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# Mersin University

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### COMPARATIVE CONTAINER PORT EFFICIENCY: TURKEY AND EUROPEAN PORTS

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#### ABSTRACT

Due to the increase in global transportation, companies are now focused on more efficient operation of their systems. In the maritime sector, efficiency studies are carried out on ports which are the place of interaction of land and sea stages of international transportation. Efficiency studies about ports have been carried out in many areas such as capacities of the ports, hinterland, number of incoming and outgoing ships, processing times and handling quantities. Thence, the companies saw the deficiencies in the ports and headed towards shortcomings and aimed to improve their ports efficiency. In this study, the European (15) and Turkey (15) port efficiency was examined by analysis of two different modeling methods. For the port efficiency, the length of the docks, the port depth, the terminal area and the amount of TEU handled were taken into consideration in models. These data were utilized and evaluated separately in Data Envelopment Analysis (DEA) and Hotelling T-square methods. Efficiency values of Europe and Turkey ports were examined with DEA. It is concluded that European ports are used more efficiently than Turkish ports. Even the best Turkish port ranked 10th in the overall ranking. Next, Hotelling T-square analysis were utilized to find out reason of differences between Europe and Turkey's ports.

Results show that almost all Turkey ports has lower efficiency values than European ports. In Turkey ports, it has reached the conclusion that the utilization of terminal area and the quay length are not operating efficiently.

**Keywords:** *Data Envelopment Analysis (DEA), Hotelling, Maritime, Port Efficiency*

## 1. INTRODUCTION

Global world trade is increasing day by day and this increase effecting directly to worldwide transportations. Seaway transportation is the most preferred transportation system in the world. More than 80% of all Worldwide transportation is done by seaway transportation (UNCTAD, 2016). Maritime transport is advantageous in terms of high carrying capacity compared to other modes of transport, -depending on distance- economical formation, comfort, environmental friendliness and safer (Ateş, et al, 2013).

The cargo carried by sea transport is made 54% by bulk cargo, 29% by liquid and gas, 17% by container ship (UNCTAD, 2016). Although it is 17% of the total transport, the cargo carried on the container ship is the type of shipping which has the largest economic return. In the same way, investment is high which is made on container shipping.

Ports are places where vessels establish links with the land, and the investments made in these places and the efficiency of the ports are important for the vessels. Capacity of port, sea depths, length of quays effect quality of services and number of ships which coming to ports. This affects the economic return that the ports and the country can obtain (Cullinane et al., 2006). Some of the ports in Europe are involved in the effects of ports on the Gross National Product.

There are many studies and methods on the efficiency of ports. Some of those; total factor productivity on the ports (Kim et al., 1986), method of creating performance indicators (Talley, 1994), multiple regression model (Tongzoni, 1995), benchmarking on updated data and the amount of container handled at a certain time (Talley, 1998), simulation method (Esmer, 2010) and Data Envelopment Analysis (DEA) – the most common one- (Roll et al., (1993), Tongzon (2001), Barros (2003), Cullinane et al., (2005), Bichou (2013), Schøyen et al., (2013), Ateş et al (2013), Baran et al., (2015), Wiśnicki et al., (2017), Gamassa et al., (2017), Mousavizadeh et al., (2017), Gökçek et al., (2018)).

In this study, after examining the efficiency with DEA, Hotelling's T-square test will be applied to benchmark Europe and Turkey ports. The reason for using hotelling technique is that it allows the effect of more than one variable for the two groups to be examined at the same time. The Hotelling test will show the infrastructural differences of the ports as a result of comparison. There are many studies with hotelling, especially in medicine (Adams et al., (1994), Holmes et al., (2008)). It is also utilized in social studies (Bircan et al., 2016), Liu et al., (2018) and industrial research (Çetin et al., 2007).

In the paper, European and Turkish ports are benchmarked. Each groups have 15 members. In the second stage of study, there are models and data which are utilized and an application on ports. The conclusion is at third stage.

## 2. MODELS AND DATA

### 2.1. Models

Data Envelopment Analysis (DEA) is non-parametric system and predicts multiple inputs and multiple outputs using mathematical programming

techniques and performs efficiency analysis of similar Decision Making Units (DMUs) (Kocakoç, 2003). Specifies the "best" observations that produce the most output composition using the least input composition in any observation set. The boundary -best observation- is considered as "reference" and measures the distance of these inactive decision units as "radial". It measures the efficiency of DMU that are equal to the same number of inputs and outputs. By modeling each unit, solving them with linear programming technique. Inactive units can be made efficient based on the reference point

The main efficiency measure in Data Envelopment Analysis is the weighted sum of the outputs divided by the weighted sum of the inputs. In other words, the criterion of effectiveness of any decision point (j. Decision point) can be defined as in Eq. (1).

$$\frac{u_1 y_1 + u_2 y_2 + \dots + u_n y_n}{v_1 x_1 + v_2 x_2 + \dots + v_m x_m} \quad (1)$$

At Eq. (1) there are n outputs and m inputs for the j. decision point. Here,  $u_n$  defined as n. the weight of the output,  $y_n$  defined as n. the amount of output,  $v_m$

defined as m. the weight of the input and  $x_m$  defined as m. the amount of input. DEA can be utilized as CCR (Charnes, Cooper and Rhodes, (1978)) and BCC (Banker, Charnes ve Cooper, (1984)) approached model. In the CCR-DEA model, since the inputs and outputs of the decision-making units are distinct limited data, the relative efficiency between the decision-making units is evaluated at a point in the time axis (Lovell et al., 2003). Another point in DEA is that model can be utilized as input oriented or output oriented with respect to data. In port efficiency studies, mostly output oriented DEA is utilized because of ensure sustainability of ports global competitiveness (Gökçek et al, 2018). Therefore, in this study Output Oriented CCR-DEA is utilized.

Another model that utilized on this study is Hotelling T-square test. The Hotelling test allows for the evaluation of more than one variable effect of two groups at the same time. The two groups examine the distance between them via the T-square test. The two groups are examined the distance between them via the T-square test. The result is determined by comparing Eq. (2) (observed) to (3) (theoretical).

$$T^2 = n (\bar{X} - \mu_0)' S^{-1} (\bar{X} - \mu_0) \quad (2)$$

$$T^2 = \frac{(n-1)p}{(n-p)} F_{n-p}^p(\alpha) \quad (3)$$

Where n is the number of observations,  $(\bar{X} - \mu_0)$  gives the mean differences of the groups being compared, S is the standard deviation matrix, p is the number of variables, and  $\alpha$  is the confidence interval value of the distribution. It is decided whether or not the hypothesis  $H_0$  is to be rejected in the comparison.  $H_0$ , there is no statistically significant difference between the compared groups,  $H_1$  (alternative hypothesis) means that there is a statistically significant difference. It can be shown as below.



$$H_0: \mu = \mu_0$$

$$H_1: \mu \neq \mu_0$$

If the value of T-square observed in the comparison is greater than the value of F, the hypothesis is rejected. Otherwise, it is not being rejected. If the hypothesis is rejected, the Independent Groups T test will be utilized to find out from which group the differences originate.

## 2.2. Data

The data to be utilized in the study were obtained from the internet sites of the relevant container ports, Deniz Ticareti paper which is published by IMEAK DTO, Lloyd's List publish Top 100 Container Port's and Static Information System of Turkish Republic.

The input and output units made in previous studies were checked for use in the DEA method. In this study, terminal area (TA), dock length (RU) and water depth (D) inputs of ports were utilized for drawing attention to infrastructural differences. As an output unit, the amount of annual handled containers was taken into consideration on the basis of TEU. The model which is utilized on this study can be shown as Figure 1.

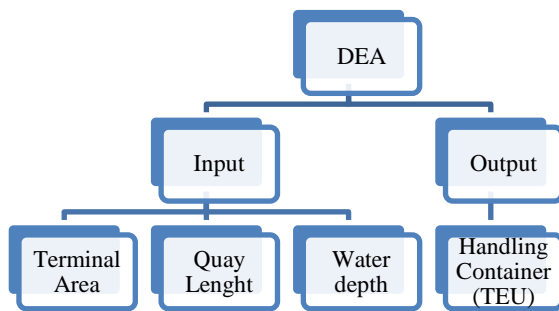


Fig. 1. Data Envelopment Analysis model creation diagram

The data were analyzed and presented through SPSS and MaxDEA software. The summary given in Table 1 below is available.

Table 1. Data summary

Data	Output	Input		
	TEU	TA(ha)	RU(m)	D(m)
Mean	2589300	135,9	3316,3	16,7
Standart Deviation	3092699	159,92	3130,77	4,88
Minimum	11000	20	450	36
Maximum	12385000	799	16325	10

## 3. IMPLEMENTATION AND RESULTS

First, the DEA method was implemented using MaxDea Basic software. Results are as Table 2. The data were analyzed using the output-oriented constant return on scale (CCR-O) analysis method. The CCR performs an efficiency analysis assuming that it was

surveyed do not find a significant relationship between the firm's scale and effectiveness (Ateş et al, 2013). CCR analysis yields the same efficacy results in both orientations when considered to have an impact on all inputs (Ateş et al, 2013).

Table 2. DEA/CCR-O results

DMU	CCR	DMU	CCR
Rotterdam	1	Ambarlı	0,80
Antwerp	1	Mersin	0,44
Hamburg	0,96	Trabzon	0,01
Bremen	0,82	Asyaport	0,43
Algeciras	1	Borusan	0,03
Valencia	0,73	Gemlik	0,20
Felixstowe	0,95	Derince	0,19
Pireas	0,97	Aliağa	0,12
Sines	0,99	Samsun	0,02
Marsaxlokk	1	Antalya	0,21
Southampton	0,78	Bandırma	0,01
Barcelona	0,59	İskenderun	0,12
La Havre	0,68	Evyap	0,16
Genoa	0,42	DP Yarımca	0,11
St. Petersburg	0,75	Yılport	0,34

According to the results of the DEA, it is found that the most efficient ports in the 30 ports are Rotterdam (Netherlands), Antwerp (Belgium), Algeciras (Spain) and Marsaxlokk (Malta). Ambarlı (0.80) is the highest efficient port within Turkey ports, but it is in tenth place even in general rankings. These results are only assessed between the 30 ports that are subject to analysis. It is known that the results may vary if new port(s) included study.

DEA results obtained between the ports of Europe and Turkey to determine whether there is a statistically significant difference was then analyzed by Hotelling's T-square test method. The normality test for the Hotelling test was performed in the SPSS package program, and the test itself was performed at EXCEL. The logarithmic transformation was performed to obtain normality distribution. The normality test results are as shown in Table 3.

The normality test results are Komogorov-Smirmov and Shapiro-Wilk tests which can be obtained from SPSS. The Shapiro-Wilk test was utilized in this study because the results of Shapiro-Wilk were more preferred in literature. Since the Significance (Sig.) Values are greater than 0.05, we can say that our data is normally distributed in the 95% confidence interval.

Levene test was conducted to check the homogeneity of the variances of the data. Levene test results are as in Table 4.

As shown in Table 4, value is greater than 0.05, it is concluded that the data show a homogeneous distribution. The results of the Hotelling T-square test made through Excel are given in Table 5.

Table 3. Normality test

		Tests of Normality					
		Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Country	Statistic	df	Sig.	Statistic	df	Sig.
TA	Europe	,210	15	,074	,944	15	,441
	Turkey	,152	15	,200*	,934	15	,309
RU	Europe	,127	15	,200*	,973	15	,897
	Turkey	,178	15	,200*	,946	15	,459
D	Europe	,199	15	,112	,911	15	,138
	Turkey	,253	15	,011	,804	15	,004

\* This is a lower bound of the true significance.

<sup>a</sup> Lilliefors Significance Correction

Table 4. Variance homogeneity test results

Test of Homogeneity of Variances					
		Levene			
		Statistic	df1	df2	Sig.
TA	Based on Mean	,856	1	28	,363
	Based on Median	,335	1	28	,567
	Based on Median and with adjusted df	,335	1	24,159	,568
	Based on trimmed mean	,811	1	28	,375
RU	Based on Mean	1,777	1	28	,193
	Based on Median	1,700	1	28	,203
	Based on Median and with adjusted df	1,700	1	27,534	,203
	Based on trimmed mean	1,766	1	28	,195
D	Based on Mean	5,013	1	28	,033
	Based on Median	3,040	1	28	,092
	Based on Median and with adjusted df	3,040	1	17,320	,099
	Based on trimmed mean	3,814	1	28	,061

Table 5. Hotelling T-square test results

Hotelling T-square Test	
Two-samples (equal covariance matrices)	
T-square	21,84277
df1	3
df2	24
F	6,720854
p-value	0,001886

program. The results are given in Table 6.

According to the results in Table 6, sig. value of less than 0.05 TA and RU units to have statistically significant difference from each port as Europe and Turkey, whereas the D unit with a value greater than 0.05 did not have a statistically significant difference.

#### 4. CONCLUSION

In addition to other port efficiency analysis, Hotelling t-square method was utilized. By using Hotelling analysis, unlike other port efficiency studies,

Table 6. Independent Groups T test

t-test for Equality of Means							
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
TA	4,233	28	,000	,48640	,11491	,25102	,72178
RU	2,907	28	,007	,32052	,11026	,09467	,54636
D	-,545	28	,590	-1,00000	1,83459	-4,75798	2,75798

According to Hotelling results, the observed F-value is 6.72. As indicated in the table, sig. value (p-value) was 0.001.  $H_0$ , the equality hypothesis of the averages is rejected. Concluded that there is a statistically significant difference between Europe and Turkey ports as an infrastructural has been reached.

