DOKUZ EYLÜL UNIVERSITY

GRADUATE SCHOOL OF SOCIAL SCIENCES

DEPARTMENT OF MARITIME BUSINESS ADMINISTRATION

MARITIME BUSINESS ADMINISTRATION PROGRAM

DOCTORAL THESIS

Doctor of Philosophy (PhD)

THE USE OF INTELLIGENT TRANSPORTATION SYSTEMS IN SERVICES MARKETING: A VIRTUAL REALITY EXPERIMENT

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İZMİR – 2023

THESIS APPROVAL PAGE

DECLARATION

I hereby declare that this doctoral thesis titled as “The Use of Intelligent Transportations Systems in Services Marketing: A Virtual Reality Experiment” has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resources in the reference list. I verify all these with my honour.

26/11/2023

Nergis ÖZİSPA

ABSTRACT

Doctoral Thesis

Doctor of Philosophy (PhD)

The Use of Intelligent Transportation Systems in Services Marketing: A Virtual Reality Experiment

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Dokuz Eylül University

Graduate School of Social Sciences

Department of Maritime Business Administration

Maritime Business Administration Program

Continuously developing technology since the early 20th century has significantly affected the service marketing sector, especially in customer-based areas such as customer satisfaction, customer loyalty and service quality. The changes that started in communication styles with Web 2.0 technologies that emerged in 2004 revealed the need for digital marketing activities in addition to traditional marketing activities, and Web 3.0 technologies that emerged in 2016 supported this need. Today's Web 4.0 technologies, which are at the center of the fourth industrial revolution, have made this a necessity. The era of Industry 4.0, in which machines not only learn but also can produce solutions, enables the machines that consumers use to communicate with other machines via the internet, and enables businesses conducting marketing activities in the service sector to synchronize directly with users.

Although intelligent transportation systems (ITS) emerged in the 1960s, they began to develop in accordance with their purposes with the development of industry 4.0 technologies. The competition that started in the 2010s among developed countries that want to have a market share of ITS, looking for a way to reduce risks on transportation systems and increase profits, has led to an increase in infrastructure investments and budgets allocated to transportation systems. Since the 2020s, it has started to come to the agenda in international

consultation meetings through international symposiums, congresses and workshops.

In this study, it is aimed to examine whether it is possible to increase the perceived service quality, customer satisfaction and customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems technologies, and whether it is possible to direct people to more environmentally friendly transportation alternatives with the effective use of intelligent transportation systems. For this purpose, the study is based on Thaler's Nudge theory, which was awarded the Nobel Prize in 2017.

In the study, first of all, in order to conduct research on intelligent transportation systems, which are among the high-cost infrastructure investments, creating the experimental environment in the virtual reality universe has been planned, which is a cost-effective alternative, and the usage examples of virtual reality technologies in the field of marketing have been researched by referring to the existing literature. In the second stage, the technical infrastructure of virtual reality applications was examined and a preliminary experiment (experiment 1) was developed, aiming to measure the validity and reliability of the study and the perception of presence, which is the most important phenomenon of virtual reality experiments. As a result of this preliminary virtual reality experiment conducted with 100 adult participants, it was decided that the study was valid, reliable and provided the presence feeling. In the third stage, online user comment analysis was carried out in order to determine the variables that will increase the perceived service quality, customer satisfaction and customer loyalty of consumers who will purchase water-based public transportation services. Data obtained from three different websites (www.twitter.com, www.eksisozluk.com, www.sikayetvar.com) were analyzed through the MAXQDA 2020 program and the main variables have been revealed that cause customer satisfaction and customer dissatisfaction in consumers using water-based public transportation services. In the final stage of the study, a virtual reality experiment was conducted according to the scenario created using all the data obtained. As a result of the study, it was concluded that it is possible to increase perceived service quality, customer satisfaction and customer loyalty

and direct people to environmentally friendly transportation alternatives with the effective use of intelligent transportation systems technologies.

Keywords: Intelligent Transportation Systems, Services Marketing, Nudge Theory, Virtual Reality, Experiment.

ÖZET

Doktora Tezi

Akıllı Ulaşım Sistemlerinin Hizmet Pazarlamasında Kullanımı: Bir Sanal Gerçeklik Deneyi

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20. yüzyılın başlarından beri sürekli gelişen teknoloji, hizmet pazarlaması sektörünü, müşteri memnuniyeti, müşteri sadakati, hizmet kalitesi gibi özellikle müşteri temelli alanlarda önemli ölçüde etkilemiştir. 2004 yılında ortaya çıkan Web 2.0 teknolojileri ile birlikte iletişim şekillerinde başlayan değişimler, geleneksel pazarlama faaliyetlerine ek olarak dijital pazarlama faaliyetlerine de ihtiyaç duyulduğunu ortaya çıkarmış, 2016 yılında ortaya çıkan Web 3.0 teknolojileri ise bu ihtiyacı desteklemiştir. Dördüncü sanayi devriminin merkezinde yer alan günümüzün Web 4.0 teknolojileri ise bunu bir nevi zorunluluk haline getirmiştir. Makinelerin sadece öğrenmekle kalmayıp çözüm de üretebilir hale geldiği endüstri 4.0 çağı, tüketicilerin kullanmakta oldukları makinelerin internet aracılığıyla diğer makineler ile iletişim kılabilmesini mümkün kılarak ve hizmet sektöründe pazarlama faaliyeti yürüten işletmelerin direkt olarak kullanıcılar ile senkronize olabilmesine imkan vermektedir.

Akıllı ulaşım sistemleri (AUS)'de 1960'lı yıllarda ortaya çıkmasına rağmen, endüstri 4.0 teknolojilerinin gelişimi ile birlikte amaçlarına uygun şekilde gelişme kaydetmeye başlamıştır. Ulaştırma sistemleri üzerindeki riskleri azaltmanın ve kazancı arttırmanın yolunu arayan AUS'nin pazar payına sahip olmak isteyen gelişmiş ülkeler arasında 2010'lu yıllarda başlayan rekabet altyapı yatırımlarının ve ulaştırma sistemlerine ayrılan bütçelerin artmasına sebep olmuştur. 2020'li yıllardan itibaren ise uluslararası sempozyum, kongre ve

çalıştaylar aracılığıyla uluslararası istişare toplantılarında gündeme gelmeye başlamıştır.

Bu çalışmada da, akıllı ulaşım sistemleri teknolojilerinin etkin kullanımı ile deniz yolu ile toplu taşıma hizmetlerinde algılanan hizmet kalitesinin, müşteri memnuniyetinin ve müşteri sadakatinin arttırılmasının mümkün olup olmadığının ve yine akıllı ulaşım sistemlerinin etkin kullanımı ile insanları daha çevre dostu ulaşım alternatiflerine yönlendirmenin mümkün olup olmadığının incelenmesi amaçlanmaktadır. Bu amaç doğrultusunda, çalışma, Thaler'in 2017 yılında Nobel ödülüne layık görülen Nudge (Dürtme) teorisini temel almaktadır.

Çalışmada ilk olarak, yüksek maliyetli altyapı yatırımlarından olan akıllı ulaşım sistemleri üzerinde araştırma yapabilmek için, deney ortamının maliyet etkin bir alternatif olan sanal gerçeklik evreninde yaratılması planlanmış ve pazarlama alanında sanal gerçeklik teknolojilerinin kullanım örnekleri mevcut literatüre başvurarak araştırılmıştır. İkinci aşamada sanal gerçeklik uygulamalarının teknik altyapısı incelenmiş ve çalışmanın geçerliliğini, güvenilirliğini ve sanal gerçeklik deneylerinin en önemli olgusu olan bulunma hissi (presence) algısını ölçmeyi amaçlayan bir ön deney (experiment 1) geliştirilmiştir. 100 yetişkin katılımcı ile gerçekleştirilen bu ön sanal gerçeklik deneyi sonucunda çalışmanın geçerli, güvenilir ve bulunma hissini sağlar nitelikte olduğuna karar verilmiştir. Üçüncü aşamada, deniz yolu ile toplu taşıma hizmetini satın alacak olan tüketicilerin, algılanan hizmet kalitesini, müşteri memnuniyetini ve müşteri sadakatini arttıracak değişkenlerin tespit edilebilmesi için, çevrimiçi kullanıcı yorumu analizi gerçekleştirilmiştir. Üç farklı web sitesinden (www.twitter.com, www.eksisozluk.com, www.sikayetvar.com) elde edilen veriler, MAXQDA 2020 programı aracılığıyla analiz edilmiş ve deniz yolu ile toplu taşıma hizmeti kullanan tüketicilere müşteri memnuniyeti ve müşteri memnuniyetsizliği yaratan başlıca değişkenler ortaya çıkarılmıştır. Çalışmanın son aşamasında ise elde edilen tüm bu veriler kullanılarak oluşturulan senaryoya göre yaratılan sanal gerçeklik deneyi gerçekleştirilmiştir. Çalışma sonucunda akıllı ulaşım sistemleri teknolojilerinin etkin kullanımı ile algılanan hizmet kalitesini, müşteri memnuniyetini ve müşteri sadakatini arttırmanın ve insanları

çevre dostu ulaştırma alternatiflerine yönlendirmenin mümkün olduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler: Akıllı Ulaşım Sistemleri, Hizmet Pazarlaması, Nudge Teori, Sanal Gerçeklik, Deney

THE USE OF INTELLIGENT TRANSPORTATION SYSTEMS IN SERVICES MARKETING: A VIRTUAL REALITY EXPERIMENT

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ABBREVIATIONS

ABS	Anti-Lock Braking System
ACSI	American Customer Satisfaction Index
APTS	Advanced Public Transportation Systems
ARI	Driver Radio Broadcast Information System
ATIS	Advanced Traveler Information System
ATMS	Advanced Transportation Management System
AUTS	Advanced Urban Transportation Systems
AVCS	Advanced Vehicle Control Systems
AVLS	Automatic Vehicle Location System
CACS	Comprehensive Automobile Traffic Control System
CO2	Carbon Dioxide
CSI	Customer Satisfaction Index
DMS	Dynamic Message Sign
DRIVE	Dedicated Road Infrastructure and Vehicle Environment
DSRC	Dedicated Short- Range Communications
DSS	Decision Support Systems
ECSI	European Customer Satisfaction Index
ERGS	Electronic Route Guidance System
ETC	Electronic Toll Collection
GIS	Geographical Information Systems
GPS	Global Positioning System
HGS	Fast Pass System (Hızlı Geçiş Sistemi)
HOT	High Occupancy Toll
INSEAD	Institut Européen d'Administration des Affaires (European Institute of Business Administration)
IoT	Internet of Things
IPTS	Intelligent Public Transportation Systems
ITS	Intelligent Transportation System
IVHS	Intelligent Vehicle Highway Systems
OGS	Automatic Pass System (Otomatik Geçiş Sistemi)

PROMETHEUS	Program for European Traffic with Highest Efficiency and Unprecedented Safety
RFID	Radio Frequency Identification
SCATS	Sydney Coordinated Adaptive Traffic System
SOR	Stimulus Organism Response Theory
SOx	Sulphur Oxide
TAM	Technology Acceptance Model
TIS	Traveler Information System
TMC	Traffic Management Centre
TUIK	Turkey Statistical Institute
UTAUT	Unified Theory of Acceptance and Use of Technology
UN	United Nations
USA	United States of America
V2C	Vehicle to Cloud
V2H	Vehicle to Home
V2I	Vehicle to Infrastructure
V2N	Vehicle to Network
V2P	Vehicle to Pedestrian/ Vehicle to People
V2V	Vehicle to Vehicle
V2X	Vehicle to Everything
VR	Virtual Reality
WHO	World Health Organization
WOS	Web of Science

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INTRODUCTION

In the global information economy made possible by Web 2.0 technologies, markets are changing and there is constant interaction with competitors, consumers and collaborators. In this environment that changes with developing technology, businesses that produce products and services gain a competitive advantage based on differentiation by establishing fast and simultaneous communication with their consumers by benefiting from the knowledge of customers, markets and technologies (Çakır, 2022:111). Although Parasuraman (1996) demonstrated the importance of technology in service marketing processes years ago with the Service Marketing Pyramid Model, which combines the employee, customer and company triangle with technology, the current level of technology has undoubtedly increased this importance even more. Today's technologies that enable machine-to-machine, machine-to-human, human-to-machine and human-to-human connection, increase marketing efficiency (Kotler, et. al, 2017: 77). These technologies, which can provide solutions to many ongoing problems in the field of marketing, also enable the development of many sectors in the economy; in retail (e-commerce), in education (online courses), in transportation (automated vehicles), etc. (Kotler, et. al, 2017: 75).

Intelligent transportation systems, whose first applications began in the 1960s, have reached a completely different dimension with the technological opportunities of today, just like service marketing applications, and can meet the iconic promises (autonomous vehicles, electric vehicles, navigation systems, etc.) and expectations that have been in the literature for a long time. Intelligent transportation systems, which emerged with the motto of providing more efficient and safer traffic management, are now used for passengers, emergencies, infrastructure systems, fleet management systems, general road conditions, public transportation systems, driver support and safety systems, accident situations or electronic toll collection. And it increases its development day by day with the help of numerous applications for its systems.

In the light of all these technological developments, the main motivation of this study is to examine the relationship between these two sectors, which grow and develop with technology today, and their possible effects on each other. In this regard, the aim of the study is to examine whether it is possible to increase the perceived

service quality, customer satisfaction and customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems technologies, and whether it is possible to direct people to more environmentally friendly transportation alternatives with the effective use of intelligent transportation systems. Since the second aim of the study is to examine whether it is possible to direct people to more efficient transportation alternatives, the study was based on Nudge theory and the teachings of the theory were greatly benefited from.

The concepts of service marketing, service quality, perceived service quality, customer satisfaction and customer loyalty, which are aimed to be developed with the efficient use of intelligent transportation systems, within the scope of the study, are explained in the first chapter of the study. The chapter also includes the relationship between all these concepts, their development over the years, and examples that will enable the successful management of these concepts in practice.

In the second chapter, intelligent transportation systems and technologies that are recommended to be used efficiently in the study are introduced. In the chapter, in addition to the historical development, foundations, development processes and purposes of these systems, which date back to the 1960s, application methods and application areas are also included. Finally, the chapter is completed by including the applications of intelligent transportation systems on public transportation.

The third chapter of the study is designed as the methodology chapter. In addition to the purpose of the study, research questions, conceptual framework, the nudge theory on which the research is based and notions related to the theory are included in this section. Detailed information about the four different methods used in the study, data collection and data analysis methods are added in the third chapter. This section also includes the designs of the virtual reality experiments implemented within the scope of the study and details of the laboratory environments where the experiments were implemented. It is evaluated that these data will contribute to the literature in creating an experimental environment in marketing studies.

The fourth chapter is the application chapter of the study. All findings obtained from bibliometric analysis, experiment 1, online user comment analysis and experiment 2 carried out within the scope of the study are included in this section. A

broad review of the research, its theoretical and practical contributions, its limits, and suggestions for further study are included in the study's conclusion section.

CHAPTER ONE
INTELLIGENT TRANSPORTATION SYSTEMS

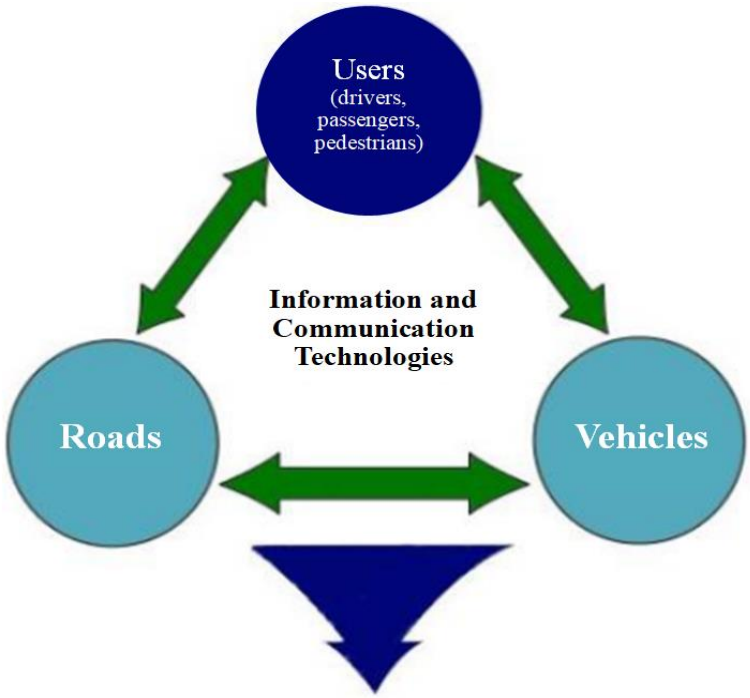
1.1. INTELLIGENT TRANSPORTATION SYSTEMS

Intelligent transportation systems (ITS) describe state-of-the-art (usually) and complex systems designed to enhance the traffic experience (Williams, 2008: 3-4). Usage of these systems is not only limited to traffic congestion control and information, but also road safety and efficient use of infrastructure are among the main objectives (Güven and Keçeci, 2020: 378). Defined as "the application of advanced communication systems, information processing, control and electronics technologies to improve the transportation system and to save lives, time and money" (Strong and Albert, 2002; Elkosantini and Darmoul, 2013: 233), these systems, allow vehicles, drivers, passengers, road operators and managers all to interact with each other and with the environment simultaneously, often enable these interactions through complex technological infrastructure systems. ITS, whose main purpose is to reduce the number of deaths and injuries caused by traffic accidents, as well as to increase vehicle and traffic efficiency, has also become used in time to reduce the negative effects of various transportation systems on the environment. In order for the system to work successfully, which needs mutual and simultaneous interaction by its nature, the right data from all sources must be delivered to the right user at the right time, and even if the user receives this data from a completely different system, it must be deciphered (Williams, 2008: 3-4). In order for a system to be considered as ITS, it must provide accurate information to users as a result of the analysis of information collected from different sources. Therefore, ITS is expected to facilitate the decision-making process through the decision support systems it offers to its users (Güven, 2019: 13).

The system, which is generally assumed to be used for road-based traffic systems, is directly related to rail, sea and air transport modes as it plays an active role in both passenger and freight transport (Williams, 2008: 3-4). ITS technologies include the most advanced wireless, electronic and automation technologies aimed at increasing the safety, efficiency and convenience of transport. ITS technologies have the potential to integrate vehicles (public transport, personal vehicles, etc.), system

users and infrastructure (roads and public transport facilities) (Güven, 2019: 14). Assumed to focus on a vehicle or its contents ITS should actually be considered primarily as transport network infrastructure. It should be noted that a system that is expected to reduce traffic congestion, simultaneously calculates and offers the optimum solution to relieve traffic congestion in coordination with multiple platforms, service providers and infrastructures (Williams, 2008: 3-4).

Figure 1: ITS User, Road and Vehicle Units



Source: Batır, 2019: 45

The system shown in Figure 1, which provides an uninterrupted and natural integration of different transportation modes such as land traffic, trains, cargo air transportation, passenger air transportation, maritime transportation, through asynchronous distributed control and coordination algorithms, should offer the following decision support opportunities to passengers as a result of this integration;

- Access to accurate status information of any mode of transport from any point in the system,

- To be able to determine the most effective route among the existing routes that include different combinations of transportation modes, taking into account the available information and the preferences of the decision maker,
- Dynamically booking other modes of transport even when traveling in any mode of transport (Güven, 2019: 13-14).

Although ITS technologies have become widely used and accepted in a relatively short time, there are large gaps in consumer knowledge about what these systems are. According to a study conducted by the University of Iova, they stated that although ITS systems are technologies that many people use extensively in their daily lives, they do not have much knowledge about ITS systems. However, ITS offers a phone application that shows the time remaining for the next bus to arrive, the braking system that can calculate the situations when the vehicle needs to brake suddenly, the kiosk system that provides fast transitions on highways, the cargo tracking system that allows us to monitor every movement of the product we purchased, the GPS (Global Positioning Systems), real-time traffic, route, etc. weather information is the sum of all the systems we can get (Auer, 2016: 1-2; U.S. Department of Transportation, 2021:1-2).

Within the scope of this study, the topic of intelligent transportation systems, which gained its popularity with the acceleration in information and communication technologies in the 2000s (Güven, 2019: 13), will be examined in detail in the titles of of history of ITS, fundamentals of ITS, types of ITS, technologies of ITS, applications of ITS and effects of ITS systems on public transportation systems.

