3 3,3	2,0, 7,3, 0,6, 6,7 5,7	3,0, 5,5, 0,6, 6,8 7,8	4,0, 8,3, 0,6, 6,8 7,8	3,0, 6,0, 0,6, 6,9 6,9	3,0, 6,0, 0,6, 6,9 3,9	1,0, 1,0, 0,6, 7,2 0,2	2,0, 7,5, 0,6, 6,7 2,7	3,0, 6,0, 5,6, 6,3 5,3
5 Education and Training	2,0,5, 0,0,6, 6,2,0, 2	2,0,0, 0,0,6, 6,8,0, 8	3,0,6, 0,0,6, 6,2,0, 2	3,0,7 ,7,6,7 ,7,8,7 ,8	2,5,7 3,0,6 ,7,7,0 ,7	5,0,3, 1,0,6, 6,8,0, 8	2,7,6 9,9,8, 6,2,9, 2	3,0,8, 5,0,6, 6,5,7, 5	4,0,3, 5,0,6, 6,7,4, 7	2,0,7 ,1,0,6 ,6,7,5 ,7	3,0,3, 0,0,6, 7,8,0, 8	1,0,3, 5,0,6, 7,9,0, 9	1,0,2 ,0,0,6 ,7,9,3 ,9	3,5,4 ,0,6,6 ,6,3,6 ,3	2,3,5, 7,0,8, 8,2,6, 2	2,0,2 ,1,0,6 ,6,8,5 ,8	4,5, 8,9, 8,6, 6,3 9,3	1,0, 0,0, 0,5, 5,8 8,2	2,0, 2,0, 0,6, 7,7 7,7	0,0, 0,3, 3,8, 8,2 0,2	1,0, 0,0, 0,7, 7,9 7,8	2,0, 2,0, 0,6, 7,2 7,8	4,0, 7,9, 5,6, 6,3 7,3
6 Communication	1,0,2 ,0,0,6 ,6,2,7 ,2	1,0,1, 0,0,6, 6,4,2, 2	2,0,0, 7,0,6, 6,3,0, 3	3,5,6, 7,0,7, 6,2,0, 2	2,0,0, 0,0,6, 6,1,0, 1	6,5,9, 9,9,6, 6,2,8, 2	2,0,3, 3,3,6, 6,3,6, 3	3,0,7, 7,9,6, 6,3,8, 3	2,0,1 ,5,0,6 ,6,3,6 ,3	2,0,8, 5,6,6 ,6,2,3 ,3	3,0,3, 1,7,6, 6,3,0, 3	1,0,1 ,3,0,6 ,6,2,0 ,2	2,0,3, 3,0,6 6,3,2, 3	2,0,8, 7,9,6, 6,3,9, 3	3,0,2 ,5,0,6 ,6,3,2 ,3	2,5,2, 5,3,6, 6,5,5, 5	1,0, 0,7, 0,6, 6,2 6,2	3,0,3, 1,7,6, 6,3,0, 3	1,0,1 ,3,0,6 ,6,2,0 ,2	2,0,8, 7,7,6, 6,8,7, 8	1,0,7, 3,0,6 6,8,7, 8	2,9,9, 9,8,6, 6,5,7, 5	3,9,8, 7,8,6, 6,7,6, 3	3,0,6, 9,5,6, 7,9,5, 3	2,0,5, 0,0,6, 7,2,2, 2	3,5,2, 5,3,6 ,6,8,7 ,8	2,0,6 ,5,3,6 ,6,5,5 ,5	1,0, 7,3, 0,6, 6,2 0,2	2,0, 1,1, 3,6, 6,1, 8,1