However, the Hotelling test does not provide information about which (s) the ports differ in terms of variables. Independent Groups T test was conducted to examine the difference between them in detail. Independent Groups T test was obtained using the SPSS

which of the data causing inefficiency was statistically analyzed. In this study, 15 from Turkey and 15 European container ports are made relative efficiency analysis. With efficiency analysis, efficient ports between 30 ports were determined. According to the results that have been achieved Europe ports are more efficient than Turkish ports. Rotterdam (Netherlands), Antwerp (Belgium), Algeciras (Spain) and Marsaxlokk (Malta), while the most efficient ports, Ambarlı port that the most efficient port in Turkey was ranked tenth among all ports. Hotelling test utilized for determine

which inputs are different behind Europe ports and Turkey ports.

Hotelling T-square test utilized for determine which input(s) that utilized in DEA (Terminal area, Quay length, depth) are different on Turkey and European ports. Based on these test results were statistically significant differences between Europe and Turkey ports. The Independent Groups T test was utilized to find out which unit caused this difference. As indicated in Table 6, there is a statistically significant difference in terminal area and quay length units, but no significant difference in terms of depth.

In the light of this results, it is concluded that Turkey ports are inefficient than European ports in the way of infrastructural. Some of Turkey ports have very large infrastructure, but not enough cargo handling and some of our ports do not have sufficient infrastructure. As seen in Table 2, the most inefficient ports of Trabzon, Borusan, Bandırma and Samsun (0,01 – 0,02 – 0,03) are indications of infrastructural missteps.

There are not only the infrastructural problems that affect the efficiency in the ports and the annual load handling amount. Port management, geographical position of the port, ease of transportation etc., it is considered that the infrastructural factors that having great economic effect should be controlled in a more controlled manner. In this context, this study shows that only improving the capacity of ports is not sufficient for port development.

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# Mersin University

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### **PROBLEMS IN URBAN E-COMMERCE DELIVERIES: A SURVEY STUDY**

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#### **ABSTRACT**

Many businesses in the e-commerce sector have different logistic processes, delivery quantity, densities and speeds. Nevertheless, the most important goal is to ensure that the products and services reach their customers quickly and smoothly. However, online businesses and logistics companies have not been able to adapt to e-commerce and digital processes as fast as customers. For this reason, both businesses and customers experience major problems in the delivery of online products. Therefore, the aim of this study is to investigate the physical distribution problems in e-commerce logistics. In the first three sections, e-commerce, logistics and e-commerce logistics are mentioned and in the last part, a survey is conducted for online retail businesses in Mersin province and the data obtained are evaluated.

**Keywords:** *E-Commerce, Logistics, E-Commerce Logistics, Urban Delivery Problems*

## 1. INTRODUCTION

In the last quarter of century, with the development of information and communication technologies and the widespread use of the internet, a great technological revolution and change has taken place. This technological revolution directly affects and changes not only our daily lives but also economic life. With the new structure brought by technology, the traditional forms of trade and shopping have changed, and many concepts like e-commerce, e-business, e-government, e-logistics, which can be defined as making goods and services exchanges in electronic environment, have begun to take their place in economic literature (Çevik, 2013).

The increase in e-commerce has influenced the classical trade structure and understanding. In the digital economy, consumers prefer to shop on the internet in order to save time and make shopping easier and more rationally. Advantages such as the opportunity to trade and shop 365 days and 24 hours without a time limit, to be able to sell without having a physical store, product options, increased competition among enterprises and to make shopping from anywhere force companies to change.

E-commerce provides various advantages to businesses and consumers as well as challenges for businesses. With the elimination of distances in online shopping, businesses who want to supply the needs of customers in time, are faced with various logistical difficulties in the distribution of products and services to customers. Whether online orders are from out of town or from a local business; In both cases, the urban distribution of the products must be carried out. Today, most of the problems in e-commerce shoppings are experienced at this point.

In this study, the problems experienced by e-commerce enterprises in urban delivery operations were investigated. In the first part of the study, the concept of e-commerce is emphasized. In the second part, information about logistics and e-commerce logistics is given. In the third part, the problems experienced by the enterprises in the last step of deliveries in the city are discussed. In addition, a comprehensive survey was conducted in May 2019 for online retail businesses in Mersin. The data obtained from the questionnaires were analyzed and conclusion and recommendations were presented at the end of the study.

## 2. E-COMMERCE

New business models and business areas have emerged with the widespread use of the Internet, rapid and easy access to information and use in many business processes. The use of this information by enterprises has enabled them to perform marketing more effectively by measuring their marketing activities and results, and it has been possible to reach many segments of the society at lower cost with new business models (Özçelik, 2017). In addition, the Internet has started to be used as a new communication and distribution channel in commercial life. It has become easier to enter difficult markets, communication between businesses has accelerated and cheaper (Terzi, 2016). While traditional trade refers to the process involving the change of ownership of the goods or services or the use rights (Akar and Kayahan, 2007), the concept of e-commerce

has emerged through the electronic environment and took its place in the economic literature.

Many countries, international organizations and organizations have made different definitions of e-commerce. According to the World Trade Organization, e-commerce is the production, advertising, sales and distribution of goods and services between enterprises, individuals, governments, public and private organizations through the internet or electronic data exchange (<https://www.wto.org>). The Organization for Economic Cooperation and Development (OECD) defines e-commerce as all commercial transactions concerning individuals and institutions based on the processing and transmission of digitized written text, sound and image (<http://www.oecd.org>).

Some scholars have defined e-commerce as follows;

- “The transfer of commercial transactions to internet or web-based systems.” (Bozkurt, 2013).

- “E-commerce is the production, promotion, sales, insurance, distribution and payment transactions through electronic tools.” (Turban and Others, 2002: 4).

When the above definitions are evaluated, it can be said that e-commerce is much more than buying and selling processes.

## 3. E-COMMERCE BUSINESS MODELS

E-commerce business models vary according to the type of shopper. The most common used e-commerce business models can be shown in Table 1.

Table 1: E-Commerce Business Models

	Government	Companies	Consumers
Government / Public Institutions	G2G	G2B	G2C
Companies	B2G	B2B	B2C
Consumers	C2G	C2B	C2C

Source: <http://www.igeme.org.tr>

### 3.1. Business to Business E-commerce (B2B)

Within the scope of supply chain activities of enterprises, all products, services and information exchange between each other is to be done over the internet. From sales contracts to production contracts, distribution, marketing and transfers of products and many other inter-business activities (Deniz, 2011). The B2B business model is used to reduce the costs of communication between businesses and increase the efficiency of business processes (Trepper, 2000).

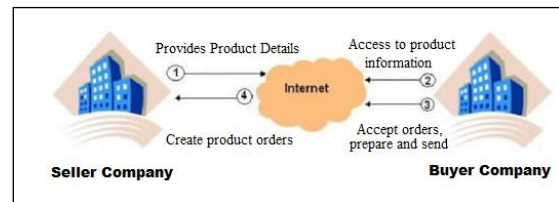


Figure 1: Business to Business E-Commerce - B2B

### 3.2. E-Commerce Between Business and Consumer (B2C)

It is a type of e-commerce that enables businesses to offer their goods and services directly to customers through internet applications. Thanks to the convenience of the internet, consumers mostly prefer to shop on the internet and B2C e-commerce is increasing rapidly. In addition, because of the low costs of the internet, businesses use B2C e-commerce to reach new markets (Trepper, 2000).

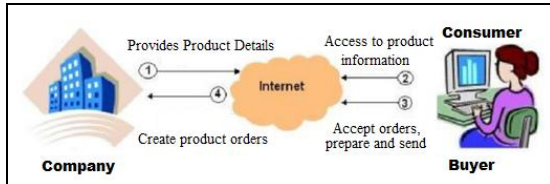


Figure 2: E-commerce between Business and Consumer (B2C)

### 3.3. Customer to Business E-Commerce (C2B)

This E-commerce model; electronic data exchange between a customer and a business organization. The model is similar to B2C. However, this model is different; consumer is the party that performs the sales transaction and the entity is the party that performs the purchase transaction. This business model usually includes individual users who sell products or services to businesses. People publish their resumes through these websites and describe the services they will offer. If businesses like people and their services; they buy or rent it. For example, freelancer.com, armut.com and so on (Altun, 2004).

### 3.4. Consumer to Consumer E-commerce (C2C)

The basis of the e-commerce process between consumer and consumer, which is a business model created by the Internet, is based on the exchange of second-hand products between consumers. It can be explained that traditional second-hand markets are easier and less costly among consumers without intermediaries. Another contribution of the Internet to this process is the expansion and registration of traditional second-hand markets to a wider audience. In this way, the websites that provide C2C trade operate as intermediaries.

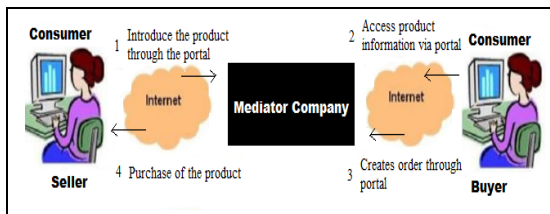


Figure 3: Consumer to Consumer E-commerce (C2C)

Apart from those described above, there are also models of business processes with the state. These are G2G; between two public bodies, G2C; between public and individual customers, C2G; between individual client and public (tax payments, etc.), G2B; B2G refers to the exchange of electronic data between public and

business organizations, and finally B2G.

## 4. THE CONCEPT OF E-COMMERCE LOGISTICS

The concept of logistics has become a process that needs to be meticulously managed for the competition and success of enterprises in today's world where new economic rules apply. Beginning in the 80s, enterprises started to see logistics activities as the key to creating a more efficient and comprehensive supply chain rather than cost reduction (Öz, 2011). The most general definition of logistics; It can be described as all the activities necessary to deliver the product to its final consumer (customers) quickly and with minimum cost.

The greatest aim in logistics management is to organize and increase the efficiency of logistics activities in a way that minimizes the cost of the customer throughout the supply chain (Bramel and Levi, 1997). Logistics activities have become more important in the eyes of enterprises that see the service provided to customers more important in increasing the number of loyal customers. Businesses are now making plans by focusing on the customer, not production. Therefore, customer satisfaction is the basis of logistics today and the success of logistics activities is measured by customer satisfaction. Delivering the products purchased in developed societies at the promised time, on the ground, at the desired quality and price, constitutes the greatest expectations of the customers and in this direction, the concept of logistics competence becomes important (Bowersox et al., 2002).

Due to the widespread use of e-commerce and the many conveniences it provides in every field, the need to make logistics activities suitable for the e-commerce sector has emerged. For example, the fact that high volume orders are replaced with small volume and frequent orders and the transportation movements become continuous are among the changes that can be given as examples (Durusu, 2011).

With the rapid increase off e-commerce volume and these changes, it is inevitable that the logistics sector will respond to the following demands (Reynolds, 2001):

- Supply of required products at desired time,
- Positioning of products in desired places at any time,
- Decreasing the prices of products to competitive levels,
- Products are available at the time of demand,
- Delivering products to consumers at the right time.

It is inevitable that logistics activities should be supported with information and information technologies in order to integrate into e-commerce sector and produce solutions to problems. The logistics sector, which is known as the classic transportation service in Turkey in the recent past, is adding new ones to its innovative and technological activities with the increasing consumer awareness and needs and new service concepts are emerging. With these developments, more information and services were started to be provided with different software and applications developed with information technologies in logistics activities and e-logistics concept, which is the advanced

form of logistics, emerged. There is no generally accepted definition of e-logistics concept since e-logistics is a new field and its effects on logistics and supply chain management cannot be explained clearly (Groznić & Kovacic, 2004). In addition to this, e-logistics is an activity where online information and communication technologies are taken as a basis in the realization of logistics processes and used intensively. In this way, speed efficiency and more customer satisfaction are provided in the processes (Türkmen and Sarıcan, 2017). According to Bayles (2001), e-logistics is the advanced form of traditional logistics where more information and services are provided, and internet technologies are based on traditional logistics processes (procurement, storage, customer service, etc.). The importance of e-logistics services is very important for e-commerce enterprises and customers of this sector.

### **5.PROBLEMS IN E-COMMERCE LOGISTICS PHYSICAL DISTRIBUTION PROCESS**

In the face of the need for fast and high quality transportation of the new economy, the interest of producers and consumers in physical distribution has increased considerably. Especially perishable products, pharmaceuticals and so on. Delivery rate criteria for many products such as has become extraordinarily important (Grau et al., 2001: 33-43). Nobody shopping online expects a product he ordered to his home or office to be delivered to him/her days later. Therefore, delivery speed is very important in e-commerce. Therefore, for e-commerce companies, the time of delivery of the product to the customer after the purchase action has become one of the biggest indicators of success. When we evaluate the logistics problems experienced by e-commerce companies and customers in Turkey in general, it is seen that these problems are experienced especially in the urban distribution part of the physical distribution stage. The problems experienced in urban delivery operations are among the most important problems of consumers in online shopping.

These problems have made physical distribution a very popular topic in e-commerce logistics. Although there are many positive developments in physical distribution in e-logistics around the world, a permanent innovative solution to these problems has not been found yet. Therefore, companies providing logistics services to online businesses now face many new challenges (Terry et al., 2000). Many experts are working on this topic and are trying to make new contributions to the e-commerce logistics literature.

In today's e-commerce, the physical distribution of products is mostly undertaken by cargo companies. Producers and consumers are mostly trying to meet the needs of fast and high quality delivery through cargo companies. For this reason, the demand for cargo sector has intensified in recent years in Turkey and in the world. The changes in economic and social life and the needs that emerged have stimulated the cargo transportation sector (Simona and Maggi, 2003: 492). Cargo companies, the leading players of physical distribution in the city, have reached the capacity to serve all corners of our country in line with the growth and need in e-commerce. These developments in cargo companies and

delivery processes significantly increase consumers' desire and motivation to shop online (Özçelik, 2017). Cargo services emerge as an important factor in reaching consumers' desired products and brands and ensuring customer satisfaction (Duran, 2017). The success of physical distribution and customer satisfaction depends on the competence and success of cargo companies (Özçelik, 2017).