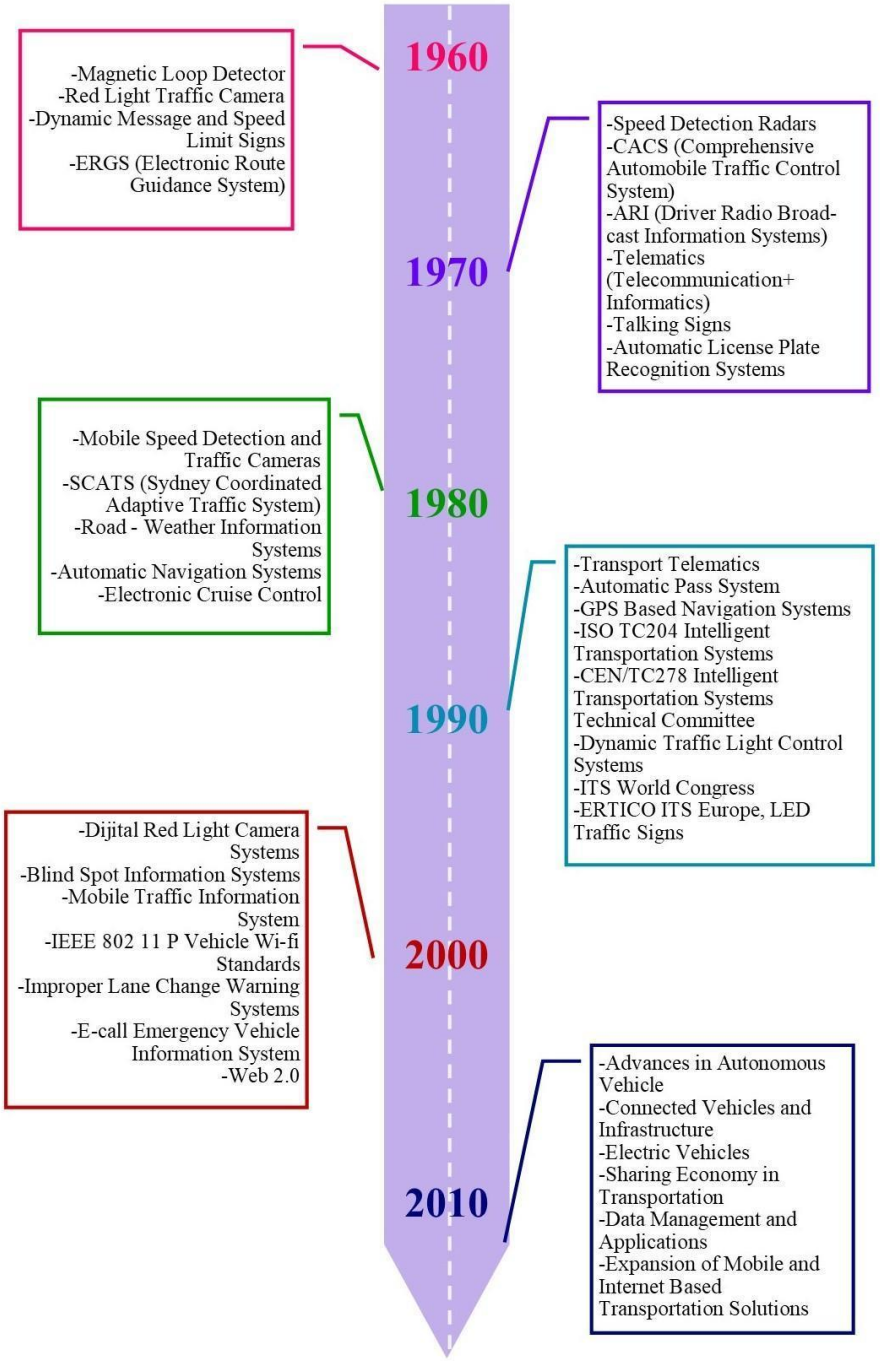
1.2. HISTORY OF INTELLIGENT TRANSPORT SYSTEMS

ITS applications were first used towards the end of the 1960s with electronic sliding message boards and cameras used in traffic lights to solve traffic problems on highways and improve service quality (Göl, 2019: 9). Yan et. al., (2012: 321) divided the historical development of ITS into two phases. Accordingly, the first stage is the collection and processing of transportation information by means of intelligent or technological tools. This process, which is examined under the title of transportation telematics, has been used since the 1970s in Japan, which is trying to find a solution

to the problem of many fatal and injured traffic accidents as well as the structurally inefficient traffic process. However, the first official transportation telematics program to be recorded after Japan was the PROMETHEUS (Program for European Traffic with Highest Efficiency and Unprecedented Safety) program, which was revealed by European automotive companies in 1986, followed by the DRIVE (Dedicated Road Infrastructure and Vehicle Environment) program, which was revealed by the European authorities in 1988. Then, the name of the IVHS (Intelligent Vehicle Highway Systems) program, which was revealed by the USA for the same purpose in 1990, was changed to ITS in 1994 and the foundations of today's known ITS (Intelligent Transportation System) have been laid (Yan et. al., 2012: 321). In this line, ITS, which emerged with the idea of directing the computer and technology revolutions that emerged with the Information Age in the 1980s on transportation by the sector practitioners, has been made possible with the cheapening and development of information processing power and communication technologies at the end of the 20th century (Weiland and Purser, 2000: 1).

Although the first beginning of the physical use of ITS applications dates back to the 1960s, the 1970s, when the road capacities were not sufficient in practice, are accepted as the starting point for ITS. Regional projects using ITS technologies in Europe, America and Japan started in these years. The history of ITS technologies is visualized in Figure 2 (Tektaş and Tektaş, 2019: 194).

Figure 2: History of Intelligent Transportation Systems



Source: T.C. Ulaştırma Denizcilik ve Haberleşme Bakanlığı, 2012: 3; T.C. Ulaştırma ve Altyapı Bakanlığı, 2018: 20; Tektaş and Tektaş, 2019: 194.

Towards the 2020s, ITS has started to be on the agenda in international consultation meetings through international symposiums, congresses and workshops.

As a reflection of this, both such activities and technological developments and needs have led countries and regions to take steps to establish their own ITS structures. Especially after 2015, a fierce competition has started among developed countries to have a share in the world ITS market. The most important indicators of this can be shown as ITS projects, infrastructure and technology investments, budgets allocated to transportation and the visions of the relevant countries (Tektaş and Tektaş, 2019: 195).

1.3. FUNDAMENTALS OF INTELLIGENT TRANSPORT SYSTEMS

ITS gives us tools, and potential for future tools, which could make our transportation system better and especially safer. By combining different tasks within vehicles or infrastructures, ITS would offer a way to reduce risks and increase gain. With ITS technologies, there are countless opportunities to enhance the transportation system (Chowdhury and Sadek, 2003: 15-16). This study will present fundamentals of ITS that are necessary for successful ITS planning as advanced transportation management systems, advanced traveler information systems, advanced vehicle control systems, advanced commercial vehicle operation systems, advanced public transportation systems and advanced urban transportation systems.

1.3.1. Advanced Transportation Management Systems (ATMS)

Advanced Transportation Management Systems (ATMS) include ITS applications focused on traffic control devices such as dynamic message signs and traffic signals on highways that provide drivers with real-time messaging about traffic or highway status. Traffic Operations Centers (TOCs), managed by cities and states, connect sensors, roadside equipment, cameras, message signs and any other device to detect accidents, hazardous weather events or other road hazards and create an integrated view of traffic flow using information technologies (Ezell, 2010: 10-11).

Ramp metering is another advanced transportation management method that can significantly improve traffic management. Ramp meters, which are traffic signals on highway entrance ramps, separate groups of vehicles as they enter the highway,

minimizing obstructions to the flow of traffic caused by groups of vehicles, and improving the safety of merging. Some sort of ramp metering is utilized in about 20 American metropolitan regions (Ezell, 2010: 10-11).

1.3.2. Advanced Traveler Information Systems (ATIS)

Advanced Traveler Information Systems (ATIS), one of the most recognized ITS applications, provides drivers with real-time information on public transport routes and schedules, travel and traffic information, navigation directions, traffic congestion, accidents, weather conditions or delays due to road repair work. The most effective and successful of these systems are expected to inform drivers about their exact location, inform them about current traffic or road conditions on their roads and surrounding roads, and make available information optimally usable by empowering drivers with optimum route selection and navigation instructions (Ezell, 2010: 10).

Advanced traveler information systems (ATIS), which allows users to plan their transportation processes (transportation means, transfer facilities, etc.), can be defined as an advanced set of services widely used by the citizens. The technology provides its users estimates of variables such as shortest time, least transfer options, and minimum fares for all modes of transport (İnaç, 2022: 56).

In the current literature, it is stated that 30 percent or more of urban traffic in big cities is caused by vehicles wandering while searching for a parking space (Atkinson and Castro, 2008: 106). Cities such as Singapore, Staocholm, and San Francisco offer systems that show drivers instantaneously empty parking spaces in the city with the help of ATIS applications. Some of these systems even allow drivers to reserve parking spaces in advance via digital channels (Ezell, 2010: 10).

1.3.3. Advanced Vehicle Control Systems (AVCS)

Smart vehicles equipped with certain sensors adapted to the internet of things technology that can be incorporated in intelligent transportation systems, allow a car to follow a line or stay in a lane within the functions of these sensors, perform certain driving tasks such as fast parking or driving on a straight road, turn on music or

windows, keep the temperature inside the vehicle in balance, detect someone who has been unattended in the vehicle for a long time and, in this case, inform the relevant authorities (Tyagi and Sreenath, 2022: 270-271).

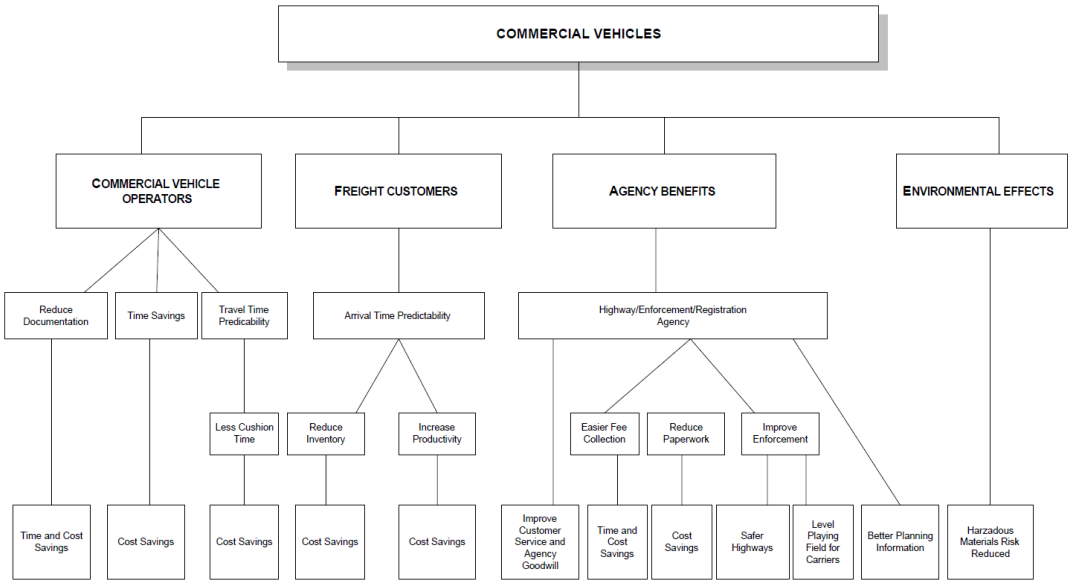
The delegation of these tasks to computers using Internet of Things technology allows human drivers to reduce stress while driving, enjoy the journey and have a much safer driving experience. which have the ability to calculate more than humans and to calculate more alternatives before deciding on the optimum solution. These technologies provide drivers with the advantage of more complex but much more advanced vehicle control (Tyagi and Sreenath, 2022: 270-271).

1.3.4. Advanced Commercial Vehicle Operation Systems

In commercial vehicle operations, ITS applications are used to improve communication between shippers and institutions responsible for transportation. Examples of these systems are electronic registration and transport permit programs, electronic exchange of inspection data between regulatory agencies for better inspection targeting, electronic scanning systems, and various applications that assist operators with fleet operations and safety issues (Köz, 2011: 62).

The use of commercial vehicle operating systems within the scope of ITS has different advantages for different actors in the ecosystem. These systems reduce costs for vehicle operators and provide greater safety for transport customers (Peng, et. al., 2000: 16).

Figure 3: Commercial Vehicle Operator Systems Benefits



Source: Peng, et. al., 2000: 16.

As shown in Figure 3, commercial vehicle operator systems have many advantages, including reducing documentation processes, reporting reliable and more predictable arrival times, and facilitating the operations of authorized institutions. When commercial vehicle operator systems are properly coordinated, they can operate without unnecessary repetition and paperwork. In this way, paperwork and the number of personnel can be reduced through electronic information sharing and automatic data collection in commercial vehicle operations, saving time and money (Peng, et. al., 2000: 16).

More advanced commercial vehicle operating systems, which increase the reliability of goods delivery, reduce inventory costs and increase productivity. In addition, commercial vehicle operator systems, which provide better and more accurate information in the future planning process for safer highways, will contribute to the creation of more accurate procedures or infrastructures (Peng, et. al., 2000: 16).

1.3.5. Advanced Public Transportation Systems (APTS)

Advanced Public Transportation Systems (APTS) include applications such as automated vehicle location (AVL) that enable bus or rail transit vehicles to report their current location and enable traffic operations managers to create a real-time view of the status of all assets in the transit system. APTS helps make public transport a more attractive option by providing enhanced visibility into the arrival and departure status (and overall punctuality) of buses and trains. In particular, advanced public transportation systems that provide "next bus" or "next train information" are becoming increasingly common around the world, from Washington, DC to Paris, Tokyo, Seoul and elsewhere (Ezell, 2010: 12). It is among the technologies that have been used for a long time in Turkiye's major cities.

The advantages of advanced public transportation systems (APTS), a tool that makes it easier to manage and monitor all modes of public transportation, are listed as real-time public transportation monitoring, information exchange with all other modes, instantaneous data on accidents, and traffic congestion. While APTS's dynamic real-time data permits efficient use of the system's available capacity, the technology also makes sure that the relevant parties are informed of any sudden changes that take place while they are using the service. The main purposes of the system are to provide information to the authorities of the operators of public transport, including buses, ferries, railway networks, taxis, etc., and to provide people with the necessary information about public transport (number of empty seats, ETA, location information, etc.) (İnaç, 2022: 56).

With APTS, it is also possible to provide electronic fare payment applications for public transport systems. The system enables public transport users to pay contactless fares from their smart cards or mobile phones using near field communication technology (Ezell, 2010: 12).

1.3.6. Advanced Urban Transportation Systems (AUTS)

Intelligent transportation systems (ITS) are an important way to alleviate urban traffic problems and increase the efficiency of the transportation industry. Advanced

urban transportation systems analyze the current and needed environmental conditions for the development of AUTS, including the policy environment, social environment, economic environment, technology environment and others (Qiao, et. al., 2012: 189).

The biggest goal in using urban transportation systems in the city is to increase mobility. Mobility is an increase in the number of trips and an indicator of development. The use of intelligent transportation systems allows coordination to be done from a single source and with the integration of all systems, losses in the system, especially time losses, are prevented (Köz, 2011: 94-95). Taking into account the 20 million daily mobility, delays will cause significant losses to businesses and increase fuel consumption (Köz, 2011: 94-95). And, cccording to 2022 data, the number of daily trips made in Istanbul, (Türkiye), the 13th most populous city in the world (www.worldpopulationreview.com, 2022), was about 20 million.

When it comes to urban ITS, public transport systems also come to the forefront. In order to switch to ITS in the management of urban public transport, the first thing to do is to make all public transport vehicles and stops smart. The second step to be taken is that public transportation vehicles have a number of priorities compared to personal cars in traffic. In traffic jams, public transportation vehicles are waiting together with other vehicles. This situation reduces the attractiveness of public transportation. When priority is given to public transportation vehicles at intersections, traffic jams are prevented by public transportation vehicles, buses pass without waiting too long, thus shortening the journey times of passengers. Due to the shortening of travel times in public transportation vehicles, public transportation systems will be preferred more and thus, urban traffic congestion will be reduced. For this, buses should be given priority in the signal system and some privileges should be given to public transportation vehicles that are not given to personal cars (Köz, 2011: 94-95)

1.4. INTELLIGENT TRANSPORTATION SYSTEM TECHNOLOGIES

There are many different types of technology used under ITS. Navigation and traffic signal control, applications that can analyze instant data from different sources, applications that can make predictions with the same data are some of them. ITS contains a variety of technologies and features (ITS). Communication technologies

and methods include bluetooth, microwave, and the Internet. Geographical locations, Geographical Information Systems (GIS), data gathering, data sharing, camera systems, and artificial vision are also included. In-vehicle systems, digital mapping, and detection and categorization are more examples of these technologies and methodologies. Technologies that enable vehicles to communicate with infrastructure (V2I) are among the most popular technologies worldwide in recent times (Tyagi and Sreenath, 2022: 9-10).

It is argued that the success of ITS largely depends on the platform used to access, collect and analyze accurate environmental data. There are 2 types of sensors commonly known today. The first of these is the sensors located inside the vehicle. These sensors collect vehicle data such as vehicle operating status and condition, the second type is known as urban sensing platform, these sensors are used to collect traffic situation and traffic flow. The information exchange relationship between Vehicle-Vehicle (V2V) constitutes a huge amount of data, as does the relationship between Vehicle-Infrastructure (V2I), so sensor technology is considered an important part during data collection. After the collected data is forwarded to the traffic management department, this department will process and analyze the data to make the next decisions. In line with these analyzes, ITS will step in to help overcome problems such as increased fuel costs, excessive carbon dioxide emissions, long traffic jams and improved road system (Nguyen, et. al., 2022: 179).

1.5. INTELLIGENT TRANSPORTATION SYSTEM APPLICATIONS

Prominent ITS applications in the world are classified as passenger information systems, traffic management systems, road information systems, public transportation systems, electronic toll collection systems, cargo and fleet management systems, driver support and security systems, and accident and emergency systems in this study.

1.5.1. Passenger Information Systems

Users can be informed about the instant traffic situation during their journey through DMS (Dynamic Message Signs) included in the passenger information systems about the current condition of the city traffic, which is monitored 7/24 by

traffic cameras and traffic flow detection sensors. With DMS', information on variables such as traffic density, weather and road conditions, and traffic accidents are transmitted to drivers instantly, and drivers can be directed to alternative routes and efficient use of road capacity can be ensured (Batır, 2019: 55-56). These dynamic message signs are also used to inform and guide about weather events such as fog, snow, rain, icing that will disrupt normal traffic flow on the highway, or speed limit applications, electronic control warnings, heavy traffic warning, attention, and vehicle restrictions (Tufan, 2014: 64).

Mobile applications and internet platforms, which are considered as another passenger information system, enable users to be informed about current road conditions before or during travel, with instant data that they instantly collect, analyze and transfer to users (Batır, 2019: 55-56).

1.5.2. Traffic Management Systems

It is used to monitor and control traffic and make the right decisions at the right time. Traffic management systems are systems that allow cars to move faster using real-time data. To make traffic flow better, changing things like traffic lights using multi-mediated architecture, using artificial intelligence applications in traffic management can be shown as examples of these systems (Tyagi and Sreenath, 2022: 167).

The working principle of traffic management systems is in the form of data collection, processing, storage and distribution. After the data is obtained with the help of cameras and sensors, it is transmitted to traffic management centers via the intelligent transportation infrastructure and transmitted to the drivers through systems such as dynamic message sign boards, mobile applications or road information radio. These devices provide information to both the driver and passengers as well as road intervention teams in the event of accidents and emergencies (Paş, 2022: 20).

Figure 4: A Traffic Management Center (TMC) in Atlanta



Source: Chowdhury, et. al., 2017: 16.

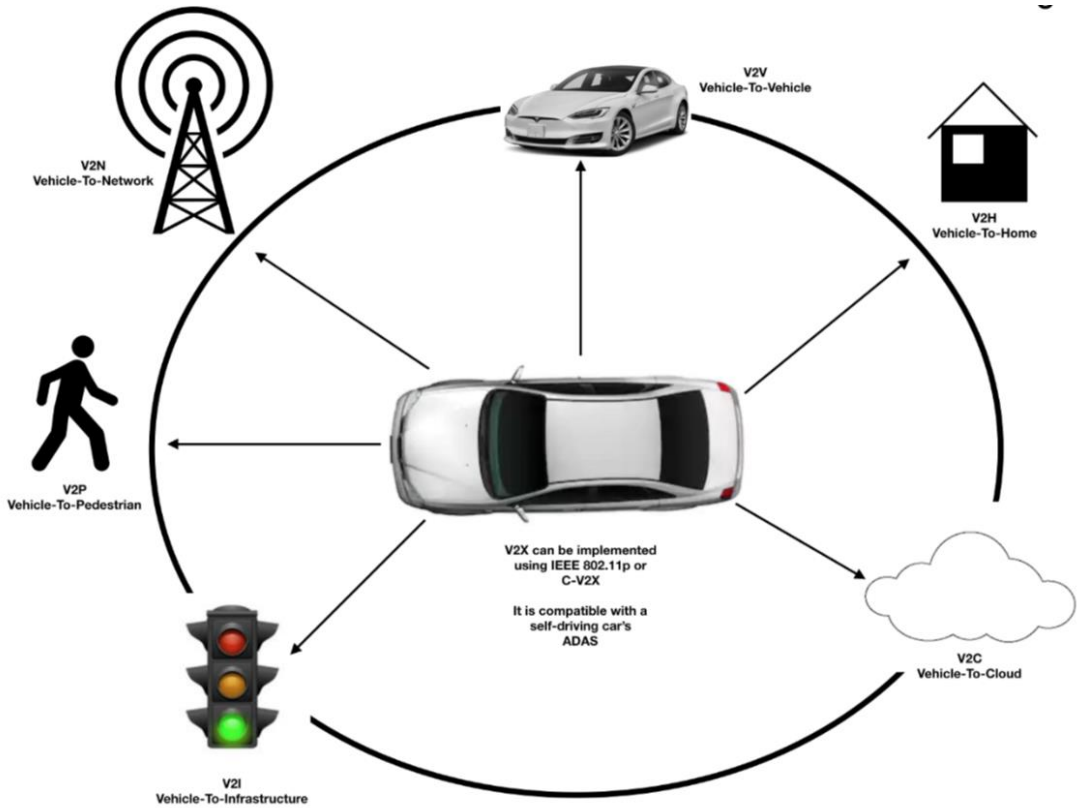
Traffic Management Centers (TMC), demonstrated in Figure 4, input and store data and provide intelligent decision support. A good illustration of how various ITS components (sensors, drivers, and ITS hubs) interact with one another to accomplish a certain goal is the changing speed limit sign. When a TMC enforces dynamic speed limits, it gathers data from ITS devices and sensors, determines variable speed limits for a specific corridor, and notifies drivers and road users of those limitations via dynamic speed limit signs. The application is typically monitored and managed centrally in a TMC. Depending on the data gathering tools, the features of the data collected may change. From a big data analytics perspective, data comes in a stream from sensor data sources on the road or in vehicles. The TMC employs a proper infrastructure to gather data, statistical techniques to detect anomalies, and trend analysis to gauge traffic flow. Future trends are predicted using machine learning

techniques, and the app immediately processes the raw data before setting the proper rate limitations (Chowdhury, et. al., 2017: 17).