7 Quality of Life on Board	2,0,2 ,3,0,6 ,6,8,0 ,8	2,0,1, 1,0,6, 6,8,5, 8	5,0,0, 3,0,6, 6,2,5, 2	4,0,3, 9,8,6, 6,8,7, 8	4,7,5, 7,6,6, 7,7,7, 7	3,3,6, 5,0,6, 6,8,6, 8	2,0,5, 0,5,7, 7,2,6, 2	3,0,7, 7,9,6, 3,9,6, 6,7,7, 7	2,0,6, 9,7,6, 6,8,2, 8	2,0,7, 9,0,6, 6,8,8, 8	4,0,6, 0,0,6, 6,8,0, 8	2,0,8, 7,7,6, 6,8,7, 8	1,0,7, 3,0,6 6,8,7, 8	2,9,9, 9,8,6, 6,5,7, 5	2,0,5, 0,0,6, 7,2,2, 2	2,0,6 ,5,3,6 ,6,8,7 ,8	2,0, 3,6, 3,6, 6,6 3,6	4,7, 9,9, 6,6, 6,8 8,8	2,6, 7,3, 6,6, 6,3 8,3	2,0, 5,0, 0,6, 6,2 3,9	1,0, 8,7, 7,6, 6,7 7,7	1,0, 5,0, 0,6, 6,2 2,7	1,0, 5,0, 5,6, 6,3 7,3
8 Motivation	7,0,2 ,9,9,6 ,6,7,0 ,2	7,9,2 ,9,9,6 ,6,7,7 ,2	8,5,0 ,9,6,6 ,6,9,9 ,3	7,7,4 7,6,6 6,7,5 2	6,5,6, 7,7,6, 6,7,1 1	6,5,7, 7,8,6, 6,8,5, 2	4,0,3, 7,6,6, 7,5,1 3	4,0,7, 3,9,6, 6,3,4, 3	4,0,8, 9,8,6, 6,9,7, 3	4,0,7, 7,6,6, 7,7,8, 3	4,0,6, 3,7,6, 6,3,0, 3	4,0,7 ,1,8,6 ,6,1,4 ,2	6,0,7, 9,8,6, 6,9,4 3	3,9,8, 7,8,6, 6,7,6, 3	3,0,6, 9,5,6, 7,9,5, 3	3,5,6, 7,2,6, 6,7,7, 5	3,0, 3,0, 0,6, 6,6 6,0	4,4, 9,9, 6,6, 6,9 7,2	4,0, 9,9, 7,9, 9,9, 2,2	5,9, 8,9, 7,6, 6,9 8,2	5,0, 7,5, 0,6, 6,9 7,2	5,0, 7,5, 0,6, 6,2 2,3	6,0, 6,3, 8,6, 6,3 0,2	4,0, 7,5, 0,6, 6,5 8,2	4,0, 7,9, 0,6, 6,9 2,1
9 Employment Terms and Conditions	5,9,0, 9,9,6, 6,7,7, 5	5,9,7 ,9,9,6 ,6,9,8 ,2	3,9,0 ,5,3,6 ,7,1,7 ,3	4,0,2 3,0,7 ,7,2,7 ,2	4,0,9, 9,5,6, 6,9,7, 1	3,0,1, 0,0,6, 6,2,2, 2	1,0,2, 0,0,6, 6,1,0, 5	1,0,0, 0,0,6, 6,0,0, 3	4,0,7, 3,0,6, 6,1,0, 3	4,0,2 ,0,1,7 ,7,2,0, 3	4,9,9, 9,8,6, 6,9,9, 3	2,9,1, 7,8,6, 7,5,6, 2	2,0,2 ,5,9,6 ,6,7,6 ,3	2,0,2 ,0,0,6 ,7,3,2 ,3	2,0,0 ,0,0,6 ,6,5,2 ,5	3,0,0 ,0,0,6 ,6,5,5 ,5	3,0, 1,0, 0,0, 0,6 6,2 0,2	2,0, 2,0, 0,0, 0,6 7,2 2,2	2,0, 2,7, 7,7, 7,5 7,2	2,0, 3,3, 0,6, 7,2 2,2	2,0, 3,0, 0,6, 6,2 2,2	2,0, 3,0, 0,3, 6,6 7,4	2,9, 5,9, 8,6, 7,9 6,2	4,0, 0,0, 0,6, 6,0 1,1