Most of the e-commerce companies all over the world have to work with the cargo companies that offer the most technological and appropriate solution in the physical distribution stage which constitutes the most important step of e-commerce logistics. However, cargo companies are not able to meet the needs of consumers and businesses sufficiently during the urban physical distribution stage and problems are experienced.

There are very few empirical studies that address problems related to urban deliveries and the cargo sector and examine the impact on consumer satisfaction. In the research on-time delivery is of great importance for 89% of online shoppers (Yankelovich, 2000). In addition, 85% of those who receive their orders on time are shopping again from these companies, while only 33% of those who do not receive their orders on time have made purchases from these companies again (ComputerWorld, 1999). Therefore, online businesses and logistics service providers have to focus more on delivery issues as the key components of online consumer satisfaction (Bromage, 2001).

In the research, it is seen that the problems experienced in e-commerce logistics mostly arise in the last step deliveries carried out by the cargo companies. The main reasons why cargo companies have problems in logistics operations can be listed as follows (Deniz & Gödekmerdan, 2011);

- Difficulty in finding qualified personnel and inability to employ personnel for a long time,
- Disruptions experienced in dealer, agency structures and management,
- Products cannot be delivered to customers at one time and delivery times are extended,
- Failure of customers to reach branches and agencies, communication problems,
- Difficulties and problems of integration in new technologies
- Insufficient access to villages and provinces and distribution network problems
- Inadequate technological applications and product options for the e-commerce sector.

In the study conducted by Deniz and Gödekmerdan, it was determined that the biggest problem of the customers receiving service from the cargo companies was delays in deliveries. However, it is stated by the customers that cargo personnel try to find solutions to the problems in good faith and try to improve the process (Deniz & Gödekmerdan, 2011).

In his study, Duran conducted a survey on 450 people with high educational level. Consumers' opinions about cargo services were evaluated within the framework of 5 factors: "logistic value", "reliability", "time", "economic expense", "personnel service". As a result of the research, it is seen that consumers are dissatisfied with time factor, especially e-commerce sites have to use contracted cargo companies. With regard to shipping charges, consumers were found to have higher pricing on a unit basis (Duran, 2017).



In a study based on cargo complaints to consumer associations, it was found that the cost of carrying cargo is higher than the cost of carrying airline passengers and cargo companies do not fulfil most of their transportation responsibilities. Although the cargo companies state that the distribution networks are wide and the quality of their services, the complaints made by the customers show that the cargo companies do not fulfil their promises in advertisements most of the time. The most frequently complained issue was the lack of timely deliveries. According to the report compiled from the complaints, cargo companies attribute these problems to lack of qualified personnel, limited time and personnel errors (www.tuketiciler.org).

## 6. THE LAST STEP IN E-COMMERCE FINDINGS OF THE SURVEY ON DELIVERY PROBLEMS

Within the scope of the study, a survey was applied to retail businesses that sell products such as flowers, cake, souvenirs and food online in Yenişehir and Mezitli districts of Mersin. The delivery problems of these enterprises were investigated.

In the collection of the data suitable for the purpose of the research, a questionnaire method consisting of forty questions, most of which were open ended, consisted of three parts. In the first part, information about the business was taken, in the second part, questions were asked about online orders, in the third part, questions were asked about the problems in delivery operations. Since the small number of enterprises surveyed eliminates the possibility of statistical analysis, the data obtained are classified and evaluated.

As it can be seen in the table below, the biggest problems that enterprises face in their final step delivery operations are; It was determined that the customer address could not be found at 40%, the lack of personnel at 31% and the arrival of orders at different densities at different times, the failure to find experienced delivery personnel at 17% and frequent personnel change at 12%.



Figure 2: The Experienced Problems in The Last Step Delivery Problems

In this respect, the following results were obtained;

- About 80% of the purchases made by companies in the sectors such as Flowers, Pizza, Gifts, Pastry and Dessert are realized online. On special occasions such as Valentine's Day and Mother's Day, it was determined that the enterprises took hundreds of orders and could not keep up with deliveries and hired special vehicles and extra personnel. It has been determined that product delivery process and speed are very important for such enterprises.

- In other types of businesses, which have both physical stores and online shopping, online shopping accounts for approximately 35% of total shopping.

- Most online businesses are unable to perform delivery operations efficiently. Many enterprises cannot allocate resources to the logistics distribution infrastructure and cannot provide delivery services to consumers because they do not reach a certain order volume. Delivery companies face many problems. Some of these problems are;

- Inadequate delivery personnel in consecutive orders,

- Lack of sufficient logistics technology or lack of resources in order processing and delivery of orders,

- Depending on the type of business, some businesses receive less orders at certain times of the day and more orders at certain times. In this case, the enterprise cannot use the delivery personnel efficiently at all hours of the day, while the delivery personnel remain idle in idle hours and the delivery personnel remain inadequate during peak hours.

- Many businesses cannot find qualified delivery personnel with driver's license (a2 or b). In addition, frequent delivery personnel change, traffic fines of delivery personnel and accidents are among the problems that enterprises experience.

- Companies that receive a small amount of online orders do not suffer or provide delivery services because the revenue from online orders does not cover the amount invested in delivery personnel, intermediary and infrastructure.

- Since online initiatives that deliver products from their own warehouse or supplier work with traditional cargo companies for online orders, deliveries are delivered to the customer in 2-3 days due to the logistical and technological deficiencies of these cargo companies, customers cannot receive fast and high-quality delivery service.

- Companies that work with order-forwarding websites have problems due to both system and delivery operations. Flower basket, food basket and so on. such as order-forwarding businesses, customers only take orders from the local businesses, the preparation and delivery of the product to the local business responsibility. The order-forwarding website is often unaware of the logistical problems experienced by the local business, the shortage of delivery personnel or the removal of the delivery service, and therefore online customers become victims of delivery problems. The biggest problem of this kind of internet initiatives is the last step delivery problem. For example, 90-95% of the problems with Yemeksepeti.com's orders were due to the restaurant and therefore 880 of the 2,500 restaurants worked in 2007 had to be removed from the list because they could not serve well. In order to overcome this problem, the food basket agreement with the courier

companies (Yemeksepeti valet service) has included the companies that do not provide delivery services for an additional fee and allowed the customers to order from these restaurants.

• Since online initiatives that deliver products from their own warehouse or supplier work with traditional cargo companies for online orders, deliveries are delivered to the customer in 2-3 days due to the logistical and technological deficiencies of these cargo companies, customers cannot receive fast and high-quality delivery service.

• At the end of the survey, close to 90% of the companies providing online sales and same day delivery service stated that they can use it if it is a less costly and quality delivery system.

## 5. CONCLUSION

When we evaluate the logistics problems experienced by e-commerce enterprises and customers in our country, it is seen that these problems are experienced especially during the physical distribution of products called last km delivery to customers. It is possible to say that the reason of these problems is the lack of logistics technology, the use of traditional methods and inefficiency.

The speed of delivery is very important for customers when shopping over the Internet. Therefore, delivery operations have become one of the biggest indicators of measurable performance for e-commerce companies. Problems in product deliveries and increasing complaints of customers led the online service providers to seek solutions and improve their logistics operations.

Today, many companies that offer online shopping have the same day delivery, fast delivery, appointment delivery, etc. that have a positive impact on customers' shopping decisions. as well as developing and providing logistics services to its customers. Many of the Istanbul-based internet companies have agreed with local courier companies to offer their customers the same day delivery option throughout Istanbul. After a while, internet companies established their infrastructures in all possible big cities instead of Istanbul and set up their delivery networks in the same day and in the surrounding regions at the latest the next day as more private and boutique than standard cargo companies. continuity, customer service and communication are expected to increase service standards.

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### **MARINA SELECTION OF YACHTSMEN USING AHP-TOPSIS AND AHP-PROMETHEE**

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#### **ABSTRACT**

In the scope of the research, determination of preference criteria of yacht owners, applicability of the most suitable marina and selected methods to the marina selection problem were evaluated and findings obtained by different methods were compared and to what extent these methods contributed to the decision-making process and how consistent they were. In this study, the criteria of yacht owners to prefer marinas of our country are tried to be determined by using Analytic Hierarchy Process (AHP) which is one of the multi criteria decision making methods. Weight input values obtained by AHP were used in TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) and PROMETHEE methods, which are multi-criteria decision-making methods, to evaluate yacht owners to determine the most suitable marina alternative for themselves. As a result of the study, consistent and real-life results were obtained, it was concluded that AHP, TOPSIS and PROMETHEE methods could be used for decision support during selection.

**Keywords:** *Marina Selection, Analytic Hierarchy Process, TOPSIS, PROMETHEE, Tourism of Marine*

## 1. INTRODUCTION

Marine tourism, which is one of the building blocks of tourism sector, has made great progress in our country in recent years as in the whole world. An important part of this progress is the modernization of newly built marinas and existing marina technologies that can serve all types of boats.

As a result of the incentives and investments made, especially the North Aegean and Western Mediterranean coasts, natural texture, climate, safe and sheltered bays attract attention with suitable sea rotations and cultural heritage for both foreign and domestic yachtsmen. The marinas are spread over the Mediterranean, Marmara and Aegean coasts of our country, surrounded by inland seas and are concentrated in Istanbul, North Aegean, South Aegean and Western Mediterranean regions.

According to the yachting statistics published by the Ministry of Culture and Tourism, the number of foreign private yachts coming to Bodrum Port in 2007 for example increased from 816 to 3691 in 2016 and increased by 452% (Ministry of Culture and Tourism, 2019).

In this study, the problem of marina selection in accordance with the individual expectations and boat characteristics of private yacht owners who intend to visit Turkey permanently or in transit is examined. Since yachts and yacht harbor profiles vary with many elements, 3 yachts with motor yachts of 25 m<sup>2</sup> and above, 5 anchors certified, blue flags and a full occupancy rate of 85% in 2019 summer period were included in the study.

## 2. AIM AND SCOPE OF THE RESEARCH

This study examines the usability of multi-criteria decision-making methods in marina selection. Additionally, evaluates the different results of the quantitative and qualitative criteria at the decision stage of foreign and domestic yacht owners who want to visit the coasts of Turkey with yachts, as well as the superiority of marinas to each other and handicaps in order to handle them in a healthy way.

The decision alternatives, which are one of the three basic components of Multi-Criteria Decision-Making methods, consist of 3 private marina enterprises in Muğla province, all with 5 anchors certified, owned blue flags and occupancy rate of 85 percent and above in summer season. The decision makers are the owners of yachts which has 25 m<sup>2</sup> area or more, in which the Ministry of Culture and Tourism deals with the status of foreign and domestic yachtsmen. Selection criteria were determined as location, capacity, prestige, security, superstructure, infrastructure and mooring fee by using the available literature and expert opinion.

## 3. YACHTS AND MARINAS

There are two basic elements of yacht tourism. These are yachts and marinas where they are moored. The marinas in marine tourism can be defined as the structures where private and commercial yachts can safely approach, professional mooring services are provided, the safety of the yacht and yachtsmen are provided, and there are

various boat handling and maintenance equipment and also social facilities and various cultural activities are carried out (Işık and Cerit, 2008). When we look at the official definitions of the word “yacht”: “not to be more than twenty miles away from the nearest land with a cabin, toilet, washbasin, kitchen, used commercially or non-commercially for sightseeing and sports purposes, not in the nature of cargo, passengers and fishing vessels, the number of passengers carried shall not exceed twelve or the cabotage is limited to one hundred miles (Tourism Incentive Law No. 2634). And “suitable for use in sea tourism trade with the purpose of travel, sports and entertainment, the number of passengers carried by the ship shall not exceed twelve” (Marine Tourism Regulation, 2009) seen as definitions.

Yachts are classified according to propulsion system, hull structure and construction methods in traditional classification. Other than these, motor yachts, sailing yachts, sports and recreational vehicles are classified as private yachts and commercial yachts. Private yacht; refers to boats used for recreational and sporting purposes, which are limited to 12 persons. Commercial yachts mean boats that do not have cargo, passenger or fishing vessel status, can travel up to 20 nautical miles away from the nearest land or do not make more than 100 miles in cabotage and who do not exceed 36 people (Kan and Nas, 2014).

The “marina” is defined as the facility that contains the equipment and materials that can accommodate all kinds of yachts' accommodation (TDK, 2019). In other words, marinas, due to their special activities should be on the sea shore, small boats and yachts sheltered for shelter, maintenance and attitude for boats and yachts, services such as wintering, electricity, water, telephone, internet, bilge, fuel. In addition, these facilities are open to tourism where yachts and yachts' needs are met such as catering, eating, drinking, and shopping (Dikeç and Töz, 2016).

The number of certified tourism businesses coastal marinas in Turkey is 27; the total capacity is 11.715't. Number of yacht berths with tourism operation certificate is 6 and total mooring capacity is 967. The number of marinas with a tourism investment certificate is 8 and the total mooring capacity is 3530. The cruise ship port with a tourism investment certificate is 1 and the overall total of all maritime tourism facilities is 42 and the total mooring capacity is 16.212 (Marine Tourism Report, Maritime Trade Magazine, 2019).