1.5.3. Road Information Systems

Today, it is extremely important to develop transportation systems to ensure safe transportation, prevent loss of life and injuries caused by transportation, and increase transportation efficiency. The communication infrastructures emerging under the ITS can help drivers be aware of variables like the state of the road, the weather, oncoming cars, or oncoming pedestrians before a dangerous situation arises, as depicted in Figure 5 (Batır, 2019: 57).

Figure 5: V2X Communications Protocol for Self-Driving Cars



Source: Batır, 2019: 58.

These communication systems, also known as V2X wireless vehicular networks, are used to ensure that drivers are more aware of their surroundings, to warn them in advance of any unfavorable conditions that may arise on the route, and to provide information to the driver about driving on that route (Batır, 2019: 57).

V2X, or Vehicle-to-Everything, is a protocol that could be useful for self-driving cars. It is a protocol that facilitates communications from vehicles to vehicles (V2V), vehicles to infrastructure (V2I), vehicles to pedestrians (V2P), vehicles to homes (V2H), vehicles to networks (V2N), and vehicles to the cloud (V2C). Self-driving automobiles will be able to interact and exchange information as a result. This will enable self-driving cars to engage with one another much like people do. Direct connectivity with infrastructure, such as intelligent buildings, smart roads, traffic signals, bridges, railroads, airports, and other intelligent transportation systems, will also be made possible by this (Tabora, 2018).

With V2V communication systems, vehicles are provided to share information and sensor data with each other and with roadside devices. The main examples are entertainment applications, security information, wireless payments and toll collection. With V2I systems, it is aimed for the roadside device to receive information from the vehicle or to reach the vehicle's network resources (such as accessing web pages). V2P systems are communication systems based on vehicles receiving data from detection systems before encountering pedestrians, while V2N systems are systems based on vehicles' communication with mobile networks. Systems that provide data exchange between smart homes and vehicles are called V2H, while systems that enable vehicles to access cloud connections via secure IP are classified as V2C (Batır, 2019: 58-59).

1.5.4. Public Transportation Systems

Efficient use of time and energy in transportation is among the main objectives of ITS. For this reason, it is important to encourage and develop public transportation with ITS technologies. The effectiveness of public transport systems depends on the awareness of the passengers. Today, as passenger information and public transportation systems, there are mobile applications, electronic payment systems

technologies used by passengers using transportation services for payment transactions (contactless smart cards) and smart stations/smart stops that inform passengers where the expected public transportation vehicle is and when the next vehicle will arrive (Batır, 2019: 59).

Electronic ticket transactions are among the ITS applications used by many metropolitan and provincial municipalities in public transportation today. Regarding the ITS applications aimed at informing the passengers in public transportation, different applications operating via smart phones and the internet have been implemented. These applications allow the passengers using public transportation in general to access the stop/station information of the public transportation lines, the timetable, the route information, and the estimated arrival times of the public transportation vehicles in real time. In addition, some of these applications allow passengers to report their requests and complaints regarding public transportation services with the instant message feature. Fleet monitoring, routing and passenger information systems record the locations of public transport vehicles and ensure that passengers in the vehicle and at the stops/stations can access instant information about the location of the vehicle. The same system allows passengers to be informed of the estimated arrival time of the vehicle they are waiting for by using the traffic data generated in the past and to see the actual arrival time of the vehicles on the electronic boards at smart stops/stations (Tufan, 2014: 69-71).

1.5.5. Electronic Toll Collection Systems

The most widely used application in ITS, which has a central role in financing countries' transport systems, is electronic toll collection (ETC), also known as "road user charging". Drivers can automatically pay tolls via a DSRC-enabled on-board device or stickers placed on the vehicle's windshield (Ezell, 2010: 11-12).

Electronic toll collection systems, which have been widely used in developed countries, especially Norway, since the 1980s, and known as HGS and OGS in Turkiye, are among the most important systems of the near future. These systems, which can detect while driving, can do the toll collection process without the need for stopping or slowing down the vehicles, by reading a transmitter device or tag on the

vehicle via DSRC or RFID, or through camera plate recognition systems for vehicles without a transmitter (Batır, 2019: 60).

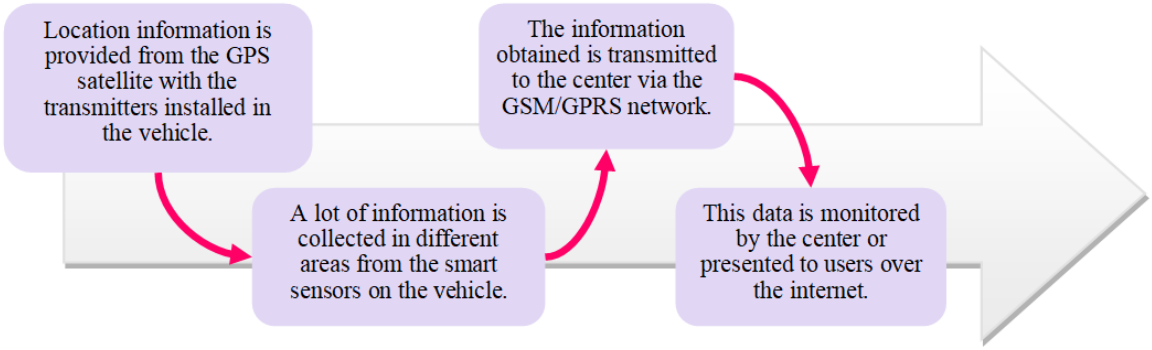
Some economists believe that reducing urban congestion and emissions will be nearly impossible without some form of congestion pricing, since half the world's population now lives in urban areas (Slaine-Siegel, 2007). For this reason, an increasing number of cities around the world are using these systems to charge fees to enter city centers, especially during rush hour, in order not only to reduce congestion, but also to finance public transport investments and create the necessary resources to reduce traffic and reduce the environmental damage of vehicles via implemented congestion pricing plans. Oslo, Singapore, London, Stockholm and Jakarta are examples of cities that have implemented congestion pricing systems to reduce traffic congestion, smoke and greenhouse gases (Ezell, 2010: 11-12).

High Occupancy Toll (HOT) lanes is another application made possible by the emergence of ETC systems. HOT lanes refer to lanes reserved for vehicles with high passenger carrying capacity, such as buses. The use of these lanes by personal vehicles is only possible by paying the toll of the vehicles. The HOT lane system is a system in which ITS is effectively used to combat traffic congestion. Cause, although only a third of highway lanes in California are HOT lanes, it has been found to carry more than half of the traffic, especially during rush hour (Ezell, 2010: 11-12).

1.5.6. Cargo and Fleet Management Systems

Cargo and fleet management systems are systems that aim to optimize and improve these processes by providing measurement, monitoring, direction and management of the process from the delivery of the load to the customer. With the data obtained from these systems, traffic density map and road capacity usage information are created to be used in traffic forecasting algorithms (Batır, 2019: 60). These systems used for monitoring and inspection of commercial vehicles. Via the cargo and fleet management systems, information such as malfunctions in vehicles, road routes used by drivers, compliance with traffic rules and when the cargo can be delivered can be easily accessed. The operating scheme of cargo and fleet management systems is briefly summarized in Figure 6 (Paş, 2022: 26).

Figure 6: Simple Operation Diagram of Cargo and Fleet Management Systems



Source: Paş, 2022: 26.

Some of the main applications in which these systems used are, systems developed for companies to centrally assign tasks to their vehicles in the vehicle pool, fleet management and task assignment systems developed for drivers to start a task from the vehicle, student and staff service vehicles planning and control systems, web-based cargo tracking systems, where companies can track their cargo along the predetermined route on the map, systems that report how many tours the work machines and trucks make in the designated working areas (Tufan, 2014: 68).

1.5.7. Driver Support and Security Systems

The main systems that emerged to ensure the safe, fast and comfortable transportation of passengers and goods, and to ensure the controlled movement of vehicles and pedestrians; driver information and support systems, traffic management systems, weather and road sensors, changing traffic and message signs, speed warning systems, lane sensors, signaling systems, camera monitoring systems (Batır, 2019: 61). Driver support and security systems in vehicles are used to reduce accidents with blind spot detections, reduce traffic congestion by sharing traffic density with the driver, and ensure vehicle safety and speed control. Driver support systems (Advanced Driver-Assistance Systems) are examined under two headings: *Active Safety Systems*, which actively try to reduce the occurrence of an accident, and *Passive Safety Systems*, which

try to ensure the safety of passengers after an accident. The most well-known and used driver support systems listed as;

- Adaptive Cruise Control
- Adaptive Light Control
- Anti-Lock Braking System (ABS)
- Auto Parking
- Navigation Systems
- Night Vision
- Blind Spot Control
- Collision Avoidance System
- Fatigue Detection System
- Driver Monitoring System
- Voice Warning Systems for Electric and All-Electric Hybrid Vehicles
- Emergency Support System
- Collision Warning System
- Hill Descent Control
- Lane Tracking System
- Lane Change Support System
- Parking Sensor
- Pedestrian Protection System
- Rain Sensor
- Perimeter Vision System
- Tire Pressure Display
- Traffic Sign Detection System
- Vehicle-to-Vehicle Communication Systems (Paş, 2022: 27-28).

1.5.8. Accident and Emergency Systems

Accident and emergency systems aim to immediately detect traffic accidents and emergencies on the roads and to intervene as soon as possible (Paş, 2022: 28). These systems try to both prevent loss of life and minimize material damage by detecting incidents that occur on highways, especially traffic accidents, and requiring

urgent intervention, making relevant notifications, and eliminating the effects of these incidents on the traffic flow quickly (Tufan, 2014: 72).

By using vehicles and road infrastructure communication (V2I), smart vehicles send information to transportation infrastructures, the direction and speed of vehicles on the road, traffic density information, and accident status can be detected instantly. With the technologies of communication between vehicles (V2V), information about the situation occurring in any vehicle is instantly shared with other vehicles around it, so that the situations occurring on the roads can be instantly transferred to other interested parties and it is possible for other vehicles to take the necessary precautions (Batır, 2019: 62).

1.6. INTELLIGENT PUBLIC TRANSPORTATION SYSTEMS

A component of Intelligent Transportation Systems (ITS), Intelligent Public Transportation Systems (IPTS) aims to manage the operation of public transportation networks and give decision makers (travelers or any users) up-to-date knowledge about travels and network operating conditions (Elkosantini and Darmoul, 2013: 233). Despite the increase in the capacities of public transportation networks today, it is becoming more and more difficult to provide a high level of service quality for users due to both continuous urbanization and the complexity of the management of the increasing capacity of transportation networks. Especially punctuality and frequency of services are among the factors that mostly cause customer dissatisfaction. For this reason, new tools, infrastructures, information and control systems are needed for more successful implementation and management of ever-expanding transportation networks. The development and application of ITS for public transportation, also known as Intelligent Public Transportation Systems (IPTS), was facilitated by the use of numerous innovative technologies. Geographical information systems (GIS), for instance, assist in the creation of new shuttles and routes. Global Positioning Systems (GPS) are used by Automatic Vehicle Location Systems (AVLS) to localize moving objects and automobiles. Users can access real-time network information from Traveler Information Systems (TIS) at any time. Incorporating Decision Support Systems (DSS), which provide regulation strategies and control decisions to preserve

network performance, is also possible with IPTS. The various forms of data produced by various detecting devices and innovative technologies, such global positioning satellites (GPS) and sensor networks, are shared, processed, and exchanged by all of these information systems and technologies (Elkosantini and Darmoul, 2013: 233).

1.7. IMPORTANCE OF ITS IN SERVICES MARKETING

Increasing demand for traffic control solutions, increasing demand for smart vehicles integrated with state-of-the-art telecommunications technology, advanced security and surveillance services offered by systems such as modern cameras and license plate recognition systems, and the lack of traffic data management due to the increasing number of vehicles. Considering these reasons, the global demand for smart transportation system is expected to increase to 132.93 Billion USD in 2032 with an annual growth rate of 11.0% (FMI, 2022).

North America, a technology hub for the development and deployment of cutting-edge technologies such as machine learning, big data, cloud computing, and IoT, accounts for 28.1% of the global intelligent transportation system market. Due to the importance given by various government organizations in the region to the development of the regional transportation network, the demand for smart transportation systems is increasing day by day. Many public-private sector cooperation initiatives that seek solutions to problems such as the increasing number of vehicles and related traffic congestion also support and direct the growth of the market in the region (FMI, 2022).

Automated and connected vehicles, the number of which increases day by day, make the transportation infrastructure ready for the future. Increasing urbanization, increasing disposable incomes and the need for advanced vehicles to streamline the driving experience have led users to demand improved infrastructure and improved road safety. It is also estimated that smart city projects, advanced communication networks and government initiatives for smart development being implemented in China, India, Singapore, Dubai and other developing countries will create new opportunities for the growth of the ITS market. It is estimated that the ITS sector, with

a market size of 37.8 billion dollars in 2022, will increase at a compound growth rate and will grow at an annual rate of 11% to 13.4% (FMI, 2022).

The huge increase in sales of intelligent transportation systems is emerging as one of the key elements driving the digitalization of many aspects of the transportation infrastructure ecosystem, supported by rapid developments in artificial intelligence and virtual reality. Artificial intelligence and virtual reality technologies are promising in the development of transportation networks around the world and facilitate and accelerate the process of creating changes in the modeling of systems. Considering many factors that directly affect intelligent transportation systems, such as reducing traffic accidents, increasing road safety, obsolescence of existing infrastructures, significant deficiencies in existing traffic data management systems, and the increase in the number of vehicles on the roads, the demand for intelligent transportation systems is expected to increase throughout the forecast period (FMI, 2022).

Nowadays, where the majority of the world's population lives in urban areas, mobility-related problems and the supply of mobility services are increasing, especially in dense cities. As the number of populated urban areas increases, users (citizens) demand a more reliable, flexible, easily accessible, environmentally friendly, multimodal and, ultimately, more personalized travel experience. Although investments in new transportation infrastructures have been huge in the world in recent years, the benefits provided in terms of urban mobility and livability in cities remain limited while the size and complexity of the challenges are increasing day by day. Therefore, urban areas today need sustainable solutions based on new vehicles that appeal to user behavior, connect different networks, optimize transportation systems as a whole, and complement new infrastructure that has become complex to implement.

The importance of intelligent transportation systems in the service marketing sector stems from their potential to create sustainable value through the cooperation of states, companies developing smart transportation systems and citizens (Zhang, et al., 2023: 366). It has been recognized in the literature on marketing that customers can become more involved in the co-creation, co-design, and co-development processes, hence creating value (Li and De Jong, 2017; Sarker, et al, 2012, Mikalef, et al, 2020, Zhang, et al., 2023: 366). Studies on big data and business analytics ecosystems

emphasizes the value can be created together through interactions between users, technological service providers and business processes, and argues that a smart ecosystem can be possible when users (citizens) participate in all processes of the smart systems to be developed, starting from the most primitive design (Li and De Jong, 2017; Sarker, et al, 2012, Mikalef, et al, 2020, Zhang, et al., 2023: 366). Government bodies, public institutions and private companies that advocate technocratic initiatives and encourage their use will produce incentives to increase their serviceability, and companies that develop intelligent transportation systems will ensure effective coordination of multiple stakeholders (Zhang, et al., 2023: 366).

CHAPTER TWO
SERVICES MARKETING

2.1. SERVICES MARKETING

The concept of service, which emerged in the 1700s with its systematic and technical dimension and has been tried to be explained with different definitions until today, is actually encountered at every stage of life (Kılıç, 1998: 6). Aiming to eliminate the ambiguities between the concepts of service, product and goods, Kotler (1998: 7) defined the concept of product as processes and objects that provide value to the customer, while goods and services are subcategories of the product (Kılıç, 1998: 6). Kotler (1998: 7) also exemplified the differences between products, goods and services by grouping them into four categories.

1. Pure tangible goods: soup, toothpaste, refrigerator, etc.
2. Goods accompanied by services: computer, car, cell phone etc.
3. Services accompanied by goods: first class airway travel, cinema, etc.
4. Pure service: babysitting, housekeeping, theater, etc.

In 2012, Kotler and Keller (2012: 378) added one more category on this service mix which has been named as hybrid.

5. Hybrid: restaurant (both the food and its preparation).

The idea of service was also categorized and defined by Zeithaml et al. (2010: 1) as activities, procedures, and performances. Numerous services, including accommodation, transportation, and health care, are offered in and of themselves, and they serve as the main source of revenue for businesses. Customer service is another type of service, which also includes support services for a company's main products. Although customer service doesn't produce money on its own, it is in charge of attending to requests, inquiries, and complaints from customers as well as offering answers. Service is another additional value. To be specific, many businesses offer, frequently for a price, training, installation, and repair services for the products they manufacture. Early on, scholars used characteristics like intangibility, perishability, variability, and the interdependence of producers and customers to separate services from products. Recent arguments have suggested that these defining characteristics

should not be considered as unique to services but rather apply to both goods and services, that "all products are services," and that "economic change is fundamentally about the provision of services."

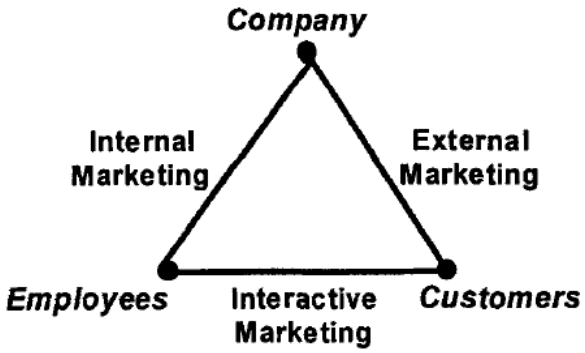
The ratio of workers in the service sector to all other employees is regarded as a criterion for being a developed country (Kılıç, 1998: 6) and is one of the factors used to gauge a nation's level of development. Since the 1700s, when the service sector first began to emerge, its importance has steadily increased. Today, it is crucial for organizations to guarantee customer loyalty and satisfaction. Today, a marketing strategy centered on increasing market share has largely replaced the conventional marketing approach that aimed to maximize profits. Due to this changing marketing approach, it has become a necessity for businesses to develop service marketing strategies that can identify a need, create a market and satisfy their customers for the continuity of businesses.

Due to the rapid growth and developments in the service sector all over the world, interest in service marketing has gradually increased in recent decades. The inability of marketing, which has traditionally been developed on the basis of physical goods, to respond to the dynamics and problems that arise in the marketing of services has led to the development of a special form of marketing or a sub-discipline of marketing called "service marketing" since the 1980s (Mucuk, 1994: 317). The main purpose of service marketing is to increase marketing power and develop better customer relations (Hole, et al., 2018: 182).

In service marketing, there are also separate marketing activities such as advertising and other non-interactive promotional tools. However, they only make up a small portion of the company's overall marketing strategy because the buyer-seller interactions that take place during concurrent production and consumption also affect the consumer's perception of the service provider and its offerings, as well as how they would behave in the future while making purchases. Consequently, overseeing these connections is a component of the overall marketing function (Grönroos, 1982: 32).
After Kotler (1972) defined marketing as the public relations of an organization that includes not only customers but also employees within the organization, Thomas (1978) was the first to state that service marketing has a triangular model structure

consisting of internal marketing, interactive marketing, and external marketing (Hsieh, 2018: 131).

Figure 7: Service Marketing Triangle Model



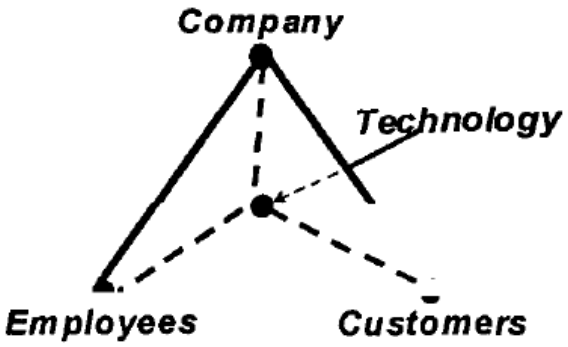
Source: Kotler, 1994.

As it can be seen in Figure 7, external marketing includes pricing, products, locations, and promotional activities between companies and customers, because the creation of the perfect customer experience depends on the rapid responses of first-line personnel, the integration of the organization's external image, and communication within the organization. While internal marketing takes into account employee job satisfaction, interactive marketing activities focus on customers and service quality. More specifically, interactive marketing necessitates that businesses have knowledgeable staff on hand to assist clients as needed (Hsieh, 2018: 131).

As in many industries, new and advanced technologies in the service sector and service marketing applications have radically changed the way many service organizations do business with their customers and what goes on behind the scenes (Lovelock and Wright, 2001: 20). It is known that many types of technology that exist in today's conditions where the fourth industrial revolution has taken place have significant effects on service. While there are examples where technology has replaced staff with automation in service companies, it is certain that the combined use of traditional personal service and new technologies for the development of the service

sector will create an improved experience for customers (Lovelock and Wright, 2001: 20).

Figure 8: Service Marketing Pyramid Model



Source: Parasuraman, 1996.

Parasuraman (1996), who suggested that developing technologies are increasingly and rapidly being incorporated into the service sector, has created the service marketing pyramid model, shown in Figure 8, as an extension of the service marketing triangle model to capture technology-related complexities in service marketing activities. Due to the possibilities of the advancement or spread of existing technology in all processes from the purchase of products and services to the consumption, the triangle model is insufficient to fully reflect all the connections in the seller-buyer exchange. The pyramid model addresses this deficiency by adding technology as the third dimension to the two-dimensional triangle model. By doing this, the pyramid model emphasizes the need for effective management of three new connections (company-technology, employee-technology and customer-technology) in order to maximize marketing effectiveness (Parasuraman and Grewal, 2000: 171).