APPENDIX-B

Indicators obtained in the first stage as a result of examining the sustainability reports.

MLC

1. Food and catering, accomodations, recreational facilities
2. Circumstances of employment
3. Minimum requirements for the seafarers
4. Medical care, social welfare
5. Compliance and Enforcement

MAERSK

6. Fees & Timely Payment of Fees
7. Treated Fairly
8. Long Service and Performance Award
9. Cultural-Language Support Giving
10. Safe and Healty Working Environment
11. Compensation
12. Freedom of Association
13. Forced Labor
14. Working Hours and Overtime
15. Constructive and Productive Working Relationships Between Managers and Employee
16. E-Learning Module on Global Employee Relations
17. Training for Employees Who Deal with Manning Agencies
18. The right to life and the right to the highest attainable standard
19. Collective bargaining
20. Rest and leisure
21. Human rights principles and standards related to labour
22. Support in place for employees whose jobs disappear due to the adoption of new technologies.
23. Gender and nationality diversity

MSC

24. Treated Fairly
25. Evolving skill needs
26. Best practices and management systems about health and safety
27. Quality Education and Traininig
28. Leadership Development Training programme
29. Welfare Facilities
30. Establish Crew Welfare Department
31. Seafarers' well-being
32. Understandable Contract
33. Working conditions
34. Compensation
35. Repatriation
36. Safety Culture on board
37. Technology supporting safety at sea
38. Hours of work and rest of crew

39. Collective Bargaining Agreements
40. Medical Coverage And Medical Benefits
41. Open communications
42. Encouraging Vocal Culture
43. Quality And Quantity Of Food
44. Work/life balance
45. Timely payment of wages
46. Protective Equipment
47. Internet access
48. Protecting The Environment
49. Arrangements For Seafarers While On Leave.
50. Young Talent Programme
51. Providing Reach to Management
52. Women's Empowerment
53. Overtime
54. Provision Of Mentoring, Coaching And Training Opportunities
55. Collaboration With School
56. Creating a Good Work Environment

CMA CGM

57. The dissemination of the Compliance culture
58. A whistleblowing system: Ethics Hotline
59. Travel-safe
60. Health and Safety of people
61. Fleet Navigation Center
62. quality of life at the workplace
63. work-life balance
64. fair warning of ship departures
65. to assist employees returning from long-term absences
66. working time
67. Diversity
68. equal opportunity
69. Anti-Discrimination Policy ;
70. collective bargaining agreement
71. Communication
72. set up a "land-sea-land career management system
73. preventing Psycho-social Risks (set up a psychological support unit)
74. ergonomy of the vessels
75. sports and performance centre
76. food onboard vessels
77. Talent Management and skills development.
78. e-learning
79. classroom-based courses
80. close working relationships with universities and colleges
81. Mentoring
82. leadership training programme
83. to be an attractive employer
84. A Competitive Wage Policy
85. performance-based salary system
86. fair wages policy

87. social benefits
88. An efficient information system
89. training courses designed to make environmental protection

COSCO

90. Occupational health and safety
91. Advocating equality and diversity
92. Maintaining labour relations
93. Protecting the legal rights of employees
94. Creating a harmonious working environment
95. welfare benefits
96. working environment for employees
97. Labor protection
98. Protective equipment
99. working in good conditions
100. Safety education
101. Fully cultivate talents(Yetenekleri tamamen geliştirin)
102. Efficent Staff Education and Training
103. equality and diversity (equally and fairly) Employee diversity, Gender equality
104. equal opportunities
105. promotion,
106. training and awards,
107. Maintaining labor relations
108. employees' rights
109. freedom of association
110. collective bargaining
111. compensation
112. Protecting the legal rights of employees
113. insurance benefits
114. Social insurances; medical insurance, unemployed insurance, injury insurance, and housing fund
115. Paid leaves, employees enjoy statutory off days and holidays, family visit leaves, as well as other holidays
116. Salary on overtime hours
117. medical examination for staff mental and physical health,
118. Employees thoughts and opinions
119. establishing a communication platform
120. Cares for employees
121. In addition to holidays, insurance and welfare benefits,
122. lighten employees' cultural life,
123. create a comfortable working environment
124. corporate cultural construction

Hanjin

125. compensation program

Hapag Lloyd

126. Work-life balance
127. flexible working times
128. short deployments
129. social insurance
130. fair pay

131. Relationships Between Managers and Employee
132. telemedicine method
133. creating a warm environment between departments and among employees

OOCL-OOIL

134. safe working environment
135. encouraging and appreciating seafarers
136. performance award
137. OOCL Academy
138. different cultures can enrich the lives of people
139. health insurance and pension funds
140. supporting research projects of universities and providing internships
141. employment terms and conditions

Evergreen

142. training of new generation sailing talents
143. foundation established
144. expand the vision of children through education by visiting schools in remote villages
145. Evergreen Marine Museum

Hamburg Sud

146. attractive working conditions
147. flexible working time arrangements for a better work-life balance

CURRICULUM VITAE

Name Surname: Osman ARSLAN

EDUCATION

2013 – 2015	Istanbul University, MSc Institute of Marine Sciences and Management
2001 – 2006	Anadolu University, BSc Business Administration

ACADEMIC EXPERIENCE

02/2016 – Present	Lecturer at Kocaeli University

PROFESSIONAL EXPERIENCE

2001 – 2007	2nd Officer and 3rd Officer in various shipping Companies