As the inland yacht tourism, which is an inland sea, has recently increased in demand, the Mediterranean has become one of the important regions for yachting globally. Local tourists realized the availability of yachting, which was discovered by foreign tourists in the 1960s with the intention of visiting the bays where no land transportation was available, in time, thus the marina and yachting activities in Bodrum, Marmaris gained momentum (Sezer, 2012). While yacht tourism has been addressed to the upper income group in the past, the middle-income group today has demanded it (Sarışık et al, 2011). When the coastal sea traffic on the coasts of our country is analyzed, it is seen that the yachts descend from the Western Mediterranean - Greek Ports - Marmaris - Bodrum to the South West Mediterranean coast. The other is a rotation Israel - Cyprus Island - the island of Rhodes over South South Aegean coasts of Turkey and Greece constitutes

stopover at the passing boats. According to the yachting statistics published by the Ministry of Culture and Tourism, every year until 2016, the most intensive region in terms of yacht traffic and occupancy rate is between Bodrum and Finike (Tourism and Culture Ministry, 2019). The criteria underlying the concentration of yacht traffic and occupancy rates in this region are seen in the literature regarding the selection of facility location (Maglič, 2019; Tomovic, 2014). When the other publications in the literature are examined, it is seen that the factors that affect the service quality of marinas other than plant location selection, application of service quality factors to marina enterprises, sustainability in marinas and reduction of environmental impacts (Dikeç and Töz, 2016; Maglič, 2019; Paker and Altuntaş 2016; Maglič, 2019; Ritchie, et al, 2017; Sezer, 2012; Wilson et al, 2015). Although the service quality is a very important criteria for yachtsmen, when the occupancy rates of the marinas on our coasts are examined to include all marinas, more important technical criteria may be present. For example, in the marinas on the Eastern Mediterranean coast of Turkey where service quality is very high, it is thought that the effect of service quality on the preferability of the marina is lower compared to some quantitative criteria.

#### 4. METODOLOGY

In the study, in order to define the weights of the criteria, Analytical Hierarchy Process (AHP) was used. The selection of criteria, which is one of the most important components of TOPSIS and PROMETHEE methods, was obtained through literature research and semi-structured interviews with 3 academicians and one senior marina manager. The relevant expert opinion was also applied to form and weight the pairwise comparison matrices of the criteria. In order to rank the decision alternatives for each criterion, the questionnaires prepared for the qualitative criteria were applied to 15 yacht owners whose total area is less than 25 m<sup>2</sup>, preferring 3 different, 5 anchored and blue flagged private marinas operating in Muğla province. While scoring of criteria with quantitative values, data were obtained via internet and e-mail.

##### 4.1. Analytic Hierarchy Process

Although the Analytic Hierarchy Process was first proposed by Myers and Alpert in 1968, Thomas Lorie Saaty developed it as a model in 1977 and made it available to decision-making processes (Yarahoglu, 2001). The Analytic Hierarchy Process allows decision makers to model problems, decision alternatives, criteria and sub-criteria, if any, and the relationship between them in a hierarchical structure. In the Analytic Hierarchy Process, the subjective interpretations and objective evaluations of the decision-maker at the decision stage are included together.

AHP has been applied in almost every field. Evaluation of information systems in the field of telecommunications (Liang, 2015), food industry supplier evaluation and selection (Rezaei and Ortt, 2013), supplier selection and evaluation in automotive sector (Kahraman et al., 2010), in state business, industrial technology development program selection and

evaluation (Huang et al, 2008), thermal power maintenance strategy evaluation and selection (Wang et al, 2006), in the field of general production, supplier selection and evaluation (Chan and Kumar, 2007).

The first step in the Analytic Hierarchy Process is to establish a hierarchical model. The aim of the problem, respectively, the main criteria, if any sub-criteria, decision alternatives are listed in a hierarchical manner.

After the hierarchy table is created, in the second step, the criteria are compared between each other and sub-criteria, if any, and their importance levels and weights are determined. In pairwise comparison, the square matrix is obtained by using the scale which developed by Saaty graded between 1-9. The effectiveness of the 1-9 comparison scale was determined by comparisons with other scales and the use of the scale in different research areas (Kuruüzüm and Atsan, 2001).

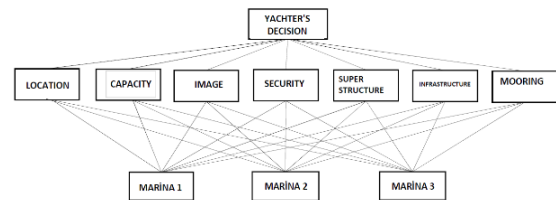


Fig.1: Marina Selection Problem – AHP Hierarchy Model

$$\text{Normalisation : } b_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad (1)$$

$$\text{Definition of Normality Vector: } w_i = \frac{\sum_{j=1}^n C_{ij}}{n} \quad (2)$$

In step 4, the consistency of the criteria is determined and matrix consistency is determined. For a matrix to be consistent, its maximum eigenvalue ( $\lambda_{max}$ ) must be equal to the matrix size (n). To find  $\lambda_{max}$ , each column element in the comparison matrix is divided by the sum of the column. Thus, the matrix is normalized. Then, each row is averaged for the priorities vector calculation. The “All Priorities Vector Matrix” is calculated by multiplying the priority vector and initial matrix. The values obtained are divided by the Priority Vector values.  $\lambda_{max}$  the average of these values is determined to calculate. This is the average  $\lambda_{max}$  value (Long and Kazan, 2016). This should be done after finding the value; As stated above, the consistency of the hierarchical table is determined by calculating the consistency ratio. The consistency ratio is calculated to prevent the expert from making mistakes when performing pairwise comparisons. If this value is greater than 0.1, the comparison should be reviewed. To calculate consistency, the consistency index (CI) is first calculated as below written equation.

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (3)$$

Once CI is calculated, the consistency ratio (CR) is

calculated by the following Eq. 4.

$$CR = \frac{CI}{RI} \quad (4)$$

*RI represents the randomness index. The randomness index is determined by selecting the appropriate value from Randomness Index table.*

Table 1: Randomness Index

Matrix size	Random Consistency index (RI)
1	0,00
2	0,00
3	0,58
4	0,90
5	1,12
6	1,24
7	1,32
8	1,41
9	1,45
10	1,49

If the obtained consistency ratio is less than 10%, the criteria weighting and / or decision-making process is consistent. The decision is applied.

## 4.2. TOPSIS

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) is widely used in Multi Criteria Decision Making processes in the literature. Developed by Hwang and Yoon in 1981, this method allows for the best choice decision by ranking among alternatives (Hwang and Yoon, 1981).

In the field of management and organization in the selection of mid-level managers in the Greek IT firm (Kelemenis et al, 2011), determination of the most appropriate system analysis engineer (Mahdavi et al, 2008), in the field of engineering, in determining the optimal scheme for the maintenance of bridge structures (Wang and Elhag, 2006) (Wahdani and Tavakkoli, 2010) and the selection and evaluation of marine pollution control equipment in the maritime field are some of the TOPSIS applications in the literature.

The reasons for preference of the TOPSIS method are simplicity, rationality, understandability, good computing efficiency and the ability to measure the relative performance of each alternative in a simple mathematical form.

While the alternative chosen in the TOPSIS method, solution is expected to be close to the ideal solution, it is expected to be far from the negative ideal solution. The objective return means maximizing the return to the ideal solution and the distance to the negative ideal solution means minimizing the cost. In the selection phase between decision alternatives, the one, which is close to the ideal solution, and the one that is far from the negative ideal solution should be chosen.

The TOPSIS method is completed in seven steps. In the first step, the decision matrix is created. The criteria for the row elements of the decision matrix and the evaluation elements for the column elements. The

decision matrix, which consists of  $m$  alternative and  $n$  criteria, is also referred to as the initial matrix (see table 2).

Table 2: Initial matrix

$$\begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}$$

In step 2, the decision matrix is normalized. Data obtained using different scales are made comparable using normalization process. This is achieved by dividing the square root of the sum of the squares of all elements of the decision matrix elements. In step 3, a weighted normalized decision matrix is created. The weight of the evaluation factors is calculated first. The Analytical Hierarchy Process is used to calculate these weights. The weighted evaluation factor values ( $w_{ij}$ ) are multiplied by each normalized matrix element ( $r_{ij}$ ).

In step 4, the positive and negative ideal solution values are calculated. The PROMETHEE method assumes that all evaluation factors have a monotonous increasing or decreasing tendency. For the ideal solution, the highest and lowest values in each column are selected among the values obtained in the previous step.

$$A^* = \{(maxV_{ij}|j \in J), (minV_{ij}|j \in J^c)\}i = 1, 2, 3, \dots, m \quad (5)$$

$$A^- = \{(minV_{ij}|j \in J), (maxV_{ij}|j \in J^c)\}i = 1, 2, 3, \dots, m \quad (6)$$

For the utility criteria, the highest value is considered and for the cost criterion the lowest value is considered. In the above equation, while  $A^*$  represents the most preferred alternative,  $A^-$  is the least preferred alternative. In step 5, the separation measures are determined. The deviation of the alternatives from the positive and negative ideal points is calculated using the Euclidian distance function. The values obtained from the calculation of the separation measures are called ideal separation ( $S_i^*$ ) and negative ideal separation ( $S_i^-$ ). In this case,  $J$  means the benefit criteria,  $J'$  means the cost criteria. The number obtained ( $S_i^*$ ) and ( $S_i^-$ ) should be equal to the number of alternatives.

$$(S_i^*) = \sqrt{\sum (v_{ij} - v_{j^*})^2} \quad i = 1, 2, 3, \dots, m \quad (7)$$

$$(S_i^-) = \sqrt{\sum (v_{ij} - v_{j^-})^2} \quad i = 1, 2, 3, \dots, m \quad (8)$$

In step 6, the relative priority is calculated according to the ideal solution. The proximity of the alternatives to the ideal solution is determined by using  $C_i^*$  ideal and negative ideal separation measures. The value used for this is the share of the negative discrimination measure in the total separation measure. Proximity to the ideal solution;

$$C_i^* = \frac{S_i^-}{S_i^* + S_i^-}; \quad 0 \leq C_i^* \leq 1 \quad (9)$$

Finally, alternatives are listed by looking at the relative proximity values. Thus, among the alternatives, the one closest to the ideal solution, that is, the alternative having the largest  $C_i^*$  value, is determined as the best decision alternative. When the  $C_i^*$  values are sorted from large to small, the alternatives are prioritized.

### 4.3. PROMETHEE

In this method, alternatives are evaluated with different preference functions. Unlike other methods, this method is the determination of both partial and full priorities of alternatives. PROMETHEE (Preference Ranking Method for Enrichment Evaluation), which is one of the most widely used methods of multi-criteria decision-making methods, has been developed based on the difficulties of implementation of existing prioritization methods in the literature (Dağdeviren and Eraslan, 2008). It has been widely used in logistics and supply chain, theory, tourism and sustainability.

Among the reasons for choosing the PROMETHEE method in the solution of the problem are the fact that the differences between the criteria are more controllable, the decision-makers can easily come to the conclusion for decision modeling, the decision-makers are closer to the real decision problem, they better define the problem and make sensitivity analysis. In our country, which is surrounded by seas on three sides, there is no study using PROMETHEE (Mareschal, 2011).

Additionally, encryption algorithm sorting in engineering (Yılmaz and Ballı, 2016), sorting network components (Almoghatawi et al, 2017), telecommunication systems selection in communication (Sabri, 2016), mobile phone selection (Kecek and Yüksel, 2016), especially in the field of maritime transportation for selection of vessel's power plant (Uzun and Kazan, 2016) are some of the applications of PROMETHEE in the literature. Therefore, national or international researchers may be interested in the field of marine tourism in the future.

The PROMETHEE method consists of two main steps: PROMETHEE 1 and PROMETHEE 2. It was developed by J. P. Brans (Brans, 1982). This method is one of the other multi-criteria decision-making methods, considering the relationship between evaluation factors and each other's own internal relationship. This internal relationship is revealed by the distribution of the data set and due to this distribution, there are six different distributions. PROMETHEE method consists of a total of seven steps, in the first step; decision alternatives and criteria are determined.

In the second step, six preference functions are determined. PROMETHEE does not determine intrinsic absolute benefits on the basis of decision alternatives and neither on the whole nor on the basis of assessment factors. It makes the comparison of decision alternatives according to each criteria in pairs. Preference functions are as below:

$$\text{First type, } P(d) = \begin{cases} 0 & d \leq 0, d > 0 \\ 1 & \end{cases} \quad (10)$$

Parameter: ---

$$\text{Second type, } P(d) = \begin{cases} 0 & d \leq q \\ 1 & d > q \end{cases} \quad (11)$$

Parameter: q

$$\text{Third type, } P(d) = \begin{cases} 0 & d \leq 0 \\ d & 0 < d \leq p \\ - & \\ p & d > p \\ 1 & \end{cases} \quad (12)$$

Parameter: p

$$\text{Forth type, } P(d) = \begin{cases} 0 & \\ 1 & d \leq q \\ - & q < d \leq p \\ 2 & d > p \\ 1 & \end{cases} \quad (13)$$

Parameter: p,q

$$\text{Fifth type, } P(d) = \begin{cases} 0, & d \leq q \\ (d-s)/r, & q < d \leq p \\ 1 & d > p \end{cases} \quad (14)$$

Parameter: s,r

$$\text{Sixth type, } p(d) = \begin{cases} 0 & d \leq 0 \\ 1 - e^{-x^2/2\sigma^2}, & d \geq 0 \end{cases} \quad (15)$$

Parameter:  $\sigma$

In the third step, common preference functions are determined by making pairwise comparisons between decision alternatives for each criterion according to the determined preference functions.

$$P(A, B) = \begin{cases} 0 & \{F(A) \leq F(B)\} \\ p[P(A) - P(B)] & \{F(A) > F(B)\} \end{cases} \quad (16)$$

In the fourth step, preference indices are determined.

$$\pi(A, B) = \sum_{i=1}^k (w_i P_i(A, B)) \quad (17)$$

In step 5, the positive and negative superiority values are determined.

$$\Phi^+ = \frac{1}{n-1} \sum \pi(A, x) \quad (18)$$

$$\Phi^- = \frac{1}{n-1} \sum \pi(x, A) \quad (19)$$

In step six, partial sorting is created. In this stage where the positive and negative superiority values of decision alternatives are compared, three different situations can be encountered such as superiority of decision alternatives, indifference or inability to compare.

$$\begin{cases} \Phi^+(A) > \Phi^+(B) \text{ ve } \Phi^-(A) < \Phi^-(B) \\ \text{veya} \\ \Phi^+(A) > \Phi^+(B) \text{ ve } \Phi^-(A) = \Phi^-(B) \\ \text{veya} \\ \Phi^+(A) = \Phi^+(B) \text{ ve } \Phi^-(A) < \Phi^-(B) \end{cases} \quad (20)$$

superior to a - b

$$\{\Phi^+(A) = \Phi^+(B) \text{ ve } \Phi^-(A) < \Phi^-(B)\} \quad (21)$$

equivalent to a - b



$$\begin{cases} \phi^+(A) > \phi^+(B) \text{ ve } \phi^-(A) > \phi^-(B) \\ \text{veya} \\ \phi^+(A) < \phi^+(B) \text{ ve } \phi^-(A) < \phi^-(B) \end{cases} \quad (22)$$

*A and B non – compare*

In the seventh step, a complete ranking of decision alternatives is made with PROMETHEE 2. For each alternative, “full priority values” are determined by the following equation and sorted from small to large.

$$\Phi(A) = \phi^+(A) - \phi^-(A) \quad (23)$$

## 5. APPLICATION

In the application stage of the marina selection problem, AHP method was used in the analysis of the problem and weighting of the criteria and decision alternatives were listed with TOPSIS and PROMETHEE methods.