In service marketing, similar methods are followed in the development of marketing strategies as in standard product marketing; ensuring competitive advantage, target market selection and analysis of the choices of consumer groups in the target market stand out as the main strategies of service marketing (Karakışla, 2019: 39). It is a known fact that businesses that detect consumer demand most quickly

in the market and offer solutions to increase customer satisfaction have become leading companies and have the majority of the market share. For this reason, it has become a necessity for businesses operating in the service sector to understand the reasons that affect consumer groups' purchasing or non-purchasing decisions, and to offer the best quality service to their customers through appropriate distribution channels in ways that will increase customer satisfaction and loyalty, in order for businesses to survive in tough competitive conditions.

2.1.1. Service Quality

Service quality is a multidimensional concept, and customer evaluations of quality include many elements from the physical characteristics of the business being serviced, reliability, and employee behavior patterns to customers. Taking into account all these elements, they are able to ensure customer satisfaction and customer loyalty of enterprises that improve the quality of the services they provide (Şahin and Şen, 2017: 1176). The concept of service quality, which is generally defined as "customers' evaluation of the service they receive" in the literature, is defined by Grönroos as "the outcome of an evaluation process in which the customer compares his perception of the service he receives with his expectations" (Şahin and Şen, 2017: 1176; Ataman, et. al., 2011: 74). Similarly, Torlak (1998: 360) defined service quality as "the ability of the business to meet and exceed customer expectations" and emphasized that what is important in service quality is the quality perceived by the customer. According to Grönroos (1984:36), although the concept of service quality is often used in literature and practice, it is not defined in a way to guide management decisions. The term “quality”, used as if it were a variable itself, is an important function of a set of resources and activities. There are two important issues that need to be completed in order to increase the competitiveness and competitiveness of service companies: (1) to define how service quality is perceived by customers, (2) in which way service quality can be affected.

Due to the intangible nature of services, companies may have difficulty understanding how customers perceive their services and assessing the quality of their services. In addition, internal power performance is unstable due to the heterogeneity

of services. It is difficult to procure or expect the same behaviors from service personnel all the time. The quality of service that the firm aims to provide may be completely different from what customers receive. Other features of the services are that production and consumption are inseparable. Due to the characteristics of the subject, the quality of the services cannot be designed in the factories and cannot be calculated by mathematical methods (Koşoev, 2003: 28).

In the literature, it is argued that there is a relationship between service quality operations and customer satisfaction and that its optimization can be measured. According to the main results obtained from studies, measuring this relationship, has been concluded that; it is a measure based on performance and service quality that can be improved, but also shows the measurement of the service quality structure, consumer satisfaction depends highly on service quality, consumer satisfaction is very important and its effect determines the purchase intention, service quality is less effective on purchasing intention than consumer satisfaction (Hole, et al., 2018: 184).

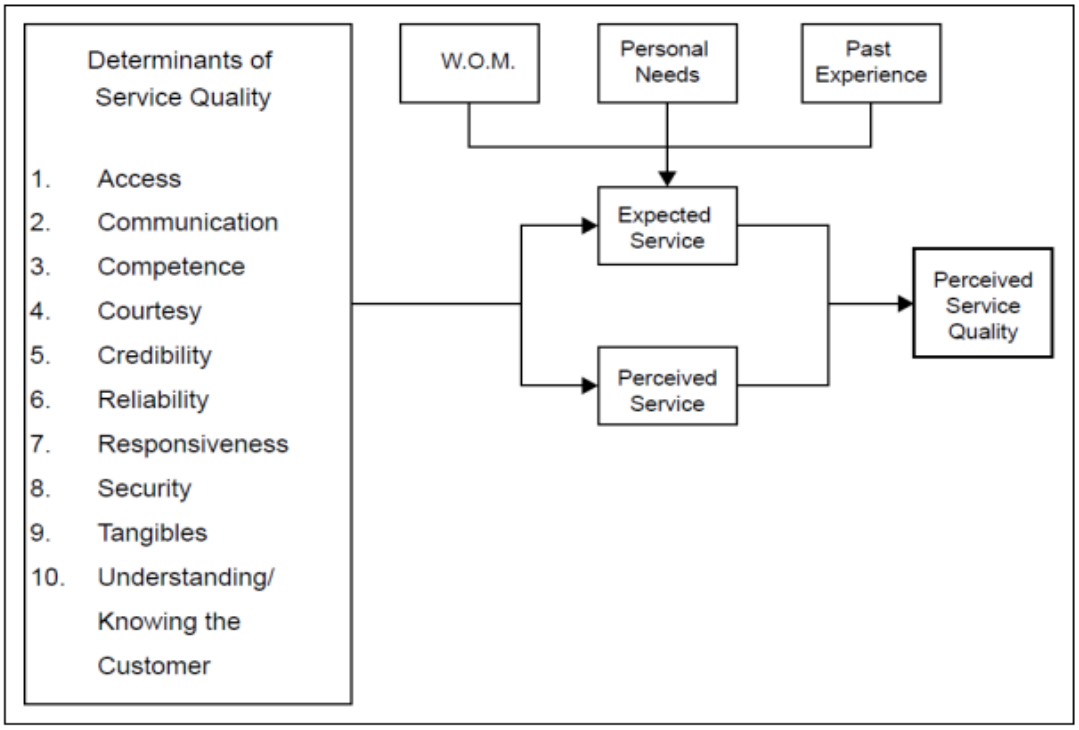
2.1.2. Perceived Service Quality

The fact that services are intangible elements and are quite difficult to evaluate has necessitated the use of the term "perceived service quality" instead of service quality. The relationship between the consumer's expectation before using the service and the service experience provides information about the perceived service quality (Akbaba and Kılınç, 2001; Akşin Aşık, 2016: 1162). According to Parasuraman et. al. (1988), perceived service quality is defined as “the general judgement or attitude regarding the superiority of the service”. And perceived service quality is related to the degree and direction of the difference between customers' perceptions and expectations (Parasuraman et al., 1988: 17).

Perceived quality of service, which measures the level of the service provided to the customer to match customer expectations, is often used as a measurement to calculate market position and business performance and is one of the main factors that create a competitive advantage. In addition, perceived service quality is one of the factors that determine and create customer loyalty (Ejdys and Gulc, 2020: 2). Businesses that have to improve their service quality in order to compete and be

successful in the race to provide service need to measure the service quality offered and the expected service quality. In this direction, Parasuraman et al. (1985) first tried to define service quality and find the factors affecting it, and then to develop a general model that can be applied to all types of services in order to make it measurable (Atan et al., 2006: 8; Aksaraylı and Saygın, 2011: 23). The SERVQUAL method, developed by Parasuraman, Zeithaml and Berry between 1983 and 1990, is considered a standard in service quality measurement. The determinants of perceived service quality developed by Zeithaml et. al (1985:49) is shown in Figure 9.

Figure 9: Determinants of Perceived Service Quality



Source: Parasuraman, et al., 1985.

Although much research has been done to decide the determinants of service quality perceived by customers, one of the most basic and most cited studies on this topic is the service quality model developed by Parasuraman, Zeithaml and Berry. This perceived service quality model, which is shown in Figure 9, offers 10 perceived quality of service decisive factors: access, communication, competence, courtesy, credibility, reliability, responsiveness, security, tangibles, understanding/knowing the

customer. When this model and the studies on the model are examined, the importance of the concept of trust (reliability) in the perceived service quality emerges. In the service sector, trust is defined as the level of reliability guaranteed for the creation of a positive relationship between the service provider and the requesting (buying) parties. That is, the trust in the party providing the service before the purchase or consumption of the service leads to the development of customer loyalty towards the service provider and even the desire to repeat the same behavior. In the service sector, it is proposed to strengthen the relations between the cooperating organizations in order to eliminate the uncertainty of the customer about the expected benefits (quality of service received) and to build trust in the service provider. Because if customer expectations are met or even exceeded by the seller, the customer's confidence will increase and the relationship between these two assets will be strengthened (Ejdys and Gulc, 2020: 2).

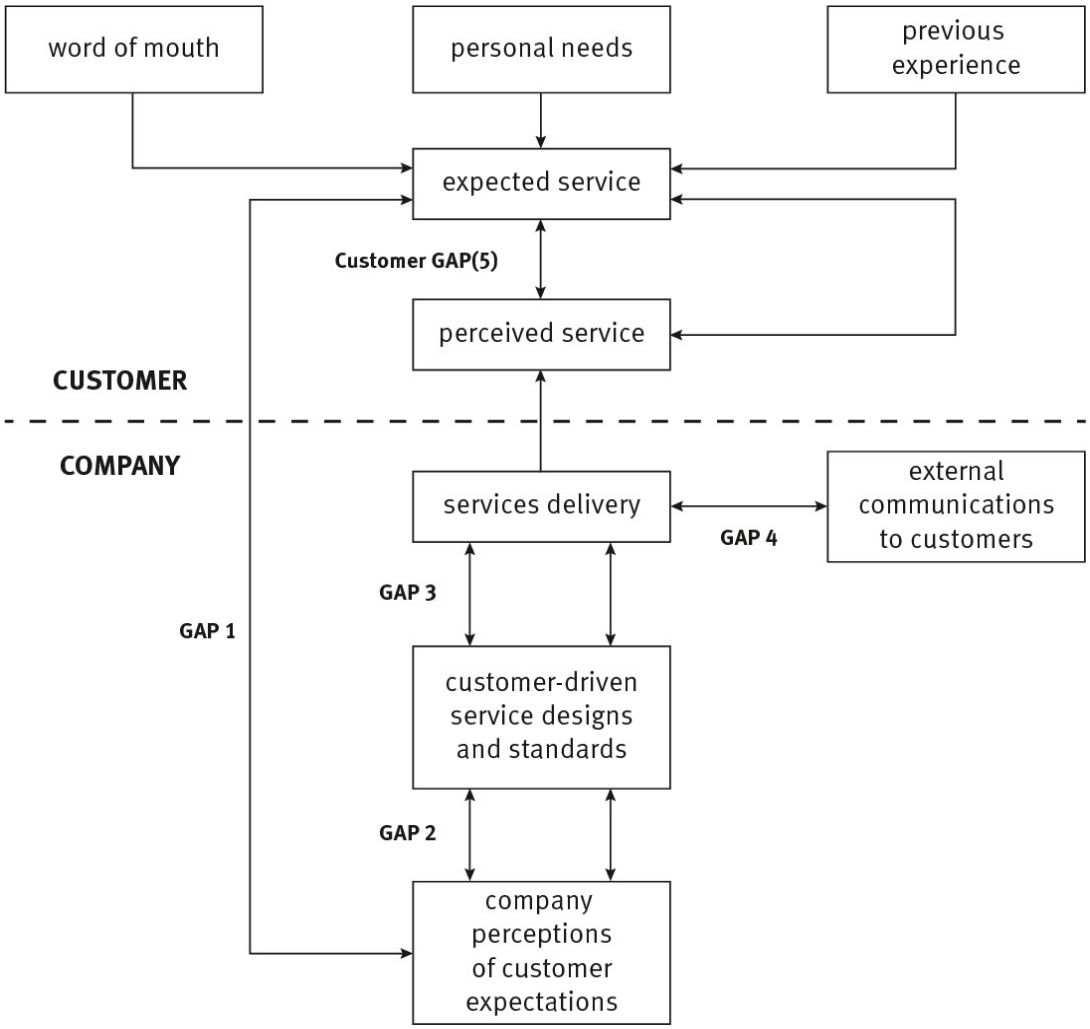
In addition, the quality of service perceived by customers should be a crucial element in the process of co-creating sustainable services, taking into account user expectations and needs and allowing service providers to develop them. Since, this approach involves all stakeholders in the service creation process (Ejdys and Gulc, 2020: 2).

2.1.3. Service Quality Gap

It is challenging to match service consistency and quality with respect to customer needs due to the intangibility of service results (Meyer, 1991). Service providers face a difficult problem since services are sold before they are delivered. Customers must therefore make assumptions about what to expect from service outcomes. Service providers must also deal with the unease of not understanding how to adequately meet consumer demands and expectations. Customers, in some cases, aren't even aware of what they need or want in order to solve their specific issue or meet their unique wants. Even when the service was performed thoroughly, this could still result in customer dissatisfaction (Koers, et al., 2014: 5). Quality is important in achieving customer satisfaction, according to a number of studies (Zeithaml et al., 1988; Bolton and Drew, 1991). For instance, the SERVQUAL model, also known as

the GAP Model, developed by Parasuraman et al. (1988), identifies five distinct service gaps that are connected to the idea of service quality and the variables that affect it (Parasuraman et al., 1985).

Figure 10: Service Quality Gap Model



Source: Parasuraman, et al., 1985: 44.

In service quality gap model, which is shown in Figure 10, the executive perception of the service provider and the consumer perception differ with regard to the customer's perspective in service delivery, for instance the service provider may not always be aware of what their clients are anticipating. Furthermore, due to the human aspect in delivery, there may be a further discrepancy between the service

specifications and actual service performance even if the standards fulfill the customers' needs. Customers' expectations are influenced by their prior experiences as well as any promotion or communication they may have received. As a result, consumer's comparison between expected service and actual perceived service determines service quality (Koers, et al., 2014: 6). As shown in Figure 1.4, there are 5 gaps in the service quality gap model.

GAP 1: The first gap is between management perception and customer expectations. When management or a service provider fails to properly understand what the client wants or needs, a gap develops. Service managers may not always understand what high-quality service entails for customers, what features are necessary for the service to have in order to satisfy customers' needs and wishes, or how the features must function in order to deliver high-quality service. The lack of understanding of customer expectations, which may be quite problematic for service firms, is linked to two main causes in the literature (Yılmaz, 2013: 4). The first of these is that service organizations undervalue the concept of learning about customer expectations and do not put enough effort into this area; the second is that customer expectations are defined by an outside source of the business. It's crucial to avoid attempting to learn by acting like an observer. On the other hand, the difference between customer expectations and management's assessment of these expectations is bigger in service organizations because there are less specific and clearly defined attributes for services than for commodities. The first difference results from inadequate marketing research emphasis, inadequate communication at the top, and a large number of layers in the management hierarchy (Parasuraman, et al., 1985: 44).

GAP 2: The second gap is between service quality specifications and management perceptions. This gap occurs when management or a service provider understands the client's needs correctly but fails to establish a performance standard. Customer expectations may be accurately perceived by management. This does not necessarily imply that the service provider will meet customers' expectations, though. Because it is challenging to deliver the degree of quality that clients desire unless these impressions are translated into service standards. Because of this, it's essential to create services that live up to client expectations and incorporate elements that do the same in the company's offerings. The lack of standardization in tasks to ensure service

quality, management's disregard for service quality, uncertain service quality targets, and the belief that it is impossible to meet customer expectations for service are the main causes of this second gap in the service quality model (Parasuraman, et al., 1985: 45).

GAP 3: The third gap is between service quality specifications and service delivery. This gap arises from the difference between the service quality standards determined by the business management in accordance with customer expectations and the provision of these standards to the customer. This difference means that the service personnel cannot provide service at the quality level desired by the management. It could happen as a result of inadequate training, inability, or reluctance to adhere to the established service standards. It could result from inefficient systems of evaluation and reward. The third factors that cause the difference between customers' perceptions and expectations regarding service quality are lack of teamwork, lack of personnel-job harmony, insufficiency of technology-job harmony, not giving personnel the opportunity to control their work, inappropriateness and inadequacy of audit control systems for evaluating the performance of personnel regarding service quality (Parasuraman, et al., 1985: 45).

GAP 4: The fourth gap is between external communications and service delivery. Media advertising and other communication techniques used by service businesses affect customer expectations. The claims made by company representatives and advertisements have a significant impact on consumer expectations. When these presumed expectations are not met at the moment of service delivery, a gap results. Conflicts between the service offered and the information given to consumers about the service, excessive promises, and lack of information on issues that need to be taken into consideration in order to provide quality service negatively affect customers' perception of service quality. As a result, this gap arises from the difference between the service that the service company promises to provide and the actual service it offers, and it arises as a result of the business making more promises than it can deliver about the service it will provide to the customer. There are two main reasons for the fourth gap. First; lack of communication (horizontal communication) between various departments within the business and with other departments, secondly; it is the

tendency to make excessive and exaggerated promises regarding the services provided by the business (Parasuraman, et al., 1985: 45).

GAP 5: The fifth gap is between perceived service and expected service. Due to the gap on the part of the service provider and the influence from the customer's side the consumer's misunderstanding of service quality causes this gap to exist. Customers' expectations in this situation are determined by their level of personal needs, word of mouth recommendations and past experiences (Parasuraman, et al., 1985: 45; Atmaja and Utami, 2018: 21129).

2.2. CUSTOMER SATISFACTION

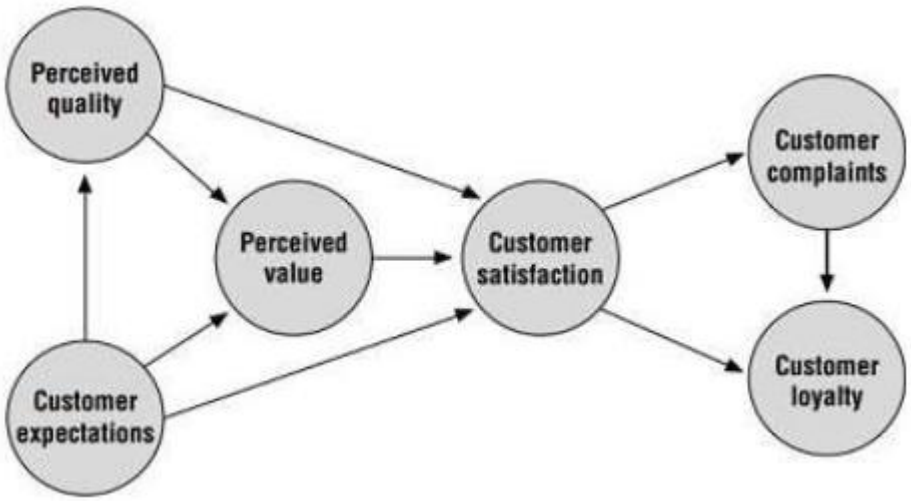
It is the satisfaction that occurs when the benefits the consumer obtains after purchasing meet his/her expectations. Everyone has certain expectations about the product or service, and satisfaction occurs when their expectations are met. Satisfaction is seen as a sum of expectations. If there is satisfaction, the possibility of using that service again increases (Koşoev, 2003: 41). According to Kotler and Keller (2012), satisfaction is defined as "a person's feelings of pleasure or disappointment resulting from comparing perceived products' performance (or outcome) in relation to his or her expectations" and satisfaction is expressed if the performance and expectation are met, and dissatisfaction is expressed if the performance and expectation is not met (Mertel, 2020:10). With the developments in the field of marketing, customer satisfaction has been one of the main issues that companies focus on and discuss in developed countries since the 1980s. It is stated that customer satisfaction, which causes company profitability, increased market shares and an increase reflected in the company growth rate, actually depends on the loyalty to the company (Eroğlu, 2005: 9; Bakır, 2018: 10). Ensuring customer satisfaction means that the customer continues to choose that service or product and contributes to the profitability of the company, and in some cases, it brings customers to the company. Therefore, it is essential for businesses to implement practices aimed at ensuring customer satisfaction and customer loyalty in order to maximize their profitability (Bakır, 2018: 10). And satisfied customers are more likely to remain loyal, be less

sensitive to price changes, and spread good word of mouth in both service and product industries (Torres and Tribó, 2011: 1090).

It is supported in the literature that companies which gather and process customer information have greater potential to make the right decisions, produce desired products or services, and deliver real value to customers. In contrast, there are few studies that recognize that continuous monitoring of factors affecting customer satisfaction creates invaluable information for businesses (Hsu, et al., 2006: 440).

Many models have been created over the years in the literature to explain the concept and process of customer and consumer satisfaction. The American Customer Satisfaction Index (ACSI), which was developed in 1994 as a national measurement tool in accordance with the Swedish customer satisfaction barometer, and the European Customer Satisfaction Index (ECSI), which was created with the participation of 12 European countries in 1994, stand out as two important models used as customer satisfaction theoretical models. Hsu, et. al (2006), taking into account the strengths of these two models, created a new customer satisfaction model for application especially in eastern countries. Customer Satisfaction Index (CSI) model developed by Hsu, et. al. (2006: 441) and shown in Figure 11.

Figure 11: Customer Satisfaction Model



Source: Hsu, et. al., 2006: 441.

The CSI model, which basically measures customer satisfaction by establishing a cause and effect relationship, considers the factors affecting customer satisfaction as the antecedents of customer satisfaction and the obtained performance indicators as the results of customer satisfaction. In this model, corporate image, perceived quality and perceived value are the antecedents of customer satisfaction, while customer complaints and customer loyalty are two possible outcomes of customer satisfaction. It is well acknowledged that consumer satisfaction plays a significant role in determining their future purchase intentions. Customers that had a pleasant experience are more inclined to tell others about it and spread the word about the business (Hsu, et al., 2006: 441).

As a result, customers are the resources on which the success of businesses depends, and providing the best possible service to these resources is the most important point that businesses should focus on for the continuity and profitability of the business (Fourie, 2015: 187). Developing customer-focused strategies to ensure customer satisfaction contributes to the success of the business and ultimately ensures customer loyalty.

2.3. CUSTOMER LOYALTY

Despite the lack of widespread agreement with regard to what defines customer loyalty, it is now more widely acknowledged that it involves both repeat business and a positive impression of the company/brand (Goncalves and Sampaio, 2012: 1509; Chaudhuri and Holbrook, 2001; Oliver, 1999; Dick and Basu, 1994). The correlation between customer loyalty and profitability is widely acknowledged to be favorable. In the study conducted by Reichheld and Sasser (1990), it was determined that if the number of customers of a business increased by 5%, its profitability increased by 25% to 125%. (Bowen and Chen, 2001: 213). Customer loyalty, which is used to express customers' repurchase intention and price tolerance, is the ultimate goal of companies. Because increasing customer loyalty reduces price elasticity, increases competitive advantage, and secures future revenues by reducing failure costs (Hsu, et al., 2006: 443).

In light of the fact that repurchase of products and services is critical for organizational success and firm profitability, customer loyalty and the antecedents of customer loyalty are a top priority for companies. There is strong empirical evidence to suggest that customer satisfaction is a precursor to customer loyalty and that there is a positive link between these two constructs. Many studies have also revealed the impact of customer satisfaction on company profitability, customer retention and company profitability, and therefore the strong determination of managers to satisfy their customers in order to create customer loyalty (Goncalves and Sampaio, 2012: 1509).

Creating and then controlling brand loyalty is one of the most important weapons of businesses in creating sustainable competitive advantage. Loyal customers are not affected by price or other changes to the brand because they consider the "switching cost". This switching cost, which relates to money, time and effort, are the costs a customer will incur to switch from one brand to another. Customer loyalty is conceptualized in two ways: behavioral and attitudinal. Behavioral loyalty is the repeat purchase action as an indicator of customers' purchasing rate, frequency and likelihood of purchasing (past purchasing behavior). Attitudinal loyalty includes purchasing intention and preference, even if the customer does not repeat the purchase. Therefore, attitudinal loyalty can be explained as the customer speaking positively about the company (word of mouth), making recommendations, convincing others to shop from the same store, or having and creating repurchase intentions (Mertel, 2020: 24).

The satisfaction of customers is produced through effective customer relationship management. As a result, satisfied customers retain in and recommend the business and its goods to others. According to studies, the loyalty of satisfied and dissatisfied customers differs significantly. Even a small amount of dissatisfaction can lead to a significant decline in customer loyalty, especially when those expectations are high. Therefore, the goal of customer relationship management is to increase customer satisfaction as well as customer loyalty. Keeping customers loyal is profitable. Most of the time, returning customers spend more and remain longer. Businesses with extremely loyal customers expand more quickly and provide two to five times the shareholder returns. Additionally, studies demonstrate that maintaining an existing customer costs five times less than acquiring a new one. Customer

dissatisfaction, on the other hand, can be expensive. More than one sale is lost when a customer leaves. It entails losing the full flow of purchases the customer would make throughout their lifetime of support (Kotler, et. al., 2023: 41).

CHAPTER THREE
THEORETICAL BACKGROUND AND RESEARCH METHODOLOGY

3.1. AIM OF THE STUDY

The aim of this study is to examine, a) whether it is possible to increase the perceived service quality, customer satisfaction and customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems technologies, and b) whether it is possible to direct people to more environmentally friendly transportation alternatives (e.g. water-based public transportation) with the effective use of intelligent transportation systems technologies. To reach this specific aim qualitative and quantitative methods were used together and four scientific methods were employed; bibliometric analysis, online user comment analysis and two different virtual reality experiments.

3.2. CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS

The primary research question addressed in this study is whether it is possible to direct people to environmentally friendly transportation options and to prevent road-induced urban traffic congestion through the effective use of intelligent transportation systems technologies. A framework that takes into account the factors of service quality, perceived service quality, customer satisfaction, and customer loyalty has been developed to address this research question. Figure 12 displays the conceptual framework that was constructed.

As shown in Figure 12, water-based public transportation systems are used as an example and suggested to reduce road-induced traffic congestion in the urban areas as a more environmentally friendly transportation alternative. Environmentally friendly public transport systems, such as water-based public transportation, offer an incredible variety of possibilities for the mobility system to be more sustainable in the future (Ghosh and Schot, 2018: 13). Hegazy (2021:2283) also emphasized the importance of promoting water-based public transportation systems and integrating them with road public transportation systems for the creation of an efficient

transportation system in the future. Similarly, Silva et al. (2014: 39) stressed that water-based public transport facilities are addressing the pedestrian and road traffic problems within the city by relieving the pressure on the main streets.

In this study, the optimum mode of transportation for the assumed route (Bostanlı-Üçkuyular) was found to be water-based public transportation. While choosing the application area and the optimum transportation mode, the travel time, travel cost, the effects of the travel on the environment and the total kilometers traveled were examined. Table 1 displays the variables, including CO2 and SOx emission levels, total travel expense, and total travel distance, that will take place if the travel between the piers of Bostanlı and Üçkuyular is made by private vehicle on the roadway, water-based public transportation (ferry) and public transportation on the roadway (public bus).

Table 1: Travel Parameters of Bostanlı-Üçkuyular Route

Transportation Mode	Distance (km)	Time (min)	Cost (tl)	CO2 (kg)	SOx (lt)	Passenger Capacity
Private Car	44,2	39	30,12	8,32	0,00003	4
Public Bus	24	140	8,78	18,71	0,00008	29
Ferry	5,90 (3,67 mile)	20	8,78	52	0,0002	426

Source: Prepared by Author

In the calculations made while creating Table 1, it was accepted that the use of 1 lt diesel fuel caused 2.6 kg CO2 and 0.00001 lt SOx emissions (www.econologie.com, 2023). Distance and time data for private car and public bus were obtained through google maps service. It has been accepted that the passenger bus consumes 29.90 liters of fuel per 100 km, while the private vehicle consumes 8.5 liters of fuel (Kılıç, et al, 2021: 950). In the cost calculation, the fuel price (21.17 TL) valid in İzmir province on February 20, 2023 and the public transportation usage fee (8.78 TL) valid for one person in the card system in İzmir province on the same date were used. Since there is no data in the literature on the fuel consumption of a ferry traveling on the Bostanlı-Üçkuyular route, an interview was held with a chief engineer and oceangoing ship officer, as experts, serving on stated route. The data gathered

from these experts, revealed that the fuel consumption was approximately 50 liters of diesel per hour, the travel duration is between 15 and 20 minutes, so the total time was taken into account in the calculations as 20 minutes in Table 1. And the passenger capacities were obtained by taking the averages of different types of public buses and ferries serving in İzmir province.

Table 2: Travel Parameters of Bostanlı-Üçkuyular Route Per Person

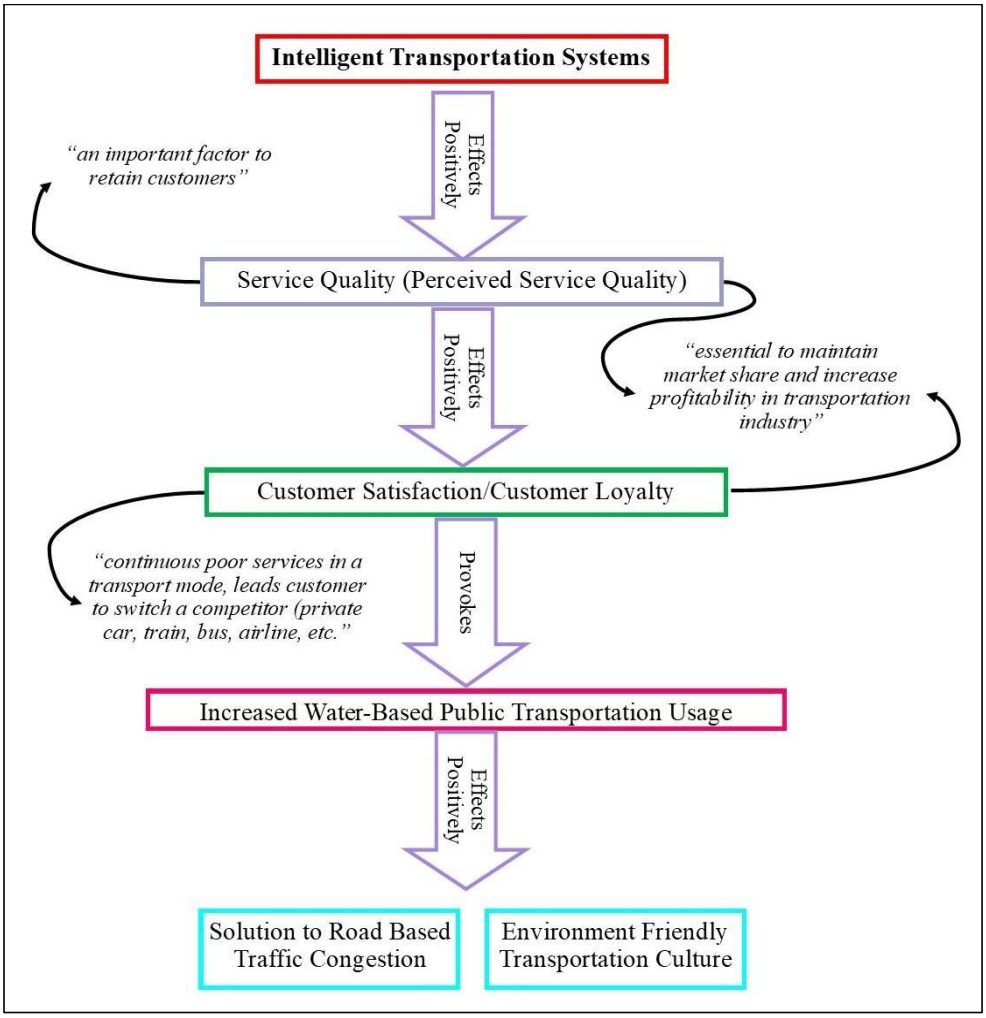
Transportation Mode	Cost (tl)	CO2 (kg)	SOx (lt)
Private Car (1 passenger)	30,12	8,32	0,00003000
Private Car (4 passengers)	7,53	2,08	0,00000750
Public Bus	8,78	0,64	0.00002051
Ferry	8,78	0,12	0,00000046

Source: Prepared by Author

Table 2 shows the cost, CO2 and SOx emissions per capita for different transportation alternatives on the stated travel route. Accordingly, although the use of ferries as a transportation alternative has a slightly higher cost compared to the use of shared private vehicles, it was determined as the optimum transportation mode with the lowest CO2 and SOx emissions and it was decided to be chosen as the application area of the study.

As stated in the first chapter, the notions of service quality, perceived service quality, customer satisfaction, and customer loyalty were taken into consideration when developing the conceptual framework of the study. In accordance with the concept of services marketing, it is intended to accomplish the study's primary objective by integrating intelligent transportation system technology into water-based public transportation services. The conceptual framework of the study is shown in Figure 12.

Figure 12: Conceptual Framework of the Study



Source: Prepared by Author

This study intends to promote the effective use of intelligent transportation system technologies, which were first mentioned in the literature in the 1960s but did not advance significantly until the fourth industrial revolution, as shown in Figure 12. And through these systems, it aims to create an environment-friendly transportation culture and to offer solutions to road-induced urban traffic congestion.

In line with the teachings of the service marketing literature, five research questions have been created within the scope of the study in order to achieve these goals and objectives. These are;

RQ-1. Is it possible to increase the perceived service quality in water-based public transportation services with the effective use of intelligent transportation systems?

RQ-2. Is it possible to increase customer satisfaction in water-based public transportation services with the effective use of intelligent transportation systems?

RQ-3. Is it possible to increase customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems?

RQ-4. Is it possible to direct people to environmentally friendly transportation options with the effective use of intelligent transportation systems?

In addition to these questions, another research question that is aimed to be answered indirectly within the scope of the study is about the service marketing gaps developed by Parasuraman (1985). The fifth research question, which is accepted as the indirect question of the study is;

RQ-5. Can any of the service marketing gaps (Parasuraman, 1985) can be filled by using intelligent transportation systems technologies in water-based public transportation?

3.3. THEORETICAL BACKGROUND

Since the aim of this study is to understand whether it is possible to direct people to more environmentally friendly transportation alternatives and to increase their perceived service quality, customer satisfaction and loyalty levels, this study has been theoretically considered within the framework of nudge theory, which aim is "to help people make better choices 'as judged by themselves" (Thaler, 2018) and has been structured on this basis.

Nudge theory is a flexible and modern concept of choice architecture to make sense of how people think, how they make decisions and behave. Helping people improve their thoughts and decisions, managing all kinds of change and changing the

existing unhelpful and harmful effects on people after they are identified. Nudge theory was named and popularized for the first time in the literature by the book "Nudge: Improving Decisions about Health, Wealth and Happiness", written by the 2017 Nobel Prize (for economics) winner behavioral economist Richard Thaler and law scientist Cass Sunstein (Thaler and Sunstein, 2008: 6). The nudge theory is a highly innovative and effective model for choice architecture (Eryaşar and Gönüllüoğlu, 2021: 165). Although there is no clear definition in the literature on Nudge theory, Thaler and Sunstein (2008: 17) defined the idea in their book as follows;

> *"A nudge, as we will use the term, is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting the fruit at eye level counts as a nudge. Banning junk food does not."*

The Nobel committee described the theory as "a bridge between economic and psychological analysis in individual decision making". The opinion of the Nobel committee on nudge theory, which was stated at the time of handing the prize to Richard Thaler, who is considered the father of nudge theory, is (Cai, 2020: 3342);

> *"Richard Thaler's contributions have built a bridge between the economic and psychological analyses of individual decision-making. His empirical findings and theoretical insights have been instrumental in creating the new and rapidly expanding field of behavioral economics, which has had a profound impact on many areas of economic research and policy."*

The concept of nudge, which emerged from behavioral economics research, basically assists individuals make better decisions that benefit both the person and society by making minor modifications to the environment in which the decision is made. Pushing people in the proper way to the right direction and influencing them in various forms of decision making is what nudge is all about (Delden and Persson; 2018: 2).

According to the theory, the mainstay of achieving this is the acknowledgement that individuals are not "econs" (Thaler and Sunstein, 2008: 7). Econs are people who do not act in accordance with the predictions of economic theories. Although the term

“econs” was coined with the nudge theory, the fact that people do not/cannot act in line with their own interests economically was expressed by Herbert Simon in 1973 (Simon, 1945; Kosters and Van der Heijden, 2015: 278). Simon's Nobel prize-winning study of limited rationality argues that humans lack of capacity to store the vast amounts of information needed for big decisions and the cognitive ability to process that information.

Consequently, according to the theory, it is possible to use nudge in two ways as a tool to encourage behavior that is beneficial to individuals or society as a whole.

1) Counteract the negative effects of attempts by other actors (business, media) to subconsciously influence human behavior and thereby reduce undesirable behavior,

2) Encouraging certain behaviors and thus increasing desired behaviors (Reisch and Oehler, 2009: 35; Eryaşar and Volunteeroglu, 2021).

In this study, the basic teachings of nudge theory are used, to encourage certain behaviors and thus increase desired behaviors. Detailed information on the experiment designed and the variables to be used/measured, inspired by the examples given in Thaler and Sunstein (2008) regarding human behavior, the experiments and the predictions developed by the authors regarding their results, are given in this section’s data collection instrument title of experiment 2 heading.

3.4. METHODOLOGIES OF THE STUDY

Four different applications were carried out in order to achieve the thesis's final goal, which is stated as to examine, a) whether it is possible to increase the perceived service quality, customer satisfaction and customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems technologies, and b) whether it is possible to direct people to more environmentally friendly transportation alternatives (e.g. water-based public transportation) with the effective use of intelligent transportation systems technologies, and three different research methodologies were used in order to conduct these applications. Detailed information on the applications carried out is explained under this title.

3.4.1. Bibliometric Analysis

The bibliometric analysis approach is a common and stringent way for discovering and analyzing enormous amounts of scientific data, as well as revealing evolutionary nuances in a certain topic (Donthu, et. al, 2021: 285). Bibliometric analysis is the information sciences research discipline that analyzes bibliographic resources using quantitative approaches and is typically used to summarize the most representative outcomes of a series of documents (Martínez-López, et. al., 2018: 441).

In this study, it was decided to use ferry transport as the optimum transport mode with the lowest CO2 and SOx emissions as shown in Table 2. However, since it would be very costly and irrational to integrate intelligent transportation technologies systems into a real ferry for just scientific application purposes, it was decided that it would be appropriate to conduct the experiment through virtual reality technologies. Hence the question of which marketing areas and in what ways the virtual reality technologies are used was focused on and bibliometric analysis was performed to investigate the use of virtual reality applications in the marketing literature.

3.4.1.1. Data Gathering and Analysis

To explore the utilization of virtual reality applications in marketing literature, publications published in the Web of Science database were collected based on specific keywords in their titles. Studies with the terms "virtual reality" and "marketing" in their titles were retrieved from the Web of Science (WOS) database on August 25, 2022 to be analyzed. The database review yielded 51 papers that fit the provided criteria; 8 of these studies were removed by the author due to being out of scope, and the remaining 43 studies were analyzed using the Microsoft Office Excel software program.

The studies that were obtained were assessed based on their publishing years, web of science indexes, publication/document types, marketing areas/fields, cited times, journals, research techniques, Web of Knowledge research areas, and virtual reality related theories stated or suggested in studies. The findings obtained via this analysis given in the last chapter of this study.

3.4.2. Experiment 1

When a user is involved in a human-computer environment that can be perceived or interacted with, the surrounding environment is called "Virtual Reality". The short definition of Virtual Reality is quoted as 'environment created by a computer or other media, an environment in which the user feels present' in many scientific articles. In virtual reality literature, the feeling of being in an environment is referred to as "presence", a term derived from the term "telepresence" (Kerrebroeck, et.al., 2017: 178). Virtual reality technology, which is expressed as a set of tools and techniques that create a sensory and psychological experience for users; depends on the principle that users can feel like they are in the presented universe and as a part of the presented scenario, for this reason the concept of “presence” felt in the virtual reality universe is accepted as one of the key elements that make this technology unique and become the focus of virtual reality-based studies (Özispa and Arabelen, 2022: 200).

To test the “presence” determinant of the actual experiment (experiment 2), a pre-test (experiment 1) has been designed and developed to test the reliability status of the actual experiment which is going to be developed to measure research questions of this study like customer satisfaction and loyalty degree of intelligent transport systems applications usage of water-based public transportation.

3.4.2.1. Virtual Reality Application for Experimental Design

Four main scenes designed for the pre-test. And a completely imaginary holiday destination related scenario has been prepared. The main aim of the pre-test decided is to measure the degree of "presence" perceived by individuals in different age groups in the sample group of the main experiment as a result of perceiving and interacting with the imaginary virtual reality world presented to them.

In order to measure the level of presence in virtual reality environments, a virtual reality environment running on Android devices was designed via the Unity program. The developed virtual reality experiment was experienced by the experiment

participants using Vivo brand mobile phone, Samsung brand virtual reality goggles and an external remote control.

3.4.2.2. Laboratory Environment Design to Conduct Experiment

Since all the equipment used in the experiment was wireless, a specially designed laboratory environment was not needed in the experiment. However, in order to ensure standardization in experimental conditions, all experiments were carried out in a room with a temperature of 21 degrees (20-21 degrees is the indoor temperature recommended by WHO in 1987) (WHO, 1987), isolated from variables such as sunlight, sound and odor. During the whole experiment, the back-and-forth and right-left movements of the participants were both disabled by software and physically prevented, and they were only allowed to rotate 360 degrees around themselves. All objects in the room were emptied in order to prevent the participants from hitting something and getting injured, as they were deprived of their ability to see their surroundings because they were wearing virtual reality goggles.

Before the experiment, the researcher explained the imaginary scenario of the experiment to all participants and gave preliminary information about the purpose of the experiment and the screens they would encounter during the experiment. In addition, all participants were given training on how to communicate with objects in the virtual reality environment and how to use the technological devices they wear before the experiment. In order to carry out the study safely, in addition to all these precautions and regulations, the researcher stayed close to the participants throughout the experiment, preventing unwanted accidents (falling, hitting the surrounding objects, etc.).

3.4.2.3. Data Collection Instrument

To reach this specific aim of this pre-test which is, to measure the degree of "presence" perceived by individuals in different age groups, the VR presence scale, developed by Coyle and Thorson (2001: 69) and improved by Kerrebroeck, Brengman

and Willems (2017: 189), is decided to use. This presence scale used in the experiments is given below Table 3.

Table 3: Presence Scale

P1	After the experiment, I felt like I came back to the "real world" after a journey
P2	The experiment created a new world for me, and the world suddenly disappeared when I finished the experiment
P3	While the experiment, I felt like I was in the created world
P4	While the experiment, I sometimes forgot that I was in the middle of an experiment
P5	While the experiment, my body was in the room, but my mind was inside created world
P6	That created world seemed to me only "something I saw" rather than "somewhere I visited"
P7	While the experiment, the created world was more real or present for me compared the real world"
P8	While the experiment, my mind was in the room, not in the created world

Source: Adopted by Kerrebroeck, et. al. 2017: 189.

3.4.2.4. Data Collection and Analysis

In order to test the reliability and validity of the VR experiment, an imaginary virtual reality holiday scenario was prepared and a virtual reality experiment was conducted on 100 adults selected by quota sampling method. In the quota sampling method, which is one of the non-random sampling methods, important groups for research are included in the sample to the extent of the estimated quotas in the universe, rates are important in this method, not probability (Kish, 1965; Arı, 1976; Ergin, 1994). The purpose of the quota sampling method is to create a small model of the universe and to ensure that some important known groups in the universe are represented in the sample. The first step in the application of the method is to determine from which groups the universe comes from and to determine the proportions of these groups in the universe. In the second stage, a unit suitable for the ratio of that group in the universe is selected from each group (Gürtan, 1982; Ergin, 1994).