The criteria that the yachtsmen will take into consideration in order to determine the most suitable marina for their own yacht from the marinas in Muğla are determined by the Analytic Hierarchy Process (AHP). Questionnaire forms were formed by using the scale that 1-9 graded by Saaty to be used in pairwise comparisons of criteria and evaluation of each alternative according to criteria (Saaty, 2003).

### 5.1. Definition of criteria

The criteria included in the study were obtained through a semi-structured face-to-face interview with three academicians and one marina official who were experts in their field through the literature survey. It has

been concluded that the most effective criteria that the yacht owners take into consideration when choosing a marina are location, capacity, prestige, security, superstructure, infrastructure and mooring fee.

### 5.2. Weighting of criteria by using AHP

Criteria weights and alternatives were evaluated as a result of interviews with 3 academicians and 1 marina manager. In order to rank the decision alternatives for each criterion, questionnaire forms prepared for qualitative criteria were applied to 15 yachtsmen and data were collected via internet and e-mail for quantitative criteria.

Table 3: Weight of Criteria

Criteria's AHP score	Weight of Criteria
Location	0,283
Capacity	0,045
Prestige	0,105
Security	0,308
Superstructure	0,062
Infrastructure	0,062
Mooring Fees	0,136

According to the table, the criteria with the highest weight value were determined as position and safety respectively. Location and security criterias are followed by infrastructure, mooring fees, superstructure, capacity and prestige criteria.

Table 4: Comparison Matrix

Criteria	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Location	1	7	9	1	5	3	3
Capacity	1/7	1	1	1/9	1/3	1/5	1/3
Prestige	1/9	1	1	1/7	1/5	1/7	1/5
Security	1	9	7	1	5	1	3
Superstructure	1/5	3	5	1/5	1	1	1/3
Infrastructure	1/3	5	7	1	1	1	1
Mooring Fees	1/3	3	5	1/3	3	1	1

Table 5: Normalized Matrix

Criteria	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Location	0,30612	0,21739	0,25714	0,31914	0,27273	0,27272	0,33834
Capacity	0,06122	0,04347	0,08571	0,06382	0,01818	0,01818	0,02255
Prestige	0,10204	0,04347	0,08571	0,06382	0,16364	0,16363	0,11278
Security	0,30612	0,21739	0,42857	0,31914	0,27273	0,27272	0,33834
Superstructure	0,06122	0,13043	0,02857	0,06382	0,05454	0,05454	0,03759
Infrastructure	0,06122	0,13043	0,02857	0,06382	0,05454	0,05454	0,03759
Mooring Fees	0,10204	0,21739	0,08571	0,10138	0,16363	0,16363	0,11278

Table 6: Grading of criteria and percent consistency

%	CA	Criteria	$\lambda_{max}$	CI/RI	Consistency Percentage
28,3%	0,92568	Location	7,60610	0,07653	%8 < %10
4,5%	1,02897	Capacity			
10,5%	1,22519	Prestige			
30,8%	0,96463	Security			
6,2%	1,12814	Superstructure			
6,2%	1,12814	Infrastructure			
13,60%	1,20534	Mooring Fees			

Consistency ratio (CR) is found to be 8% (0.07653), which is less than 0.1, which is the upper limit of consistency ratio. In this case, since 8% < 10%, it can be said that experts make comparisons consistently.

### 5.3. Sorting alternatives with TOPSIS

In this section, decision alternatives are listed with TOPSIS method, based on the assumption that the yachters will choose the best alternative. The transactions are listed in below tables.

Table 7: 9-point scale for participants

Marina Alternatives	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Marina 1	Moderate Good	Good	Good	Moderate Good	Very Good	Extremely Good	Very High
Marina 2	Good	Moderate Good	Very Good	Good	Moderate Good	Moderate Good	Moderate High
Marina 3	Moderate Good	Very Good	Moderate Good	Good	Good	Good	Moderate High

Table 8: Scores of alternatives

Marina Alternatives	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Marina 1	5	3	3	5	7	9	7
Marina 2	3	5	7	3	5	5	5
Marina 3	3	7	5	3	3	3	5
Weights	0,283	0,045	0,105	0,308	0,062	0,062	0,136

Table 9: Normalized scores of alternatives

Marina Alternatives	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Marina 1	0,65094	0,32929	0,32929	0,76249	0,76834	0,83925	0,70352
Marina 2	0,39056	0,54882	0,768349	0,45749	0,54882	0,46625	0,50251
Marina 3	0,39056	0,76834	0,548821	0,45749	0,32929	0,27975	0,50251
Weights	0,283	0,045	0,105	0,308	0,062	0,062	0,136

Table 10: Weighted and normalized scores of alternatives

Marina Alternatives	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees
Marina 1	0,18421	0,01482	0,03458	0,23480	0,04760	0,05200	0,09567
Marina 2	0,11053	0,02470	0,08068	0,14090	0,03410	0,02890	0,06834
Marina 3	0,11053	0,03458	0,05763	0,14090	0,02040	0,01730	0,06834

Table 11: Values of positive and negative ideal solutions

Ideal Solution Value	0,18422	0,03458	0,08068	0,23484	0,04764	0,05203	0,06835
Negative Ideal Solution Value	0,11053	0,01482	0,03458	0,14090	0,02042	0,01735	0,09568

Table 12: Sorting of alternatives

Alternatives/ Criteria	Location	Capacity	Prestige	Security	Superstructure	Infrastructure	Mooring Fees	Total
Marina 1	0	0,00039	0,00212	0	0	0	0,00074	0,00326
Marina 2	0,00542	9,75904	0	0,00882	0,00018	0,00053	0	0,01507
Marina 3	0,00542	0	0,00053	0,00882	0,00074	0,00120	0	0,01673
Marina 1	0	0	0	0,00882	0,00074	0,00120	0	0,01619
Marina 2	0,00542	9,75904	0,00212	0	0,00018	0,00013	0,00074	0,00328
Marina 3	0	0,00039	0,00053	0	0	0	0,00074	0,00166
Alternatives			Si+		Si-		Ci	
Marina 1			0,05712		0,12727		0,69022	
Marina 2			0,12277		0,05735		0,31840	
Marina 3			0,12934		0,04085		0,24003	

#### 5.4. Sorting alternatives with PROMETHEE

In this section, the criteria determined and weighted by AHP method were evaluated by scoring with a 9-scale scale for each marina as stated in TOPSIS method.

The application of the PROMETHEE method was carried out using the academic version of the "Visual PROMETHEE" software. "Visual PROMETHEE" application is a decision support software that is very easy to use.

The criteria weight inputs required for the application of PROMETHEE method were obtained by AHP method as in TOPSIS method.

Since the owners and experts think that the criteria should have a value above average for each selection alternative, the preference function to be used is determined as the "Fifth Type (linear) preference function" (Şenkayas and Hekimoğlu, 2013).

##### 5.4.1. PROMETHEE Partial Ranking

"PROMETHEE I" calculates values between +1 and -1 (Güney, 2017) for each marina alternative. The

positive value indicates the positive superiority of each marina over the other marinas, and the negative value indicates how weak the marina is compared to other marinas as shown in pic 2.

##### 5.4.2. PROMETHEE Complete Ranking

With PROMETHEE II, negative advantages are subtracted from positive advantages. Thus, it can be decided which marina to prefer by determining net advantages (Ömürbek and Şimşek., 2014). In the PROMETHEE II, the marina, which belongs to values between 0 and +1, takes the lead in the ranking (Şahin and Akkaya, 2013).

##### 5.4.3. PROMETHEE Network

On the PROMETHEE Network screen, alternatives are shown with nodes and preferences with arrows (VP Solutions, 2013). In the study, while Marina 2 and Marina 3 are two close preferences, Marina 1 alternative seems to be the preferred alternative.

Scenario:	Loca...	Caba...	Prest...	Secu...	Sue...	Infra...	Moor...
Unit	9-point	9-point	9-point	9-point	9-point	9-point	9 points min
Cluster/Gr	◆	◆	◆	◆	◆	◆	◆
Preferen							
Min/Max	max	max	max	max	max	max	min
Weight	0,28	0,04	0,10	0,31	0,06	0,06	0,14
Preferenc	Linear	Linear	Linear	Linear	Linear	Linear	Linear
Threshold	absolute	absolute	absolute	absolute	absolute	absolute	absolute
- Q:	1,00	1,00	1,00	1,00	1,00	1,00	1,00
- P:	2,00	2,00	2,00	2,00	2,00	2,00	2,00
- S:	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Statistic							
Minimum	3,00	3,00	3,00	3,00	3,00	3,00	3,00
Maximum	5,00	7,00	7,00	5,00	7,00	7,00	5,00
Average	3,67	5,00	5,00	3,67	5,00	5,00	3,67
Standard	0,94	1,63	1,63	0,94	1,63	1,63	0,94
Evaluati							
Marina 1	A	B	B	A	G	G	level5
Marina 2	B	A	G	B	A	A	level3
Marina 3	B	G	A	B	B	B	level3

Fig.2: PROMETHEE data input screenshot

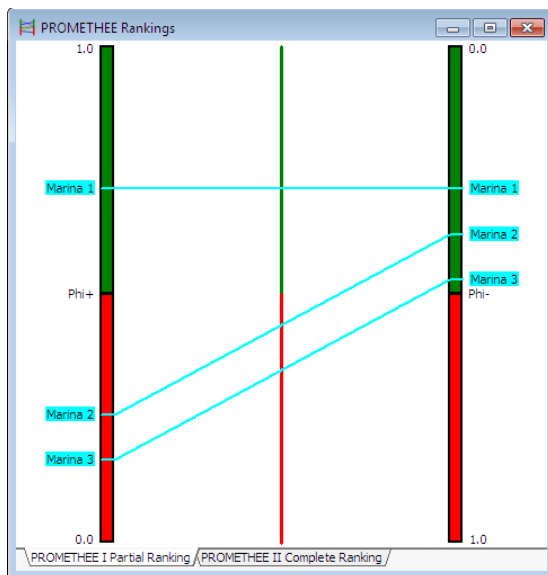


Fig. 3: PROMETHEE Partial Rankings

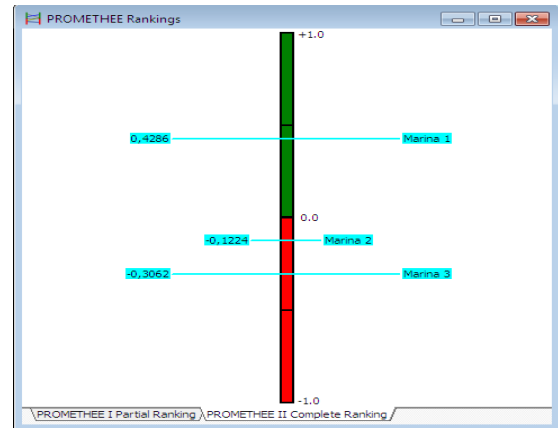


Fig. 4: PROMETHEE Complete Ranking

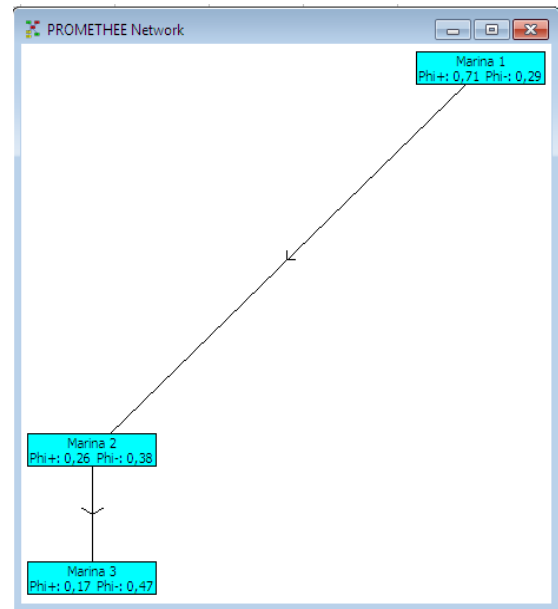


Fig. 5: PROMETHEE Network

#### 5.4.4. PROMETHEE Solution Table

The “PROMETHEE V, Solution” tab of the application lists three alternative “net flow” values. In the study, it was seen that the net superiority values of Marina 1 were higher than the other two marinas.

Actions	Net Flow	Optimal	Compare	Constraints	Optimal	Compare
Marina 1	0,4286	yes	Yes	Minimum	1,00	>= 1,00
Marina 2	-0,1224	no	No	Maximum	1,00	<= 3,00
Marina 3	-0,3062	no	No			
<b>Total:</b>	<b>0,4286</b>	<b>0,4286</b>				

Fig. 6: PROMETHEE V – Solution Table

## 6. RESULTS AND DISCUSSION

In this study, determination of preference criteria of yacht owners, the most appropriate marina they can choose and the applicability of selected methods to marina selection problem were evaluated. In addition, by comparing the findings obtained with different methods, it was tried to determine to what extent these methods contributed to the decision-making process and how coherent they were.