The sample of the study was created using the Turkey Statistical Institute (TUIK) Address Based Population Registration System, Izmir province 2020 data. Considering that virtual reality experiments are classified according to the age of the participants in the existing literature, the population data of the city of Izmir for 2020 has been narrowed down according to their age groups to create a sample. The youngest age included in the scope of study is 18, while the oldest age included in the scope of the study was limited to 55, which is accepted as the upper limit for organ or blood donation campaigns by the Red Crescent. And participant consent forms were signed by all the participants of the experiment and their explicit consents obtained before starting the virtual reality experiment.

At the end of the experiment, which lasted approximately 3.5 minutes, the participants were asked to fill out a questionnaire that allowed them to give feedback on their experiences. The data collected face-to-face from the participants through questionnaires has been analyzed through the IBM SPSS Statistics 21.0 program. Details of the sample and the first findings of the experiments given in the last chapter of this study.

3.4.3. Online User Comment Analysis

To decide the main variables causing customer dissatisfaction and customer satisfaction and identify the customer demands and requests who use water-based public transportation services, online user comments about a company providing water-based public transportation services in Izmir, gathered from three different websites which are; www.twitter.com, www.eksisozluk.com and www.sikayetvar.com coded and analyzed via MAXQDA 2020 Professional Data Analysis Software for Qualitative and Mixed Methods program. And the main variables causing customer dissatisfaction and customer satisfaction have been identified in addition to customer demands and requests in water-based public transportation services.

As mentioned before, one of the final aims of this study is to understand if it is possible to increase perceived service quality/service quality, customer satisfaction and customer loyalty of water-based public transportation with the integration of

intelligent transportations systems on water-based public transportation processes. To reach this aim, it is planned to act with the service marketing pyramid model that demonstrated in Figure 2, and develop a model that will respond to the demands and needs of all three elements (company, employees and customers) placed in this figure with the help of existing technologies.

3.4.3.1. Data Gathering

Cause it seemed necessary to measure the perceived service quality and spot the main user problems to create a user friendly and more preferable ferry environment with the intelligent transportation systems technologies online user comment analysis conducted in this study. In this direction 263 tweets between the dates of 01.01.2020 and 31.12.2021 gathered from www.twitter.com, 35 entries from www.eksisozluk.com and 28 entries from www.sikayetvar.com websites using Python web scraping codes. Because the neat style of the coding technique of the Python language was approved as the easiest approach to obtain the needed data from the desired website (Thomas and Mathur, 2019: 450), it was chosen to use Python in the web scraping stage, and a total of 326 comments analyzed by the author.

In the study, 1569 tweets written with the hashtag "keyword (the name of a water-based public transportation provider in İzmir region" were taken from Twitter, but the tweets written by the company itself or similar institutions (news sites, local promotion sites, etc.) were excluded by the author, and 263 tweets written by service users were included in the scope of the research. Since it was determined that all entries from the sikayetvar.com and ekisozluk.com websites are user comments, all entries on the websites were included in the scope of the study.

3.4.3.2. Data Analysis

To analyze these 326 comments, the code system has been created in MAXQDA software. With this coding system, in total 440 coding was done in the data set consisting of 326 comments. Of these 440 encodings; 6 main criteria were obtained as demand, complaint, suggestion, neutral, customer satisfaction and customer

dissatisfaction. Details of the analysis regarding the online user comment analysis is given in the last chapter of this study.

3.4.4. Experiment 2

When variables are obtained about customer dissatisfaction in water-based public transportation, possible solution proposals for these dissatisfactions created using intelligent transportation systems technologies, which relies on nudge theory and its notions.

Based on the teachings, notions, and previous applications of the nudge theory, customer dissatisfaction causes obtained through online user comment analysis method were attempted to be transformed into customer satisfactions in this study, which aims to nudge people towards more environmentally friendly transportation alternatives while increasing customer satisfaction, perceived service quality, and customer loyalty. For example, during the online user comment analysis, it was found that people expressed their dissatisfaction due to the prices of tickets (high boarding fees/high cost of boarding tickets). In order to eliminate this customer dissatisfaction, using the anchoring technique, which is one of the notions of nudge theory and which has been used in other studies before, the ferry boarding fees are compared with the costs of alternative transportation modes. And again, by using the salient incentives technique, which is one of the notions of nudge theory and has been used in other studies before, it is aimed to make it visible that these prices are not high and to solve the dissatisfaction of people with the help of nudge theory teachings. Similarly, during the online user comment analysis, since it was determined that people were satisfied with listening to classical music during their ferry trips and this created customer satisfaction, classical music was placed in the background in the sections where people were asked to feel positive emotions in the experiment.

The nine notions of the nudge theory used in the experimental design are explained below. Detailed information on the experimental design can be found under the title of virtual reality application for experimental design.

Anchoring: Amos Tversky and Daniel Kahneman (1974) define this concept in their research program which is known as the “heuristics and biases” human

judgment approach. According to this approach anchors can affect people's decision making without people even realizing it. For example, when charities ask for donations, they offer options such as $100, $250, $1,000, or $5,000. These values are not randomly chosen because these choices will affect the amount of money people donate. According to this approach, in many areas, the more people want, the more they tend to get. The lawyer suing the cigarette companies uses a similar approach, when they present million-dollar cases to the jury at the first hearings, with the defendant feels that they have won the case by paying half the amount originally mentioned (Thaler and Sunstein, 2008: 40).

Salient Incentives: In free markets, it is assumed that decision makers really pay attention to the incentives in front of them. However, whether non-econ people can detect these incentives in their daily lives is open to debate. It is therefore recommended that choice architects make incentives visible. For example, the telephones at the INSEAD business school in France are set to display the long-distance call charges instantly in order to protect the environment and reduce energy consumption. Similarly, people stated that they like to see the amount of calories they burn while working on sports equipment (Thaler and Sunstein, 2008: 128-129).

Following the Herd: Because people have a desire to adapt, they are easily influenced by other people. According to this notion of theory, if a city government wants to encourage people to do more sports, it will be able to achieve significant improvement by simply explaining the number of people doing sports in the city (which should be a high number). In short, if choice architects want behavior change and aim to do it through nudges, it will suffice to inform people of what others are doing (Thaler and Sunstein, 2008: 75-89).

Mere-Measurement Effect: According to mere-measurement effect, when people are asked what they want to do about a subject, individuals become more inclined to exhibit a behavior in line with their answers. This finding has been confirmed in many contexts. When people are asked whether they want to eat certain foods, diet or exercise, their answers will affect their behavior (Thaler and Sunstein, 2008: 94).

Automatic System: The automatic system does not require what we typically connect with the word thinking, but it is quick and feels instinctive. An automatic

system is engaged when you become anxious during turbulence on an airplane, or smile at an adorable baby. The automatic system's functions are linked to the earliest regions of the brain, according to brain scientists. The automatic system can basically be defined as people's instinctive response. And reactions learned by automatic systems can easily be a habit (Thaler and Sunstein, 2008: 20-117).

Collaborative Filtering: Collaborative filtering can be defined as the filtering of options by using the judgments of people with similar tastes when they make a choice. Collaborative filtering, a choice architecture problem-solving effort, facilitates difficult choices for most of us in daily life. For example, in addition to the content that we have watched and stated we like before, Netflix blends the data that users with similar tastes like us and offers us content suggestions that we will love, and considerably reduces the possibility of content-related customer dissatisfaction (Thaler and Sunstein, 2008: 125-126).

Mappings and Feedback: Most people have trouble understanding how the savings they make today will affect themselves or the universe in the future. However, it is possible to make these abstract concepts easier to understand by transforming them into concepts that everyone can easily understand. For example, if people are shown the house they will live in 20 years later (a small apartment) if they save x amount for retirement today, and the house they will live in 20 years later (villa with pool) if they save 5x amount, it is predicted that the amount of savings that a person will set aside for retirement will increase (Thaler and Sunstein, 2008: 166).

Contagion Effect: The influence of social processes on human decisions is very important. Namely, if the majority of the public thinks that many people start to eat healthy and do sports, more people will start to eat healthy and do sports. Or if fat people think they have gained weight because of their own fault, the number of fat people trying to lose weight will increase (Thaler and Sunstein, 2008: 197).

Default Rule: People's automatic systems tend to make uncontrolled, effortless, quick and mindless choices. When the mindless choice behavior managed by the automatic system is combined with the tendency of people to lose aversion, individuals who are asked to make a choice will be prone to prefer the "default option" offered to them by the system implementers, as they will show risk-averse behavior. Therefore, if the situation desired to be preferred by individuals is defined as the "default option",

the number of people who will be included in this situation will increase. The default rule method has been used many times, especially in organ donation campaigns, to encourage people to donate organs and has yielded successful results (Thaler and Sunstein, 2008: 34, 54, 220).

3.4.4.1. Virtual Reality Application for Experimental Design

While nudging people to decide to use water-based public transport systems within the scope of the study, it was decided to conduct the experiment in ferry since it was aimed to examine whether customer satisfaction, perceived service quality and customer loyalty could be increased regarding water-based public transport systems. In this direction, a ferry serving in Izmir Bay was modeled (based on the fire plan of the ferry) via the Unity program. In order to increase the factuality of the experience and to transfer some of the variables planned to be measured to the virtual, a ferry pier was also modeled in addition to the ferry, and the beginning of the experiment was planned as the ferry bridge (waiting area inside the pier), and the second scene was planned as boarding the ferry from the ferry bridge.

A total of 3 separate stages were designed: the ferry bridge (waiting room), the inside of the ferry (downstairs - closed area) and the second floor of the ferry (upper floor - open area). A separate resting area, named Instagramable area, was designed and added to the stern on the second floor of the ferry, since it is one of the variables to be measured, although it is not on the real ferry. In addition, some of the seating areas on the real ferry were canceled (as they were considered insignificant during the experiment) in order to speed up the transition between the scenes during the virtual reality experiment. Thus, the experimental period was shortened and the movement areas of the users in virtual reality were expanded.

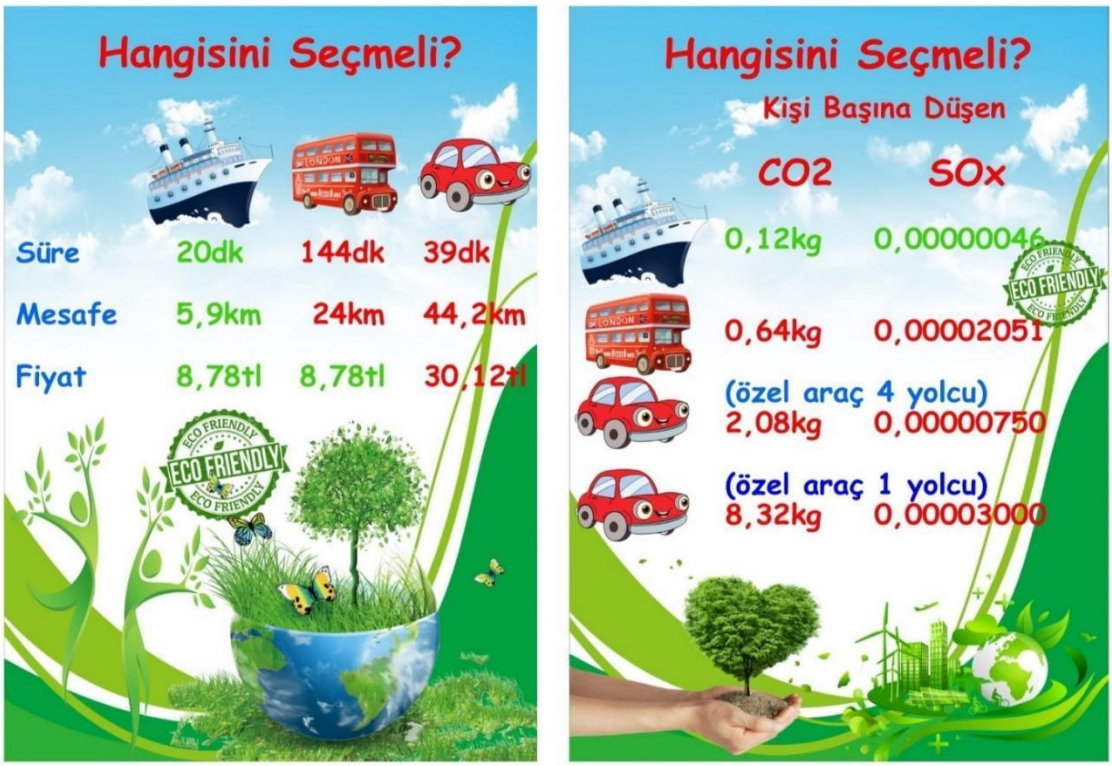
In the experiment, seven physical variables were placed on the virtual ferry. The first of these physical variables is the information board based on DMS (Dynamic Message Sign) technology, located on the ferry bridge (waiting room) in the first scene. “For a limited time, ferry use is free for a week for only seven tickets. Apply now, don't miss the opportunity!” message is included. With this variable, it is aimed

to make the ferry the default rule as a transportation option and to teach the behavior of using the ferry to the automatic system.

The second physical variable encountered during the experiment is the qr code scanning variable to be used when boarding the ferry. It is aimed to measure the effect of QR code transition systems, which can be realized with the help of technologies under the headings of road information systems (V2V protocol) and public transportations systems, on customer satisfaction, perceived service quality and customer loyalty. In addition, the impact of the use of this technology on the quality of service and customer satisfaction for the purpose of personalizing customer information and the service provided to the customer was also examined. With this technology, it will be possible to store the data obtained from the passengers boarding the ferry via the QR code on the cloud and it will be possible to provide a personalized service to the customers by taking into account the frequency of their travel or the routes they frequently use by using this data. In order to measure the effect of this personalized service on customer satisfaction, service quality and customer loyalty, the third physical variable of the experiment was used and the participants who boarded the ferry with the help of the QR code were encountered with a message which says "Congratulations. You won a concert ticket for choosing the ferry for the 20th time this month. We wish you a good time."

In the second scene of the experiment, the participants inside the ferry (downstairs-closed area) reached the informative messages that will be possible by using advanced traveler information systems, passenger information systems and road information systems technology inside the ferry. These messages, which are accepted as the fourth physical variable of the experiment, were prepared as two screens and placed in various places in the ferry. Images with information comparing the same route in terms of various factors in the use of private vehicles, buses and ferries are shown in Figure 13.

Figure 13: Traveler Information Systems used in Experiment



Source: Created by author

* Since the experiment was carried out in Turkey, the informative messages were visualized in Turkish. The image in the figure is the original images placed inside the virtual ferry. The data contained in the visuals is the actual data obtained as a result of calculations (see. Table 1 and Table 2).

Figure 13 shows the comparative values of ferries, buses and private vehicles moving on the same route in terms of journey time, distance traveled, cost, CO2 and SOX emission amounts. This variable is based on anchoring, and salient incentives notions. The data obtained with the help of variables and their effect on the purpose of the study are explained in detail in the findings section.

The fifth physical variable involved in the experiment is a video, integrated into the virtual ferry during the experiment. This video shows the participants what the world will be like in 50 years if they prefer environment friendly transportation options (like ferry), which is safer, cheaper, and has lower energy consumption than other types of transportation and what the world will be like in 50 years if they don't. Based on mappings and feedback and contagion effect notions of the theory, the video aims

to examine whether it is possible to direct people to more environmentally friendly transportation alternatives. According to the contagion effect, if people think that things will end badly because of their own mistakes, they are more willing to correct those mistakes (Thaler and Sunstein, 2008: 166-197). Therefore, with this variable, people were visually shown the possible consequences of their wrong choices and their right preferences. In order to better feel the dystopian world and utopian world feeling planned to be given in the created videos, classical music that gives a feeling of happiness and unhappiness is placed in the video backgrounds. Since it is aimed to create the feeling of unhappiness during dystopian world images, Beethoven's "Moonlight Sonata" is used in this section. In the utopian part, which is aimed to create a feeling of happiness, Johann Strauss II's "Tritsch Tratsch Polka" was preferred in the background.

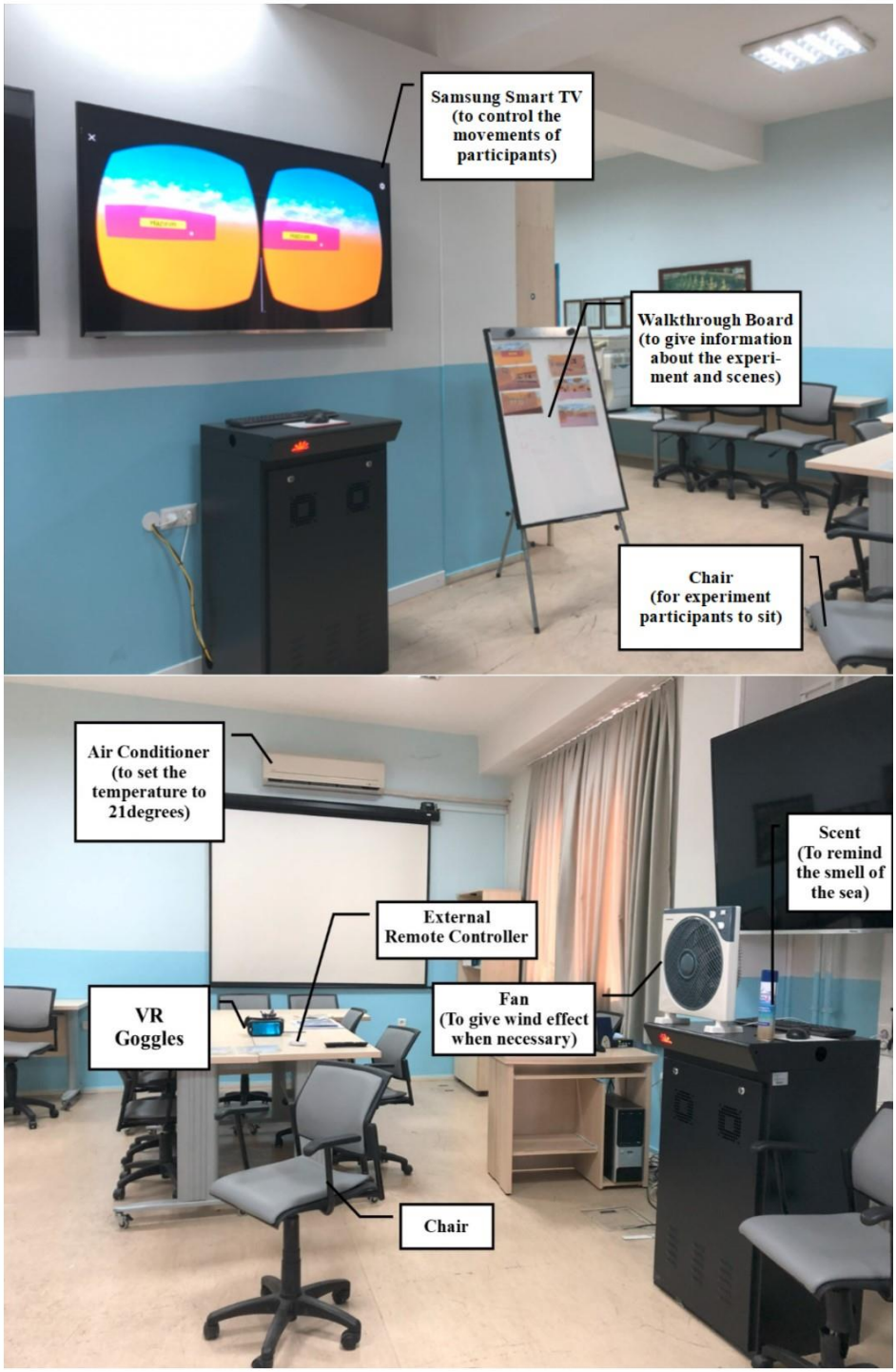
The sixth and seventh physical variables in the experiment are those related to the instagramable area, which was added to the virtual ferry even though it was not on the real one. With these variables, it is intended to create locations where individuals can enjoy themselves on the ferry, take pictures, post those pictures on social media, and be briefly visible. This area organized in the simplest way possible, where there are fancy chairs and spotlights, and which is organized to encourage people to take photos there and share them on social media accounts, is based on the following the herd and collaborative filtering notions, and is created to encourage people to use the ferry and to encourage others who see their posts to use the ferry. In the seventh and final physical variable, participants watched a video of people sharing happy images of themselves in the Instagramable area and the posts highlighted the importance of protecting the environment. This variable is specifically intended to test nudge theory's doctrine which implies that people are willing to do things that other people do (Thaler and Sunstein, 2008: 80-89).

In addition to the physical (visible) variables placed on the ferry in the virtual reality experiment designed within the scope of the experiment, detailed information about other variables aimed at understanding and perhaps nudging people is described in the data collection instrument section.

3.4.4.2. Laboratory Environment Design to Conduct Experiment

As in the first experiment (experiment 1), a Samsung brand smartphone, Samsung brand virtual reality goggles and external remote control were used as equipment in the experiment. However, in this experiment, in order to be able to monitor all the movements of the participants by the researcher and to ensure that the participants communicate with all the variables in the experiment, the movements of the participants were transferred to the Samsung brand smart television through the smart screen application and the participants were guided by the researcher during the experiment. For this reason, Dokuz Eylül University, Maritime Faculty, Marine Engineering Simulation Laboratory was prepared as an experimental environment and the movements of the participants were followed by using the smart screens in the simulation lab. Back-and-forth and right-left movements of the participants were both disabled by software and physically prevented, and they were only allowed to rotate 360 degrees around themselves. In addition, since the duration of this experiment (20-25 min) was longer than the first experiment (which is 3,5-4 min), it was decided to sit the participants. Participants seated in chairs that could rotate 360 degrees were warned of side effects of virtual reality such as dizziness and nausea, and were instructed to abandon the experiment immediately if one of these occurred. The image of the environment in which the experiment was performed is shown in Figure 14.

Figure 14: Laboratory Environment of Experiment



Source: Prepared by Author

As in experiment 1, the ambient temperature was set at 21 degrees, which is the recommended indoor temperature by WHO in 1987 (WHO, 1987). The environment is isolated from variables such as smell, sound and sunlight. In order to increase the feeling of presence in the experiment, when the participants went to the upper floor of the ferry (open space) during the experiment, a wind effect was given with the help of a propeller and in addition to this, a room smell with sea smell flavor was sprayed at the same time and the participants were allowed to feel the sea air and smell.

Before the experiment, the researcher explained the imaginary scenario of the experiment to all participants and gave preliminary information about the purpose of the experiment and the screens they would encounter during the experiment. In addition, all participants were given training on how to communicate with objects in the virtual reality environment and how to use the technological devices they wear before the experiment. Since the participants decided to sit in the experiment, the risks of hitting the objects or walls around them were reduced. For this reason, the items in the laboratory were not emptied, but the researcher ensured their safety by following the movements of the participants throughout the entire experiment.

3.4.4.3. Data Collection Instrument

In the data collection form prepared within the scope of Experiment 2, a total of 32 questions were used: 19 yes/no questions to find answers to the research questions of the study, 3 questions to analyze the demographic information of the participants, 8 likert scale questions to measure the perception of presence felt in the virtual reality experiment and 2 questions to determine whether the participants experienced discomfort such as dizziness and nausea during the experiment.

Two of the 19 yes/no questions in the data collection form were asked to determine the first ideas of the participants before the start of the experiment as required by the scenario, and 17 of them were asked to analyze the ideas and feedback of the participants about the ferry trip they experienced after the experiment.

According to the mere-measurement effect, one of the notions of the nudge theory, when people are asked for their opinion by giving them preliminary information about a topic, when that topic/situation occurs, if they remember their first

answer, their reaction will be appropriate to the answer they gave when the question was asked. Based on this theory teaching, participants were given prior to the experiment with preliminary information about the extent of global warming and how global warming will affect their own environment in the next 10 years (factual information was used). And in the light of this information, they were asked about their preference, encouragement and recommendation of the use of ferries from more environmentally friendly transportation alternatives. The follow-up question of this question was moved to the post-experiment and people were reminded of their answers to the first question and asked whether they would prefer and encourage the use of ferries with integrated intelligent transportation systems. Through these two questions, it is aimed to test both the mere-measurement effect and to determine whether it is possible to nudge people to more environmentally friendly transportation alternatives as well as to make them advocates for it.

In the second question asked before the experiment, users were informed about the intelligent transportation technologies that make it possible to communicate with their phones and stations (that we assume the application is installed on their phones with location services turned on). With the help of this technology, when they enter the 1 km. radius of the pier, they are asked whether receiving notifications about the upcoming departure times through the application will affect their preference for the ferry as a transportation option. Through this question, it was aimed to determine whether some important customer dissatisfaction obtained as a result of the online user comment analysis carried out earlier in the study could be solved with a mobile application belonging to the transportation company.

With the 16 yes/no questions asked after the experiment, it was aimed to measure the attitudes of the participants about the variables described in the virtual reality application for experimental design title that they interacted with during the experiment and whether these variables could be used as a tool to achieve the aims and objectives of the study. The likert-scale questions (Kerrebroeck, et. al. 2017: 189) used to measure participants' perceptions of presence adopted to the experiment which were also used in Experiment 1, shown in Table 3. Three questions asked for gender, age and education information to explore the demographic characteristics of the participants. The data collection form used in the research is included in Appendix-2.

3.4.4.4. Data Collection and Analysis

In order to reach the aim of the study and search answers to the research questions, a virtual reality experiment was conducted on 50 adults selected by quota sampling method. When marketing studies involving virtual reality experiments on consumers are examined, the number of virtual reality experiments performed starts from 6 (Ghinea and Gorenli, 2017), predominantly between 10-50 (Subawa, et al., 2021; Meyerding and Mehlhose, 2020; Singh, et al., 2019; Vassalos, et al., 2016; Balling, et al., 2015; Gu, et al., 2014), while in long-term market research and policy-related subjects, it is between 150-180 (Geiger, et al., 2015; Fagerstrøm and Ghinea, 2011; Grudzewski, et al., 2018; Sung, et al., 2021).

The sample of the study was created using the Turkey Statistical Institute (TUIK) Address Based Population Registration System, Izmir province 2020 data. Considering that virtual reality experiments are classified according to the age of the participants in the existing literature, the population data of the city of Izmir for 2020 has been narrowed down according to their age groups to create a sample. The youngest age included in the scope of study is 18, while the oldest age included in the scope of the study was limited to 55, which is accepted as the upper limit for organ or blood donation campaigns by the Red Crescent. And participant consent forms were signed by all the participants of the experiment and their explicit consents obtained before starting the virtual reality experiment.

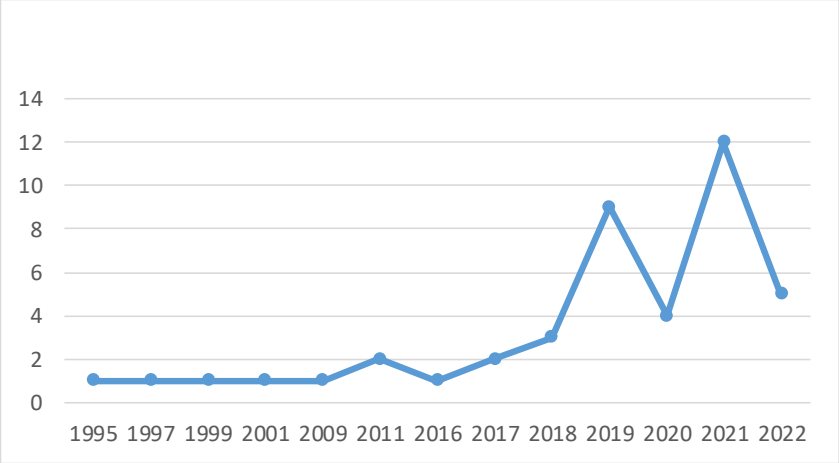
At the end of the experiment, which lasted approximately 20-25 minutes, the participants were asked to fill out a questionnaire that allowed them to give feedback on their experiences. The data collected face-to-face from the participants through questionnaires has been analyzed through the IBM SPSS Statistics 21.0 program. Details of the sample and the first findings of the experiments given in the last chapter of this study.

CHAPTER FOUR
FINDINGS

4.1. FINDINGS OF BIBLIOMETRIC ANALYSIS

To investigate the use of virtual reality applications in the marketing literature and which marketing areas and in what ways the virtual reality technologies are used bibliometric analysis has been conducted. Final 43 studies which contains “"virtual reality" and "marketing" phrases in their titles in the WOS database retrieved as explained in the third chapter. The findings obtained such as, publication years, marketing areas/fields, WOS indexes, WOS research areas, publication/document types, research methods, and VR related theories of the WOS database’ studies are presented in this section.

Figure 15: Publication Years of Studies



Source: Created by author

Figure 15 demonstrates the publication years of virtual reality and marketing related studies. Accordingly, the first mention of virtual reality in the context of marketing was made in the literature under review in 1995, and the number of articles did not significantly rise until 2016. The number of publications on the topic is shown to have risen in 2019 and 2021 before appearing to slightly fall in 2022.

Table 4: Marketing Fields of Studies

N	Marketing Fields	Frequency	Percent
1	Consumer Marketing	10	22,73
2	Tourism Marketing	8	18,18
3	Review Study	5	11,36
4	Real Estate Marketing	4	9,09
5	Destination Marketing	3	6,82
6	Educational Study	3	6,82
7	Web-Based Marketing	2	4,55
8	Brand Marketing	2	4,55
9	Automotive Marketing	2	4,55
10	Museum Marketing	1	2,27
11	B2B Marketing	1	2,27
12	Social Marketing	1	2,27
13	Marketing Communication	1	2,27
14	Network Marketing	1	2,27

Source: Created by author

The marketing fields of the studies that were evaluated have been categorized according to their key themes and are shown in Table 4 because this application's stated goal is to examine the use of virtual reality applications in marketing literature. Although the marketing fields are employed in the classification method as long as feasible according to what the studies' authors indicated in their research, the author also investigated the studies where the marketing field was not explicitly identified and determined which marketing field was pertinent during this investigation. This process has resulted in 14 distinct marketing domains where virtual reality applications are present or are anticipated to be connected to virtual reality.

Table 5: WOS Indexes of Publications

Web of Science Index	Frequency	Percent
Social Science Citation Index (SSCI)	24	50,00
Science Citation Index Expanded (SCI-EXPANDED)	4	8,33
Emerging Sources Citation Index (ESCI)	7	14,58
Conference Proceedings Citation Index - Science (CPCI-S)	8	16,67
Conference Proceedings Citation Index - Social Science & Humanities (CPCI-SSH)	5	10,42

Source: Created by author

According to an analysis of the indexing data for the studies, 50% of all studies published in journals are indexed in SSCI-Social Sciences Citation Indexed journals. ESCI- Emerging Sources Citation Indexed journals and SCI-Expanded- Science Citation Index Expanded journals are listed in that order, with SSCI journals coming in third and fourth, respectively. Detailed information from the conference proceedings citation index is shown in Table 5.

Table 6: WOS Database Research Areas of Publications

Research Areas	Frequency	Percent
Business & Economics	15	22,39
Social Sciences	9	13,43
Computer Science	8	11,94
Engineering	5	7,46
Education & Educational Research	3	4,48
Environmental Sciences & Ecology;	2	2,99
Science & Technology	2	2,99
Psychology	2	2,99
Mathematical & Computational Biology	1	1,49
Neurosciences & Neurology	1	1,49
Urban Studies	1	1,49
Public Administration	1	1,49

Research Areas	Frequency	Percent
Mathematics	1	1,49
Chemistry	1	1,49
Materials Science	1	1,49
Physics	1	1,49
Imaging Science & Photographic Technology	1	1,49
Geography	1	1,49
Other Topics	11	16,42

Source: Created by author

When the studies are assessed based on the WOS research fields, it is found that 22% of the studies are in the field of business and economics. Business and economics are followed, in that order, by the fields of social sciences, computer science, and engineering. Table 6 displays specifics of each WOS research area of the studies that have been reviewed.

Table 7: Publication Types of Studies

Publication Types	Frequency	Percent
Article	24	55,81
Review Article	6	13,95
Article/Conference Proceeding	2	4,65
Conference Proceeding	10	23,26
Editorial	1	2,33
Total	43	100

Source: Created by author

According to an analysis of the studies' publishing categories, approximately 75% of the studies were published as articles, with 59% of those publications being research papers and 14% being review articles, only one editorial paper was found, and conference proceedings made about 10% of the studies that were reviewed. 2 studies that were both conference proceedings and journal articles were discovered in

the database. Information from these two studies' conferences and journals was included into the study. Table 7 displays the distribution of publications by publication type.

Table 8: Research Methods of Publications

Method	**Frequency**	**Percent**
Experiment	13	30,95
Review	12	28,57
Survey- Statistical Methods (SPSS-AMOS)	5	11,90
Simulation	3	7,14
Case Study	2	4,76
Interview	2	4,76
Focus Group	1	2,38
Systematic Mapping	1	2,38
Structural Equation Modeling	1	2,38
3D modelling	1	2,38
Multi Criteria Decision Making (DEMATEL)	1	2,38

Source: Created by author

Table 8 demonstrates the research methods applied in the reviewed studies. Virtual reality studies in the marketing industry used experimental methodologies in about 31% of studies. Followed by review studies and survey approaches, respectively. Aside from simulation, case studies, interviews, focus groups, systematic mapping, structural equation modeling, 3D modeling, and DEMATEL techniques were also used in these reviewed studies.

Table 9: Virtual Reality Related Theories Mentioned in Publications

Theory	**Frequency**	**Percent**
Flow Theory	5	11,90
Technology Acceptance Model (TAM)	4	9,52

Theory	Frequency	Percent
Stimulus-Organism-Response Theory (S-O-R)	3	7,14
Theory of Planned Behaviour	2	4,76
UTAUT (Unified Theory of Acceptance and Use of Technology)	1	2,38
Users Experience Theory	1	2,38
Media Environment Theory	1	2,38
Content Marketing Theory	1	2,38
Brand Equity Theory	1	2,38
Mobility Theory	1	2,38
Use and Satisfaction Theory	1	2,38
Theory of Gamified Learning	1	2,38
Means-End Chain (MEC) theory	1	2,38
Theory of Self-Expansion	1	2,38
Presence Theory	1	2,38
Affective Appraisal Theory	1	2,38
Theory of Sensory Conflict	1	2,38
Media Richness Theory	1	2,38
Innovation Economic Theory (R&V)	1	2,38
Theory of Destination Branding	1	2,38
Theory of Value Co-Creation	1	2,38
Load Theory	1	2,38
Ownership Theory	1	2,38
Theory of Interactive Media Effects	1	2,38
Gratification Theory	1	2,38
Self-Determination Theory	1	2,38
Competitive Interference Theory	1	2,38
Theory of Dialogic Engagement	1	2,38
Behavior–Attitude Theory	1	2,38
Knowledge-Power Theory	1	2,38
Theory of Social Change	1	2,38
Theory of Hegemony	1	2,38

Source: Created by author

According to the author, it is crucial to extract from the present literature the marketing and virtual reality associated theories because virtual reality is a relatively new topic, particularly in the field of marketing. For this reason, all hypotheses that are claimed to be connected to VR in the papers are presented in Table 9, along with the theories on which the research is based. 32 theories that are directly or indirectly related to virtual reality and marketing concepts have been discovered after the author thoroughly analyzed all papers to arrive at this conclusion. The most prevalent or suggested theories in the fields of virtual reality and marketing were flow theory, technology acceptance model (TAM), stimulus organism response (SOR) theory, and theory of planned behavior, with a combined usage of almost 33%. Other theories found in the literature and their usage percentages are detailed in Table 9.

4.2. FINDINGS OF THE EXPERIMENT 1

When a user is involved in a human-computer environment that can be perceived or interacted with, the surrounding environment is called "Virtual Reality". The short definition of Virtual Reality is quoted as 'environment created by a computer or other media, an environment in which the user feels present' in many scientific articles. In virtual reality literature, the feeling of being in an environment is referred to as "presence", a term derived from the term "telepresence" (Kerrebroeck, et.al; 2017).

In order to test the reliability and validity of the planned VR experiment (experiment 2), it is decided to use the presence sense of the subjects. Hence, an imaginary virtual reality holiday scenario was prepared and transferred to virtual reality as experiment 1. Four main scenes designed for experiment 1. And a completely imaginary holiday destination related scenario has been prepared. The main aim of experiment 1 is to measure the degree of "presence" in virtual reality experiments and to investigate if there are any differences between the “presence” levels of individuals in different demographics groups. To reach this specific aim the VR presence scale, developed by Coyle and Thorson (2001) and improved by Kerrebroeck, Brengman and Willems in 2017, is decided to use (see Table 1). The results of experiment 1, which was conducted on 100 adults selected by quota sampling method is given below.

4.2.1. Sampling of Experiment 1

The sample of the study was created using the Turkey Statistical Institute (TUIK) Address Based Population Registration System, Izmir province 2020 data. Considering that virtual reality experiments are classified according to the age of the participants in the existing literature, the population data of the city of Izmir for 2020 has been narrowed down according to their age groups to create a sample. In Table 10, the population of Izmir in 2020 and the narrowed sample within the scope of the study are shown.

Table 10: Population and Sample of the Experiment 1

Age Groups	Population	Sample
18-21	230.322	10
22-30	574.681	23
31-40	702.660	29
41-50	671.925	27
51-55	282.858	11
Total	**2.462.446**	**100**

Source: Prepared by Author

4.2.2. Descriptive Statistics of Experiment 1

The distribution of the participants by gender, education level and their health conditions is given in the Table 11 below.

Table 11: Educational Level and Gender of the Participants in Experiment 1

Education Level	Frequency
High School and below	9
Vocational School /Associate Degree	9
Undergraduate Degree	41

Master Degree	19
PhD	22
Gender	**Frequency**
Female	38
Male	62
Dizziness	**Frequency**
Positive	45
Negative	55
Nausea	**Frequency**
Positive	10
Negative	90

Source: Prepared by Author

When analyzed the participant, according to education status, it is seen that the majority of the participants have undergraduate degrees, followed by doctoral and master's degree graduates. In addition, while the number of men participating in the study was 62, the number of women was found to be 38.

When the studies in the literature were examined, it was seen that the participants had complaints of dizziness and nausea in virtual reality experiments (Kaleci, et al., 2017: 676). For this reason, questions were asked to control the health status of the participants in the study. Accordingly, 45% of the participants stated that they experienced mild dizziness, while 10% stated that they experienced nausea. However, although all participants were warned that they might experience dizziness and nausea before the experiment and were informed that they should terminate the experiment in case of any discomfort, none of the participants left the experiment halfway and continued until the end.

Various parametric (one-way anova) and non-parametric (kruskal wallis) statistical analyzes were carried out in order to understand whether there is an existing relationship between the demographic characteristics of the participants and their complaints of dizziness and nausea, but no significant results were reached within the sample of the study.

4.2.3. Reliability of Experiment 1

To test the reliability of the scale, Cronbach's alpha value has been calculated. According to the result the Cronbach's Alpha value was found as 0.880. This value indicates a high level of reliability as shown in Table 12.

Table 12: Cronbach's Alpha Level of Reliability

Cronbach's Alpha Score	Level of Reliability
0.0 – 0.20	Less Reliable
>0.20 – 0.40	Rather Reliable
>0.40 – 0.60	Quite Reliable
>0.60 – 0.80	Reliable
>0.80 – 1.00	Very Reliable

Source: Hair, et.al, 2010.

As it can be seen in Table 12, the reliability scores of experiment 1 have been found as "very reliable". In addition to total reliability scores, reliability tests are also conducted according to different age groups. Findings of the reliability scores according to age groups can be seen in Table 13.

Table 13: Reliability Scores According to Age Groups

Age Groups	Cronbach's Alpha Score
18-21	0,906
22-30	0,828
31-40	0,900
41-50	0,894
51-55	0,911

Source: Prepared by Author

As it can be seen in Table 13, the reliability scores of all age groups have been found as "very reliable". This result was interpreted as there is no need to exclude any

age group from the scope of the study in the experiment 2. Reliability tests results according to different education levels given in Table 14.

Table 14: Reliability Scores According to Different Education Levels

Education Levels	Cronbach's Alpha Score
High School and below	920
Vocational School /Associate Degree	734
Undergraduate Degree	889
Master Degree	913
PhD	817

Source: Prepared by Author

When the reliability value of the scale has been examined according to the educational status of the participants, it was determined that high school, undergraduates, master's and PhD graduates scores were found as "very reliable", and vocational school/ associate degree graduates were found as "reliable". This result was also interpreted as there is no need to exclude any education level group from the scope of the study in the experiment 2.

4.2.4. Normality of Experiment 1

To test the distribution of normality of the data, Kolmogorov-Smirnov and Shapiro-Wilk tests were conducted. Results of the tests are shown in Table 15.

Table 15: Normality Tests of Experiment 1

	Kolmogorov-Smirnov	Shapiro-Wilk
P1*	,000	,000
P2	,000	,000
P3	,000	,000
P4	,000	,000
P5	,000	,000
P6	,000	,000

	Kolmogorov-Smirnov	Shapiro-Wilk
P7	,000	,000
P8	,000	,000

Source: Prepared by Author

*VR Presence scale variables taken from the literature (see Table 3)

In both normality tests, it was concluded that the distribution was not normal because the significance value is less than 0.05. In cases where the distribution is not normal, it is recommended to use non-parametric tests (Guris and Astar, 2014). Although the Shapiro-Wilk test is more reliable among these two tests, while it tests the normality of the distribution in studies conducted in the field of social sciences (especially where human emotions and behaviors are analyzed and likert tests are used), it is insufficient compared to basic sciences. Hence, it is recommended to analyze the Skewness and Kurtosis values of the data in studies in the field of social sciences. Skewness and Kurtosis values of the data are given in Table 16.

Table 16: Skewness and Kurtosis Values of Experiment 1

	Skewness	Kurtosis
Presence Scale	-,898	,099

Source: Prepared by Author

There are three different approaches in the literature on the interpretation of Skewness and Kurtosis values. While Hair, et al. (2013) stated that the distribution was normal if the values were between -1 and +1, Tabachnick and Fidell (2013) argued that it was acceptable between -1,5 and +1,5, and George and Mallary (2010) stated it is acceptable if the values are in between -2 and +2. Since the Skewness and Kurtosis values shown in Table 16 were acceptable according to all three approaches, it was accepted that the data had a normal distribution in the study and it was decided to use parametric tests while testing hypotheses.

4.2.5. Validity of Experiment 1

Although the scale used in the study was taken from the literature and already tested for validity, factor analysis was still performed on the scale. Results of the factor analysis is given in Table 17.

Table 17: Factor Analysis of Experiment 1

	Component (1)
P1*	,706
P2	,792
P3	,707
P4	,722
P5	,769
P6	,659
P7	,756
P8	,816

Source: Prepared by Author

*VR Presence scale variables taken from the literature

As a result of factor analysis, it was determined that only one factor occurred in the scale used for virtual reality presence measurement and the validity of the scale was accepted.

4.2.6. Hypothesis Tests Results of Experiment 1

Within the scope of Experiment 1, five hypotheses were formed to determine whether there was a difference between the demographic characteristics and health conditions of the participants and their sense of presence. Hypotheses and analysis results are shown below.

H1: There is a significant difference between female participants and male participants' sense of presence.

H0: There is not a significant difference between female participants and male participants' sense of presence.

Table 18: H1 Results

	Levene's test for equality of variances		t-test for equality of variances		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	1,059	**,306**	1,125	98	,263
Equal variances not assumed			1,081	68,498	**,284**

According to independent samples t-test results as it can be seen in Table 18, there is not a significant difference between female participants and male participants' sense of presence. Hence the null hypothesis (H0) was supported.