According to the findings, the most important criterion of yacht owners when choosing the marinas of our country are security, location, mooring fees, prestige, infrastructure, superstructure and capacity respectively. Since all 3 marinas selected in the study were within the boundaries of Muğla, the effect of the security criterion on the selection was reasonable. Although the capacity criterion is closely related to the physical size or smallness of a marina; it is noteworthy that it has the least impact among the selected criterion affecting the choice of the yacht owner. As the capacity criterion has the least importance and the occupancy rate is high, it can be concluded that low capacity marinas may be preferable unexpectedly. TOPSIS and PROMETHEE methods have provided consistent results in the ranking of marina alternatives, and in both Marina 1, Marina 2 and Marina 3.

No studies using the MCDM method for marina selection have been found in the literature. Therefore, the usability of Multi Criteria Decision Making Methods in Marina Selection problem should be discussed.

In future studies, it will be beneficial for the sector and yachtsmen to determine the criteria by considering the socio-economic characteristics of each yachtsman, the purpose of use of the marina and the size of the yacht, and the use of multi-criteria decision-making methods that include other quantitative and qualitative criteria.

## 7. LIMITATIONS

In order to avoid subjective results, criteria must be chosen objectively. But in this study criteria have determined and scored by using expert opinions. This may cause a not sensitive result in our study. We can consider this issue as a limitation for our study.

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### **ANALYZING EMPLOYEE TURNOVER IN SEAPORT BUSINESS AND AN IMPLEMENTATION**

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#### **ABSTRACT**

The rapid increase of commercial relationships with globalization has caused an increase of the importance of maritime industry. The ports, as the start and end of maritime transportation, have strategic importance. Even if technological improvements evolve, the technology substitutes for human resource on one hand and it increases the need for qualified seafarers and maritime businesses daily on the other. At this point, the importance of employee turnover, which is adopted as the efficiency and productivity indicator of seaports in services industry, arises. Employee turnover is adopted an concept which usually causes negative consequences. Low rates of employee turnover generally has positive aspects, however high rates of it refers to negative outcomes such as increasing costs, decreasing productivity, employee unrest and depression.

The aim of this study is to determine the employee turnover and its main causes, furthermore it is aimed for measuring the employees' loyalties to their companies, determining the factors that cause leave from their companies and presenting the findings for possible precautions. In this study a survey is adopted for data collection. The universe of the study is a large-scale port which serves to general cargo ships. According to the findings, the employees don't have sufficient job satisfaction; inability to adapt the business environment is caused by low wages and promotion barriers; and leave the company can be prevented by increased wages, economic security, high morale and positive supervisor attitude. Based on those findings there are some recommendations presented in order to decrease the employee turnover rate in seaport businesses.

**Keywords:** *Seaport Businesses, Employee Turnover, Efficiency, Turkey, Port.*

## 1. INTRODUCTION

Employee turnover can be defined as the leave and joining activities in an organization. When it is evaluated as numerically or proportionally, these activities become an important indicator for human resources. In seaport business, especially in busy seasons, it is believed that employee leaves cause to disruptions, extended work hours, and decline in product and service quality. All of them may also cause higher customer dissatisfaction. It is beneficial to know the reasons of employee turnover, cause it generally relates with leaves and/or joinings. From a general perspective, leaves depend on two reasons voluntarily and reluctantly (Cheng ve Brown 1998). In either way, low and high employer turnover rates closely relate to organizational activities. Employee leaves are costly because they usually increase hiring and orientation costs (Loi, Hang-yue and Foley, 2006). When the employees, who are intended to leave, keep organizational knowledge to themselves, the spread of implicit knowledge would be limited organization-wide. Thus, when they leave, they'll take those knowledge with themselves and the organization would lose this knowledge forever. Consequently, as one of the main antecedents of leave from organization, intention to leave (Griffeth etc. 2000; Stejin, 2004; Lui, He and Yu, 2017) seems to be a significant factor. In terms of seaport businesses, employee turnover concept must be handled both in business and operational level. For instance, fatal accidents during loading and unloading operations are usually caused by comparatively inexperienced staff members. Significant part of accidents at sea arise from human fault. Even if technological improvements evolve day by day, the technology substitutes for human resource on one hand and it increases the need for qualified seafarers and maritime businesses daily on the other.

## 2. EMPLOYEE TURNOVER

Employee turnover is a broad concept that includes job dissatisfaction, low morale, gender of employees, automation, wages and organization culture. Thus, it is difficult to make a clear definition that contains all its aspects. For some authors it is viewed as workforce's willingly leave from his/her company, for some others it should include dismissals. However, there are different views on employee turnover in the literature (Dai and Qin, 2016). Employee turnover can be defined as speed of the movement of labors' enter or exit in/from the organization in a certain time (Baysal, 1984; Mucuk, 1998). Employee turnover can be occurred when laborforce experiencing an acute disease, necessity to move due to spouse's changing location, necessity to take care of elder relatives or kids and it is occurred due to some uncontrolled reasons. Besides it is also occurred when the worker has low performance or the management asks the worker to leave due to some violations that the worker has made. Sometimes, it occurs without a reason. In either way, employee turnover has costs for the organization. In addition to the costs of replacement, recruiting and training, there will be also extra time and laborforce needed. This condition may increase non-financial costs for the organization. If

an organization has high employee turnover rates, it may negatively affects organizational memory (Probst, 2000; Croasdell, 2001).

### 2.1. Importance of Employee Turnover

Mostly people may not find an equivalent position to their talents and skills. With other factors such as wage, location or promotion possibilities, workers continuously change their position or firm until they find the suitable position. Similarly employers continuously seek the right candidate and they replace workers until they find him/her. In that case, when the desire of the worker to find the best position and the employer's desire to find the right candidate gets into a balance, the maximum efficiency is provided. To achieve such a balance, it is necessary to have a certain degree of employee turnover rate. In more detail, employee turnover concept has three aspects (Ikım Şimşek and Derin, 2018): from an economic perspective, from a business perspective and from laborforce perspective. In general, employee turnover have two dimensions: labor movement intersectoral and labor movement interdistricts (Igbaria ve Guimaraes, 1999; Demir, 2002).

The costs of workers to the organization hold a significant ratio in total costs. Thus, replacement of insufficient employees by qualified and talented ones would be beneficial in terms of costs. By doing this, the training costs, travel costs, etc. would be considerably low until the candidate gains experience. On the contrary, when experienced employees start in new positions or industries rather than he/she is experienced, there will be additional costs for new recruitment, plus previous training or travel costs will mostly disappear (Demir, 2002). Another interesting topic related with costs is the laborforce movement across industries may cause to employee dissatisfaction, productivity and work motivation loss due to labor surplus. These incidents may also cause economic loss.

The labor force density in labor force mobility negatively affects local labor force market, on the other hand this would be an economic loss due to transferring the funds of the employees whose families live mostly outside the region. Furthermore, the employee density in some regions may increase the unemployment rate (demir, 2002).

From company perspective, to have low employee turnover rates are desired for almost every company. Because high employee turnover rate has many negative effects on companies. One of those effects is undertaking high costs. Those costs are listed below (baysal, 1984):

- The costs of selecting and placing new employees,
  - Training costs,
  - Costs may increase due to new recruits who are not used to their work environment or the machines of which may cause work accidents.
- High employee turnover rates may increase costs and decrease efficiency. This can be explained below:
- Following leaves the existence of rumors and anxiety among the employees cause working efficiency to decrease,
  - Until new employees replace vacancies, there would be production loss and/or delay,
  - Because new employees are mostly inexperienced or



not be able to use the machines effectively, there would be production & performance loss and machinery deterioration.

Employers leave any company either by his/her decision voluntarily or by the management decision reluctantly (Zaffane, 1994). According to the literature, it is claimed that employee turnover rate is a significant performance indicator for companies and it has to be low. It is also claimed in the literature that when employee turnover rate is high, employers' productivity and product quality would be low respectively. In those studies, in order to lower employee turnover rate it is suggested that to improve the satisfaction and working conditions of the workers (Spector; 1997).

### 3. METHODOLOGY

An important part of service industries, port business is business which labor is intensively used. In these kinds of industries, the human factor is essential. Human is the key to acquire the quality, success, profitability and efficiency. From this point of view, it is not desired employers to leave or the employee turnover rate to get high numbers.

In those companies which have high employee turnover rates, it is very difficult to serve high-quality services and to ensure this high-quality service constantly. Ensuring high service quality is possible just only with qualified and experienced employees. New hired employees usually make mistakes in the orientation period. These mistakes probably have a negative effect on customers and may be costly for the company. Thus, employee leaves must be under control, and employee turnover rate getting high must be prevented.

In Turkey, there is no comprehensive study relating with employee turnover within the port business sector. Most studies have explored the effect of motivation tools on employee turnover rate and in the field research tourism industry has been used just because it has high employee turnover rates.

The universe of this study is a major commercial port which serves to general cargo ships. Port managers and employees both have participated the study. The factors that effect on employee turnover has been analyzed and evaluated. This study is judged to be important because it is aimed to give solution suggestions by exploring the factors effect on employee turnover both personal and executive level and second it may lead to subsequent studies in this sector.

In this study, after the literature review a field study has been carried out. A structured survey is used for data collecting. Surveys are economic, has a possibility to acquire more data and with surveys the data can be statistically analyzed. Survey questions are determined through literature review (Chen and Brown, 1998; Igarria and Guimaraes, 1999; Demir, 2002). Two separate surveys are prepared, one for executives and one for employees. The executive survey composed of three parts. Questions about the company, demographics for executives and company's employee turnover rate. The employees survey composed of two parts. Questions about the demographics of employees and the factors that may effect turnovers. Before conducting the survey, an interview with five executives from different positions in the company is executed. The final revision

of the survey has been developed after the literature review and the feedbacks getting from this interview.

Surveys has been delivered and collected through face to face interviews. The sample of the study is 200 people who were recently working in the company. There are 193 useable surveys collected from the sample.

In the first part participants were asked to tick the numbers from 1 to 11 which indicate the agreement level of the question "which factors are important your inability to adapt the work?" (11=absolutely not, 6=undecided, 1=possibly be). In the second part of the survey participants were asked to tick the numbers from 1 to 5 which indicate the agreement level of the question "which factors can prevent your leave decision from your company?" (5=may substantially prevent, 4=may prevent, 3=neither prevent nor cause, 2=may not prevent, 1=never prevent). The data are evaluated based on highest and lowest segments.

### 4. FINDINGS

In the sample which represents 193 port employees and executives, %6 of them are women, %94 of them are men. %14 of the sample are single, %86 of them are married. %10 of them are 40-49 years old, %8 are 50-59 years old, %59 are 20-29 years old and %23 are 30-39 years old. In terms of education, %16 of the participants have high school, %25 have vocational school, %59 have bachelor degree. In terms of experience, %21 of the participants have experience less than 5 years, %33 have 5-9 years, %26 have 10-19 years, %14 have 15-30 years and %6 of the participants have 30 years and more experience. In terms of experience in the current business (the sample port), %9 of the participants have experience less than 1 year, %15 have 1-5 years, %17 have 10-15 years, %17 of the participants have 15 years and more experience. %10 of the participants say yes and %90 of them say no according to the question "Is there anybody changes (in or out) in your position in the last 5 years?".

When the participants asked which reasons are important for their decision to leave the company (1 represents the most common reason, 11 represents the less common reason), %25,61 of them evaluate "not get used to the workplace" factor as 5, %4,13 evaluate it as 8 (Table 1).

It can be seen that %39,99 of the employees evaluate "not get used to colleagues" factor as 7th, %6,61 evaluate it as 9th in the order of significance.

It can be seen that %41,32 of the employees evaluate "dislike to superiors" factor as 8th, %1,66 evaluate it as 6th in the order of significance.

It can be seen that %23,14 of the employees evaluate "Lack of promotion opportunities" factor as 4th, %1,66 evaluate it as 1st in the order of significance.

It can be seen that %95,04 of the employees evaluate "Insufficient wages" factor as 1st, %1,65 evaluate it as 3rd in the order of significance.

It can be seen that %34,71 of the employees evaluate "health problems" factor as 4th, %17,35 evaluate it as 6th in the order of significance.

It can be seen that %91,73 of the employees evaluate "retirement" factor as 10th, %8,26 evaluate it as 11th in the order of significance.

It can be seen that %86,78 of the employees evaluate “finding another job” factor as 2nd, %3,30 evaluate it as 1st in the order of significance.

It can be seen that %24,79 of the employees evaluate “family issues” factor as 4th, %9,92 evaluate it as 7th in the order of significance.

It can be seen that %93,39 of the employees evaluate “death” factor as 11th, %6,61 evaluate it as 10th in the order of significance.

It can be seen that %55,37 of the employees evaluate “getting fired” factor as 9th, %11,57 evaluate it as 8th in the order of significance.

Table 1. Reasons of the Participants Inability to Adapt Workplace

Which could be the reasons that you are not able to adapt your business environment?	1 ... possibility	2	3	4	5	6 ... undecided	7	8	9	10	11 ... absolutely not
	%	%	%	%	%	%	%	%	%	%	%
Not get used to the workplace	-	-	23,14	17,35	25,61	22,31	7,43	4,13	-	-	-
Not get used to colleagues	-	-	-	-	7,43	6,61	39,66	35,53	6,61	4,13	-
Dislike to superiors	-	-	-	-	6,61	1,65	19	41,32	31,40	-	-
Lack of promotion opportunities	1,65	5,78	19,83	23,14	15,70	10,74	9,09	7,43	6,61	-	-
Insufficient wages	95,04	3,30	1,65	-	-	-	-	-	-	-	-
Health problems	-	-	24,79	34,71	23,14	17,35	-	-	-	-	-
Retirement	-	-	-	-	-	-	-	-	-	91,73	8,26
Finding another job	3,30	86,78	9,92	-	-	-	-	-	-	-	-
Family issues	-	-	20,66	24,79	21,49	23,14	9,92	-	-	-	-
Death	-	-	-	-	-	-	-	-	-	6,61	93,39
Getting Fired	-	-	-	-	18,18	14,88	11,57	55,37	-	-	-

In Table 2, when the participants asked to specify the most important factors to prevent their decision to leave according to its strength (5=may substantially prevent, 4=may prevent, 3=neither prevent nor cause, 2=may not prevent, 1=never prevent) %71,90 of the employees evaluate “wage hike” factor may prevents their decision to leave, %3,31 of them evaluate it as may not prevents.

%33,88 of the employees think that “respect for personality” factor may substantially prevents their decision to leave, %16,3 of them think that it may not.

%47,93 of the employees are undecided with how “fee with bonus payment” factor affects their decision about to leave. %11,57 of them think, that factor may substantially prevents their decision to leave.

%66,94 of the employees think that “financial insurance” factor may substantially prevents their decision to leave, %7,44 of them think that it may not.

%42,15 of the employees are undecided with how “profit share” factor affects their decision about to leave, %10,74 of them think, that factor may not prevents their decision to leave.

%66,94 of the employees think that “financial insurance” factor may substantially prevents their decision to leave, %7,44 of them think that it may not.

%42,15 of the employees are undecided with how “profit share” factor affects their decision about to leave, %10,74 of them think, that factor may not prevents their decision to leave.%46,28 of the employees are undecided with how “Making employees a shareholders” factor affects their decision about to leave, %5,78 of them think, that factor may substantially prevents their decision to leave. %43,80 of the employees think that “morale” factor may prevents their decision to leave, %5,78 of them are undecided with how that factor affects their decision about to leave. %43,80 of the employees think that “morale” factor may prevents their decision to leave, %5,78 of them are undecided with how that factor affects their decision about to leave. %38,84 of the employees think that referral system factor may not prevents their decision to leave, %4,96 of them think, that factor may substantially prevents their decision to leave. %38,02 of the employees think that “authority to speak” factor may prevents their decision to leave, %9,9 of them think, that factor may not prevents their decision to leave. %38,02

of the employees are undecided with how “participation to decisions” factor affects their decision about to leave, %7,44 of them think, that factor never prevents their decision to leave. %35,54 of the employees think that

“improvement and success” factor may prevents their decision to leave, %6,61 of them think, that factor never prevents their decision to leave.

Table 2. Potential Precautions to Prevent Employees’ Leaves

Which factors may prevent your decision to leave your company?	May substantially prevent (%)	May prevent (%)	neither prevent nor cause (%)	may not prevent (%)	never prevent (%)
Wage hike	71,90	11,57	13,22	3,31	-
Respect for personality	33,88	19,01	30,58	16,53	-
Fee with bonus payment	11,57	27,27	47,93	13,22	-
Financial insurance	66,94	-	25,62	7,44	-
Profit share	15,70	31,40	42,15	10,74	-
Making employees a shareholders	5,78	11,57	46,28	26,45	9,92
Morale	33,88	43,80	22,31	-	-
Referral system	4,96	23,14	27,27	38,84	5,79
Authority to speak	28,93	38,02	23,97	9,09	-
Participation to Decisions	14,05	28,01	38,02	12,40	7,44
Improvement and Success	23,14	35,54	26,45	8,26	6,61
Compliments	6,61	23,97	42,15	18,18	9,09
Status	25,62	35,54	21,49	12,40	4,96
Adaptation to others	25,62	39,67	22,31	9,92	2,48
Independent working	19,83	26,45	35,54	13,22	4,96
Competition	-	19,00	47,93	23,97	9,09
Be Proud of Work	19,83	33,88	23,14	17,36	5,79
Leadership	31,40	40,50	21,49	6,61	-
Common Goal	7,44	32,23	35,54	19,01	5,78
Communication	23,97	35,54	25,62	10,74	4,13
Balance of Authority with Responsibility	28,1	38,84	23,14	9,92	-
Financial Rewards	9,09	22,31	34,71	24,79	9,09
Training	6,61	23,97	47,11	19,83	2,48
Career Planning	25,62	31,40	35,54	7,44	-
Social Activities	5,79	15,70	30,58	25,62	22,31
Sincerely interest to Work	12,40	31,40	33,89	15,70	6,61
Fair and continuous Discipline System	2,48	21,49	28,1	36,36	11,57
Performance Evaluation	-	7,44	19,01	38,84	34,71
Environmental arrangement at Work	-	4,96	10,74	32,23	52,07

%42,15 of the employees are undecided with how “compliments” factor affects their decision about to leave, %6,61 think, that factor may substantially prevents their decision to leave. %35,54 of the employees think that “status” factor may prevents their decision to leave, %4,96 of them think, that factor never prevents their decision to leave. %35,54 of the employees are undecided with how “independent working” factor affects their decision about to leave, %4,96 of them think, that factor never prevents their decision to leave. %47,93 of the employees are undecided with how “competition” factor affects their decision about to leave, %9,9 of them think, that factor never prevents their decision to leave.

%33,88 of the employees think that “be proud of work” factor may prevents their decision to leave, %5,79 of them think, that factor never prevents their decision to leave. %40,50 of the employees think that “leadership” factor may prevents their decision to leave, %6,61 of them think, that factor may not prevents their decision to leave. %35,54 of the employees are undecided with how “common goal” factor affects their decision about to leave, %5,78 of them think, that factor never prevents their decision to leave. %35,54 of the employees think that “communication” factor may prevents their decision to leave, %4,13 of them think, that factor never prevents their decision to leave. %38,84 of the employees think that “balance of authority with responsibility” factor

may prevents their decision to leave, %9,92 of them think, that factor may not prevents their decision to leave. %34,71 of the employees are undecided with how “financial rewards” factor affects their decision about to leave, %9,90 of them think, that factor never prevents their decision to leave however %9,90 of them think it may substantially prevents their decision to leave.

%47,11 of the employees are undecided with how “training” factor affects their decision about to leave, %2,48 of them think, that factor never prevents their decision to leave. %35,54 of the employees are undecided with how “career planning” factor affects their decision about to leave, %7,44 of them think, that factor may not prevents their decision to leave.

%30,58 of the employees are undecided with how “social activities” factor affects their decision about to leave, %5,79 of them think, that factor may substantially prevents their decision to leave. %33,89 of the employees are undecided with how “sincerely interest to work” factor affects their decision about to leave, %6,61 of them think, that factor never prevents their decision to leave. %36,36 of the employees think that “fair and continuous discipline system” factor may not prevents their decision to leave, %2,48 of them think, that factor may substantially prevents their decision to leave. %52,07 of the employees think that “environmental arrangement at work” factor never prevents their

decision to leave, %4,96 of them think, that factor may prevents their decision to leave.

## 5. CONCLUSION

Considering that in the sample %59 of the employees have bachelor and %25 of them have vocational school degrees, employees in the port business have higher education level in general. %25,61 of the employees think that Not getting used to the workplace is the 5th important factor affecting the decision to leave. This points out that, in the port business, the intensive business tempo in the beginning may cause leaves for the apprentices.

The most remarkable issue in the findings is, %95,04 of the employees think that insufficient wages could be the reason that they are not able to adapt their business environment. This is the highest score among all other factors. In Turkey, like many other sectors, it can be seen that employees in port business are not satisfied with the fee they got and because of that they tend to leave their job.

Health issues, especially for the employees working in the field, affect job satisfaction, considering that %34,71 of the employees evaluate health problems as 4th degree important. In many times port workers in the field have to work under heavy conditions. Because there are night shifts, accident risk existence all the time during cargo loading/unloading, exposure to extreme weather conditions (hot or cold), hazardous materials which are risky for human health; occupational health is more important for employees in the port business, and it plays a key role for transfers to another sector or leaves. Being a docker is one of the hardest work. Besides physical difficulties in it, working in the field of ports also have psychological difficulties which may easily wear the dockers down. Dockers should also should also experience in-service training.

Another important issue is that %86,78 of the employees think that finding another job is the 2nd reason that they are not able to adapt their business environment. May be this is because the lack of qualified human resource in the maritime industry. Due to this problem, employees continuously take business offers from another company and have chance to be employed with higher salaries. This makes the problem is getting more serious. The employee is interesting more to the economic side of the salary. This is because, a salary is essential for the employee and his/her family in order to meet their needs. Getting sufficient financial earnings positively affects employees to be more creative, to be permanent and consistent at work. According to findings, with %71,90 of the employees agree it may substantially prevent to leave, the most important factor to prevent leaves wage hike. With %66,94 of the employees agree it may substantially prevent to leave, another important factor to prevent leave decisions is financial insurance. As it can be seen from these findings, financial aspects are essential in employees jobs satisfaction. Considering that its role in employees good performance, salary must be in a sufficient level by taking into account the cost of life in Turkey. Besides wage policies must be clear so that employees can easily understand, they should be adapted to changing economic improvements. Thus, there will be positive developments such as preventing qualified

employees' transfers to another industry in maritime industry due to insufficient salaries.

Considering that %38,84 of the employees thinking that wouldn't affect their decision to leave, it can be said that employees in port business may have chance to share their opinion and suggestions but these contributions wouldn't be taking into account enough by the administration. To encourage employees to feel them an inseparable part of the organization and to work with enthusiasm, administrators should establish good relations with their subordinates, they should enhance employees' morale with less surveillance. Administration team should establish participation to decisions from all levels of the organization. Considering that %42,15 of the employees are undecided with how "compliments" factor affects their decision about to leave, it can be said that in the sample organization, appreciation and compliment system is not working efficiently.

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### **THE IMPACT OF CORONAVIRUS DISEASE (COVID-19) PANDEMIC ON CRUISE INDUSTRY: CASE OF DIAMOND PRINCESS CRUISE SHIP**

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#### **ABSTRACT**

World economic system is global and also cruise industry is rapidly growth in recent years. Global virus pandemics such as Spanish, Asian and Hong Kong Flus in 20<sup>th</sup> century, H1N1 and SARS viruses in 21<sup>th</sup> century are occurred and infected millions of people in the world. Coronavirus disease (COVID-19) pandemic started in Wuhan City, China on 31 December 2019. This study's aim is to determine the impact of this pandemic on cruise industry and examine a case of Diamond Princess Cruise ship. The methodology of this study is qualitative case study methodology. According to the findings of this study, pandemics are quickly spread in ships. And because of this, pandemics are important for cruise industry and cruise industry must be taking preventive and proactive precautions.

**Keywords:** *Coronavirus Pandemic, Covid-19, Tourism, Cruise Industry, Diamond Princess*

## 1. INTRODUCTION

Definition of globalization is “the development of an increasingly integrated global economy marked especially by free trade, free flow of capital, and the tapping of cheaper foreign labor markets.” (Merriam-Webster.com Dictionary, Merriam-Webster).

In the global world, the spread of international trade, the increase of labor and capital movements, the end of ideological polarizations between countries, the countries’ convergence in terms of economic, political and socio-cultural aspects are a result of rapid change in technology (Bayrakdaroğlu and Ege, 2007, 57).

In recent years, two important trend occur in the world economy. First one is technological innovations and developments, other one is openness and interdependently in the society. In an open world economy these incentives invariably reflect aspects of the international trade environment (Grossman and Helpman, 2001, xi-xii).

Neoliberalism has spread across the world as a result of the globalization and these trends. Entrepreneurialization, privatization and commodification is important concepts in this period (Rossi and Vanolo, 2015, 846).

States and markets have been continuously shaped by the developments such as globalization, technological advancement and increasing competition since 1990s. In this period, global markets have been faced with both new opportunities and dangers (Ege, 2007, 79). Global virus pandemics are example of these dangers. Three influenza pandemics such as Spanish, Asian and Hong Kong Flu in 20<sup>th</sup> century, H1N1 and SARS viruses in 21<sup>th</sup> century were occurred.

Coronavirus disease (COVID-19) pandemic started in Wuhan City, China on 31 December 2019. World Health Organization (WHO) was informed of cases of pneumonia of unknown cause in this date. Chinese authorities was identified of this new type of coronavirus and named “2019-nCoV” on 7 January 2020. This new virus is imported in other countries, including in the European Region, USA, Turkey and totally 210 countries. On 21 April 2020, world has confirmed over 2 million 400 thousand cases of COVID-19, and 174 thousand fatalities in total according to the WHO (World Health Organization, 2019).

COVID-19 pandemic is rattling the stock market, economy and business such as health sector, tourism, supply chain, marketing companies, entertainment sector, food and beverage sector, capital and money markets, international trade and the shipping industry.

Global travel and transport play a critical role in the spread of infections. Results of infected passengers, the travel restrictions, quarantines, and heightened vigilance had an impact on maritime industry (Lim, 2011, 170). This study’s aim is to determine the impact of new Coronavirus disease (COVID-19) pandemic on cruise industry and examine a case of Diamond Princess Cruise ship.

## 2. A BRIEF REVIEW OF WORLD CRUISE INDUSTRY

The global maritime shipping industry is liberal market and free from the constraints of government and

trade union regulation. Effectively freed from national hiring restrictions, most ship owners no longer crew their vessels with the highly unionized seafarers of the traditional maritime countries, such as Greece, Japan, Norway, or the United Kingdom, instead preferring to hire from lower wage maritime labor exporting countries, such as India, the Philippines and Russia (Lillie, 2006, 1).

In this period, liberal economy and open labour market period, seafaring populations of all the traditional maritime countries such as Great Britain, are declined. Today ships crews are multi-national and culturally diverse. These crews are generally Philippines, Russia, Ukraine, Indonesia, India, China and Turkey nationality (Couper, 2000, 4).

In recent years, cruise industry is rapidly development and growth. As a result it has become one of the fastest growing and most dynamic segments of the tourism industry (Dwyer and Forsyth, 1998, Couper, 2000, 4, Wie, 2004, Marti, 2004).

Tony Peisley is cruise industry analyst and author of *Cruising at the Crossroads: A Worldwide Analysis to 2025* and his nationality is UK. He emphasizes importance and development of cruise industry and says “Still, this is the golden age of cruising in terms of quality of the product. You will still get people saying, ‘Well, there is too much capacity and that’s why the yield is not as good as it has been,’ and I always say to that, ‘How many hotels were built this year? Hotels don’t run 100 percent-full, and ships do.’” (Smith, 2020).

## 3. COVID-19 AND CRUISE INDUSTRY

Social distancing and isolation is important for preventing a Covid-19 pandemic. But travelers must spend time close together in cruise ships. Travelers and crew members are from many countries. Because of these, Covid-19 disease is rapidly spread in cruise ships.

Some of crew members are transferred other ships. Because of this, pandemics can spread and transfer other ships. Cruise ships are visited global ports in different countries and infected people may also travel between countries and it is caused that infections rapidly spread between country to country (Centers for Disease Control and Prevention, 2019).

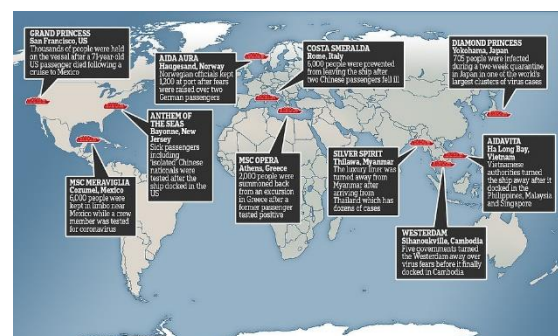


Fig. 1. Map of Coronavirus Cases in Cruise Ships (Dailymail, 2020)

Many coronavirus cases are occurred in different cruise ships. These cases are shown in the Fig. 1. Some of them are Diamond Princess, Ruby Princess, Grand Princess, Zaandam, Coral Princess, Costa Fascinosa, Celebrity Apex, Greg Mortimer, Costa Atlantica, Aida

Aura, Costa Smeralda, Anthem of the Seas, MSC Opera, Silver Spirit, MSC Meraviglia, Aidavita, Westerdam. First coronavirus case is Diamond Princess and it is important case for pandemics in cruise ships. These pandemic ships are visited different ports and countries. For example, Ruby Princess is docked on Sydney port in Australia and first Covid-19 case is reported in 19 March, 2020. In this cruise ship eleven passengers died and at least 662 passengers and crew infected. Grand Princess is docked on San Francisco port and Zaandam is docked on Florida in USA. In Costa Fascinosa, ship's doctor and two crew died in Brazil. More than 200 crew infected in Celebrity Apex and 148 crew infected in Costa Atlantica. Short information of other cases are shown in Fig 1 and Table 1.

Table 1: Coronavirus on Cruise Ships

Ship	Location	Covid-19 reported	Scale of outbreak	Current status
Diamond Princess	Japan	4 February	700+ passengers and crew infected, nine died	Cleared
Ruby Princess	Australia	19 March	11 passengers died, at least 662 passengers and crew infected. Ship blamed for 10% of Australia's cases	Required to leave Australia. Some crew onboard - health status unknown
Grand Princess	San Francisco	9 March	Two passengers, one crew member died. 100+ tested positive during Hawaii cruise	Some crew still onboard off Mexico - health status unknown
Zaandam	South America/Florida	27 March	Four passengers, one crew member died. 100+ became ill. Ports refused to allow the ship to dock	Exposed crew still onboard in Florida - health status unknown
Coral Princess	South America/Florida	1 April	Three passengers died. Ship not allowed to dock in South America	Exposed crew still onboard in Florida - health status unknown
Costa Fascinosa	South America/Brazil	March	Ship's doctor and two crew members died in Brazil; other crew hospitalized	Crew are quarantining aboard the ship; a Brazilian court has prohibited crew from getting off the ship
Celebrity Apex	France	March	More than 200 crew infected as ship prepared to launch in Saint-Nazaire, France	Some crew still onboard; some still hospitalised; others sent home
Greg Mortimer	Uruguay	27 March	One crew member died, at least 128 passengers and crew infected	Crew, including many confirmed cases, still aboard off Uruguay; company having trouble repatriating crew
Costa Atlantica	Japan	23 April	148 crew members tested positive, as the ship remained at dock for repairs	Crew quarantined onboard

(The Guardian, 2020)

Jean-Paul Rodrigue is a professor of transport geography at Hofstra University in New York. He said that "Air circulation there is worse than on an aeroplane." Because air circulation in cruise ships is not from outdoor and clean air. Corridors are not open and some cabins are without window, as a result these ships has ideal environment for spreading of viruses. William Schaffner, is an infectious disease specialist at Vanderbilt University. He pointed this important point and said that "A cruise ship is an almost ideal environment to enhance the transmission of a virus, whether norovirus, coronavirus, or flu, from person to person." Crew are sleep in dormitories, sharing toilets and dining rooms. They work with face to face contact.

#### 4. CASE OF DIAMOND PRINCESS CRUISE SHIP

The Diamond Princess is famous cruise ship and one of about 300 cruise ships that circle the globe each year. The brochures called the Diamond Princess, "a precious

gemstone on the seas of the world", where, "day or night, it's always an adventure." It is owned and operated by Princess Cruises. Princess Cruises is the second largest cruise line in 2018 and the first largest cruise line in 2019 by net revenue. It has \$21bn revenues in 2019. Cruise ships carried 30m passengers in 2019 and Princess Cruises carries half the world's cruise passengers each year (The Economist 1843, 2020).

The Diamond Princess is "Best International Ship In Japan" by Cruise Magazine Reader's Poll. Its inaugural date is March 13, 2004. Its length is 952 feet (290 m), height is 205 feet (62 m) and tonnage is 115.875. Medical center and elevators are in the middle of the ship (Fig 2).

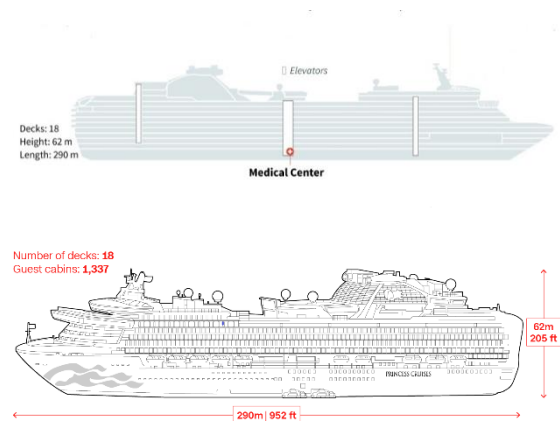


Fig. 2. General Plan of Diamond Princess (Hussein, 2020)

The Diamond Princess has 18 decks. Deck plan of Diamond Princess is shown in Fig. 3 and 4. Decks 1 through 3 are available to crew only. There is no Deck 13. Its decks name between 4<sup>th</sup> and 18<sup>th</sup> decks are Gala Deck, Plaza Deck, Fiesta Deck, Promenade Deck, Emerald Deck, Dolphin Deck, Caribe Deck, Baja Deck, Aloha Deck, Lido Deck, Sun Deck, Sports Deck and Sky Decks, respectively.





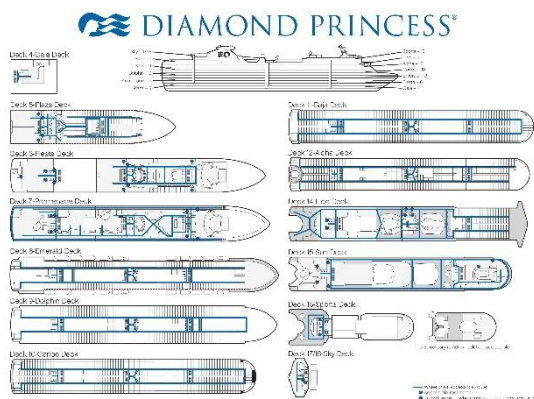


Fig. 3. Deck Plan of Diamond Princess (The Princess, 2020)

The Diamond Princess has 1337 guest cabins. Types of cabins are premium suite with balcony, penthouse suite with balcony, cabins with balcony and cabins without windows. Types and plan of cabins in this cruise ship are shown in Fig. 4.

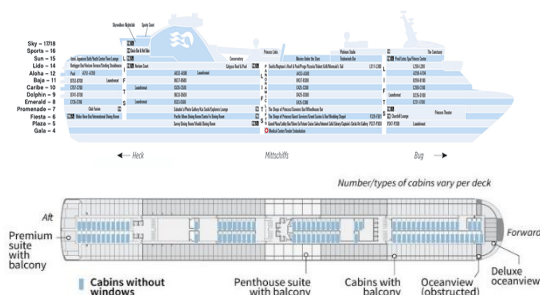


Fig. 4. Types and Plan of Guest Cabins in Diamond Princess (Hussein, 2020, <https://www.seascanner.com/>,2018)

The Diamond Princess has more than 3.700 passenger and crew 56 countries on board in the last voyage. Number of guests are 2.670 and crew are 1.100. It departed from Yokohama port, Japan, on Jan. 20, 2020, and returned on Feb. 3 after making six stops in three countries. Because on Feb. 2, an 80-year-old passenger, who had departed Jan. 25 in Hong Kong, was confirmed to have the coronavirus. Since then, the Diamond Princess has been quarantined off Yokohama with about 3,700 people on board. Of the 381 people from the ship who were symptomatic and tested positive, 37 (9.7%) needed intensive care and 9 (1.3%) died. There were 428 Americans on the ship, of whom 107 (25.0%) tested positive and 11 remained hospitalized in Japan as of March 13, they said. Infected people are from Argentina, Australia, Canada, Hong Kong, Japan, the Philippines, the UK and the United States (Fig. 5).



Fig. 5. Route of Diamond Princess (The Straits Times, 2020)

Guests are quarantined to their staterooms. Food and beverages are being distributed three times a day to guest rooms via a daily menu. In addition, the Princess company is providing many in-room activities and entertainment options. The current guidance from the Japanese Ministry of Health is that the ship will be alongside for 14 days (until February 19). Crew members who have been cleared after an initial health screening by the Japanese Ministry of Health are fulfilling their duties as required. Additional crew testing by health officials is ongoing. When not working, crew members are requested to be in their staterooms (The Princess, 2020).

During the quarantine, same crew gave service for infected guests. They worked in difficult conditions and long hours. The crew delivered meal and medicine to infected passengers. They are not isolated from infected people (The Diplomat, 2020).

Table 2: Coronavirus Cases on Diamond Princess

Age group	Symptomatic confirmed cases (%)	Asymptomatic confirmed cases (%)	Total confirmed cases (%)
00-09	0(0)	1(6)	1(6)
10-19	1(4)	1(4)	2(9)
20-29	18(5)	2(1)	20(6)
30-39	18(4)	5(1)	23(5)
40-49	18(5)	7(2)	25(8)
50-59	27(7)	22(6)	49(12)
60-69	73(8)	56(6)	129(14)
70-79	92(9)	136(13)	228(22)
80-89	27(13)	25(12)	52(24)
90-99	2(18)	0(0)	2(18)
<b>Total</b>	<b>276(7)</b>	<b>255(7)</b>	<b>531(14)</b>

Source: National Institute of Infectious Diseases, 2020.

Percent of persons aboard who were confirmed with COVID-19 by age group and symptom status are given in Table 2. Percent of infected people are generally elder people. Pandemic is rapidly spread in Diamond Princess.

Diamond Princess is important case for Covid-19 pandemic. It is like laboratory for researchers, World provide important information about this pandemic.

## 5. CONCLUSION

In the future, studies on the use of autonomous ships in international trade are being carried out rapidly. The Advanced Autonomous Waterborne Applications Initiative and AAWA project was realized by Rolls Royce. Norway is also working on autonomous ships. Work on the legal infrastructure of IMO about autonomous ships has begun (Ece, 2018, 282, Yılmaz and Onacan, 2019). Although it is not possible to use autonomous ships in the cruise sector, which is the service sector, autonomous systems with fewer personnel can be developed. Thus, the effect of similar pandemics like coronavirus disease (Covid-19) may be reduced in cruise ships.

Case of Diamond Princess Cruise Ship is important for researchers. John Ioannidis says "Cruise ships are like an ideal experiment of a closed population. You know exactly who is there and at risk and you can measure everyone," He is an epidemiologist at Stanford University in California. But every results are not similar to countries. Because "A whole country is not a ship.", Ioannidis says (The Guardian, 2020).

While pandemic is expected to negatively affect cruise tourism, it is seen that the number of reservations will not decrease next year. Perhaps cruise tourism may even be advantageous from this crisis. According to Wen et al, 2020, luxury trips will grow. And cruise tourism is luxury tourism.

Due to the corona virus (Covid-19), it is seen that some ship companies are heading to the Eastern Mediterranean ports, including Kuşadası. Because of this, Turkey can be hosted on the number of ships and passengers expected.

Minister of culture and tourism Mehmet Nuri Ersoy says that "I think cruise tourism will shift to mid-summer or a little later in the season. There were no protocols there yet. Galataport was ready on April 5, now it is ready. It is able to pick it up as soon as the ship is berthing in a port."

Covid-19-like pandemics will continue in the future. May be the ships will change physically, the dock plans will change. The number of cabins may decrease. Some cabins will not be used. Working conditions on ships will change.

Internationally accepted guidelines are needed for reporting, investigating, and controlling norovirus illness on cruise ships in Europe (Verhoef, et al, 2008). Strong need for the monitoring and implementation of preventive measures in semi-closed communities, such as cruise ships (Bert, 2014).

Customers of cruise industry have top level income and cruise tourism is expensive service. Because of this, profitable is high in this sector. In the post pandemic period, new preventions are been in cruise ships.

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