H2: There is a significant difference between the age groups of the participants and the mean of the presence values.

H0: There is not a significant difference between the age groups of the participants and the mean of the presence values.

Table 19: H2 Results

Levene Statistic	Df1	Df2	Sig.
,311	4	95	**,870**

	Sum of squares	df	Mean Square	F	Sig.
Between groups	2,162	4	,541	,834	**,507**
Within groups	61,597	95	,648		

According to one-way anova test results as it can be seen in Table 19, there is not a significant difference between the age groups of the participants and the mean of the presence values. Thus the null hypothesis (H0) was supported.

H3: There is a significant difference between the education levels of the participants and the average of their presence values.
H0: There is not a significant difference between the education levels of the participants and the average of their presence values.

Table 20: H3 Results

Levene Statistic	Df1	Df2	Sig.			
2,114	4	95	**,085**			
	Sum of squares		df	Mean Square	F	Sig.
Between groups	2,859		4	,715	1,115	**,354**
Within groups	60,901		95	,641		

According to one-way anova test results as it can be seen in Table 20, there is not a significant difference between the education levels of the participants and the average of their presence values. Thus the null hypothesis (H0) was supported.

H4: There is a significant difference between the sense of presence of the participants who experienced dizziness during the experiment and those who did not.
H0: There is not a significant difference between the sense of presence of the participants who experienced dizziness during the experiment and those who did not.

Table 21: H4 Results

	Levene's test for equality of variances		t-test for equality of variances		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	,488	**,486**	,220	98	,827
Equal variances not assumed			,220	94,081	**,827**

According to independent samples t-test results as it can be seen in Table 21, there is not a significant difference between the sense of presence of the participants who experienced dizziness during the experiment and those who did not. Hence the null hypothesis (H0) was supported.

H5: There is a significant difference between the sense of presence of participants who experienced nausea during the experiment and those who did not.
H0: There is not a significant difference between the sense of presence of participants who experienced nausea during the experiment and those who did not.

Table 22: H5 Results

	Levene's test for equality of variances		t-test for equality of variances		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	,698	**,406**	-,992	98	,324
Equal variances not assumed			-,865	10,477	**,406**

According to independent samples t-test results as it can be seen in Table 22, there is not a significant difference between the sense of presence of participants who

experienced nausea during the experiment and those who did not. Hence the null hypothesis (H0) was supported.

As a result of the research, no significant difference was found between the participants' educational status, gender, age, whether they experienced dizziness and nausea during the experiment and their sense of presence, so all five hypotheses were rejected and null hypotheses were supported. The results obtained within the scope of the sample included in the study indicate that there was no difference between the sense of "presence" for all men and women between the ages of 18-55, who received primary school or doctoral education. For this reason, in Experiment 2, it was decided that the population of the research would be participants between the ages of 18-55 living in Izmir and that no demographic group should be excluded from the scope of the experiment.

4.3. FINDINGS OF ONLINE USER COMMENT ANALYSIS

To decide the main variables causing customer dissatisfaction and customer satisfaction and identify the customer demands and requests who use water-based public transportation services, online user comments about a company providing water-based public transportation services in Izmir, gathered from three different websites which are; www.twitter.com, www.eksisozluk.com and www.sikayetvar.com coded and analyzed via MAXQDA 2020 Professional Data Analysis Software for Qualitative and Mixed Methods program. The results of online user comment analysis given below.

4.3.1. Code System

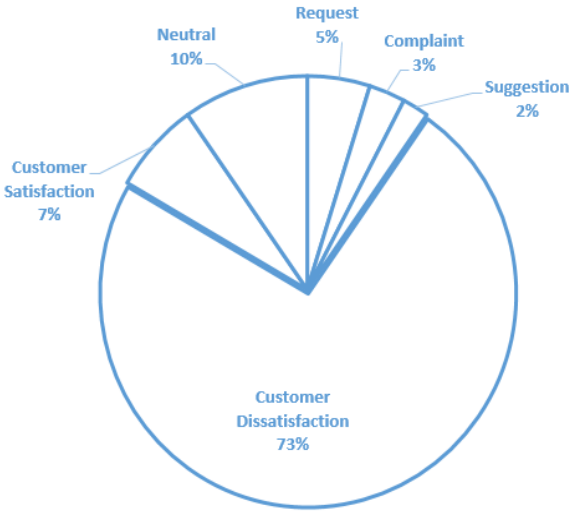
In total 440 coding was done in the data set consisting of 326 comments. Of these 440 encodings; 6 main titles were obtained as demand, complaint, suggestion, neutral, customer satisfaction and customer dissatisfaction.

Table 23: Online User Comment Analysis Code System

Code	Code Count
Request	19
Complaint	11
Suggestion	8
Customer Dissatisfaction	287
• Administrative problems	44
• Pandemic	37
• Staff related dissatisfaction	27
• Voyage cancellation	24
• Insufficient number of voyages	24
• Route inconveniency	23
• Auxiliary services	21
• Lack of online information	16
• Pricing	15
• Failure to comply with scheduled departure times	14
• Inappropriate departure times	10
• Shift to another mode of transport	2
• Other	30
Customer Satisfaction	21
• SMS notification	1
• Landscape watching	8
• Staff related satisfaction	6
• Ancillary service	9
• Voyage frequency	3
Neutral	29
• Giving information	27
• Getting information	7
• Special day celebration	4
TOTAL	**440**

In addition, 13 sub-titles were classified under the customer dissatisfaction title, 5 sub-titles under the customer satisfaction title, and 3 subtitles under the neutral title. Detailed information and coding numbers of the total 27 titles and subtitles obtained are shown in Table 23.

Figure 16: Main Titles Obtained from Code System



As it can be seen in Figure 16, 73% of the coding have been pointing to customer dissatisfaction. Followed by neutral, customer satisfaction, request, complaint and suggestion respectively.

Figure 17: Main Subtitles of Customer Dissatisfaction

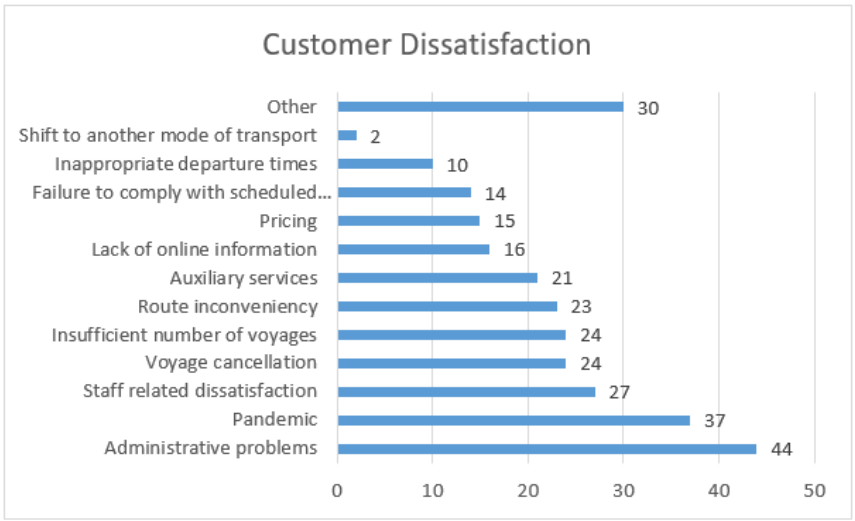
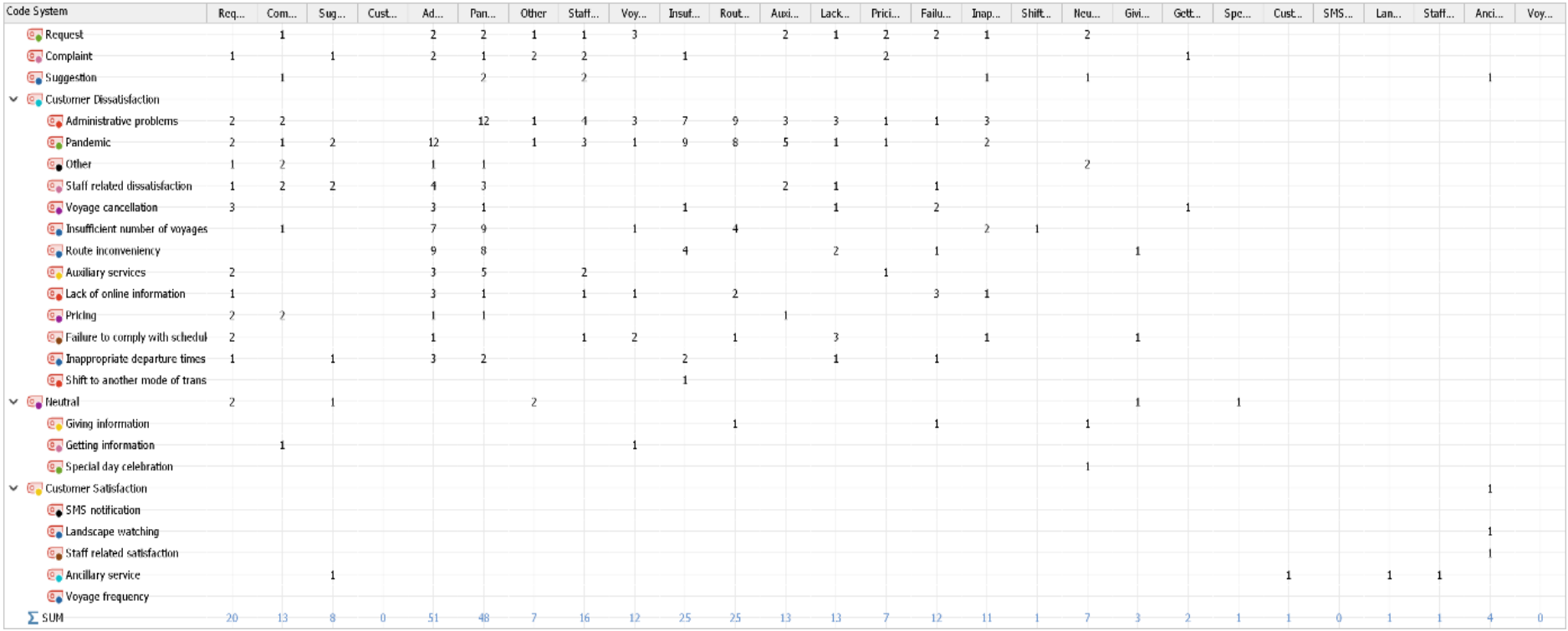


Figure 17 demonstrates the most important customer dissatisfaction creators for this specific water-based public transportation service provider as administrative problems, pandemic related problems, staff related problems, voyage and route related

problems. Analysis that aim to measure the relations between these titles obtained from the MAXQDA 2020 program are given in Figure 18, 19, 20, 21 and 22.

As it can be seen in the matrix map of coded titles in Figure 18, the pandemic and administrative problems were the headings that mostly coded together and the headings included in the other customer dissatisfaction sub-headings were the most coded together. In addition to these, subheadings of customer dissatisfaction, such as insufficient number of voyages, lack of online information, route inconveniency, requests, staff related dissatisfaction, complaints, failure to comply with scheduled departure times, auxiliary services, voyage cancellation and inappropriate departure times were coded together with other problems.

Figure 18: Matrix Map of Coded Titles

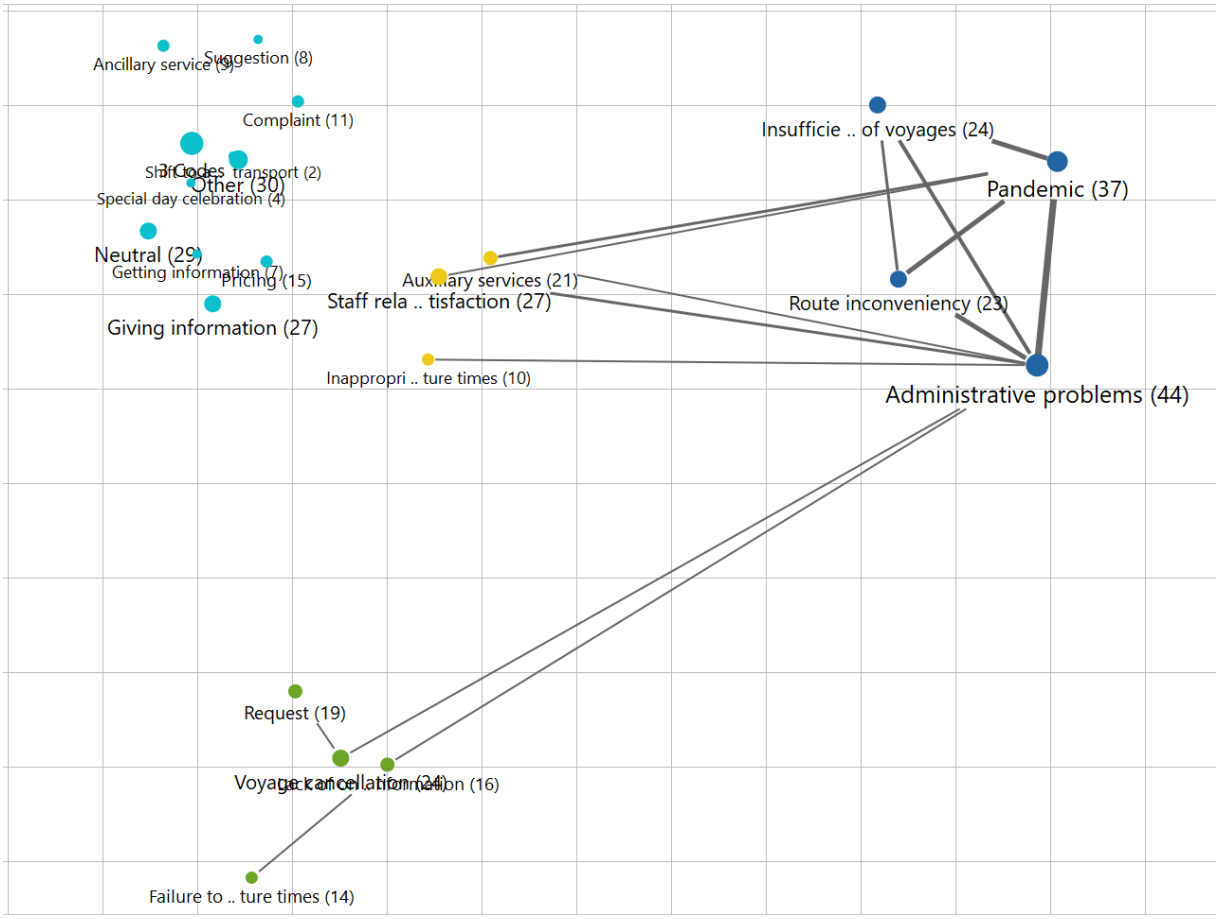


Code System	Req...	Com...	Sug...	Cust...	Ad...	Pan...	Other	Staff...	Voy...	Insuf...	Rout...	Auxi...	Lack...	Prici...	Failu...	Inap...	Shift...	Neu...	Givi...	Gett...	Spe...	Cust...	SMS...	Lan...	Staff...	Anci...	Voy...
Request		1			2	2	1	1	3			2	1	2	2	1		2									
Complaint	1		1		2	1	2	2		1				2						1							
Suggestion		1				2		2								1		1								1	
Customer Dissatisfaction																											
Administrative problems	2	2				12	1	1	3	7	9	3	3	1	1	3											
Pandemic	2	1	2		12		1	3	1	9	8	5	1	1		2											
Other	1	2			1	1												2									
Staff related dissatisfaction	1	2	2		4	3						2	1		1												
Voyage cancellation	3				3	1				1			1		2					1							
Insufficient number of voyages		1			7	9			1		4					2	1										
Route inconveniency					9	8				4			2		1				1								
Auxiliary services	2				3	5		2						1													
Lack of online information	1				3	1		1	1		2				3	1											
Pricing	2	2			1	1						1															
Failure to comply with schedul	2				1			1	2		1		3			1			1								
Inappropriate departure times	1		1		3	2				2			1		1												
Shift to another mode of trans										1																	
Neutral	2		1				2												1		1						
Giving information											1				1			1									
Getting information		1							1																		
Special day celebration																		1									
Customer Satisfaction																										1	
SMS notification																											
Landscape watching																										1	
Staff related satisfaction																										1	
Ancillary service			1																			1		1	1		
Voyage frequency																											
SUM	20	13	8	0	51	48	7	16	12	25	25	13	13	7	12	11	1	7	3	2	1	1	0	1	1	4	0

Source: Prepared by Author

4.3.2. Cluster Analysis of Codes

Figure 19: Cluster Analysis of Codes

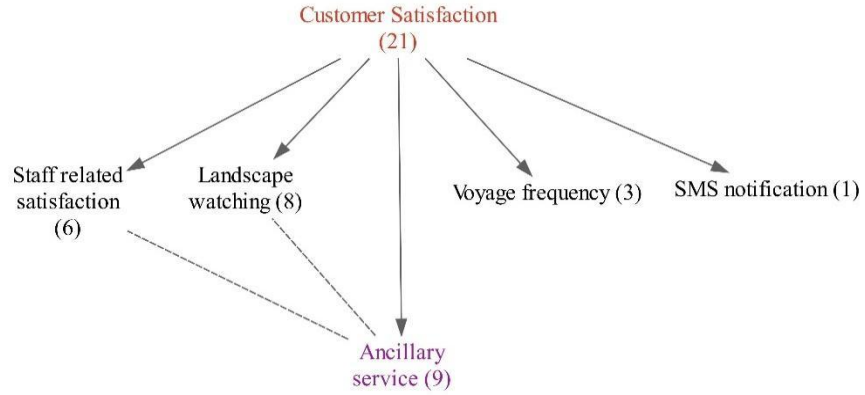


Source: Prepared by Author

Figure 19 shows which of the titles are related to each other and the importance degree of their relations. Accordingly, administrative problems, route inconveniency, pandemic and insufficient number of voyages were determined as the cluster that was coded the most and co-coded, and it was seen that it was associated with the other two important clusters (green and yellow).

4.3.3. Hierarchical Code-Subcodes Models

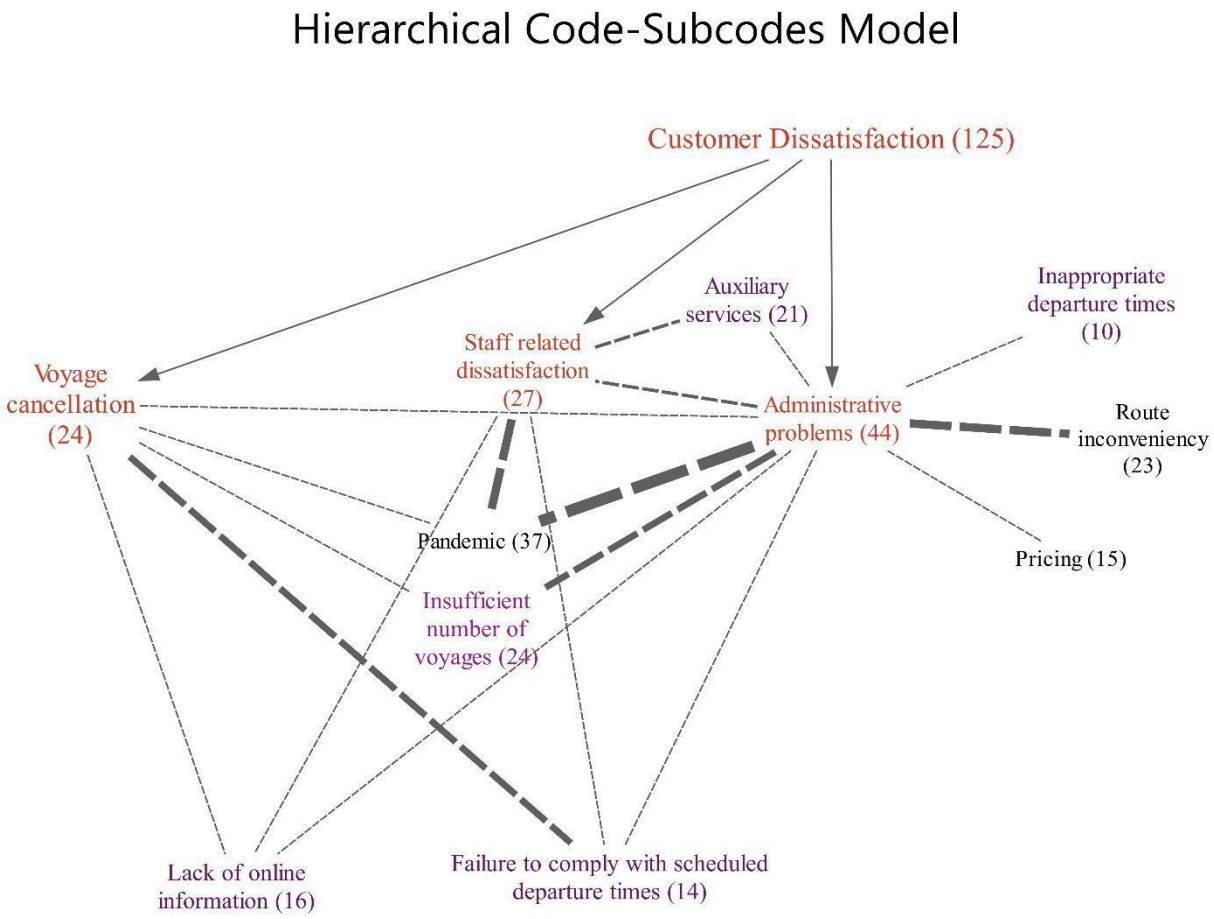
Figure 20: Hierarchical Code Model of Customer Satisfaction Title



Source: Prepared by Author

Figure 20 demonstrates the hierarchical code-subcode model of customer satisfaction title. Accordingly, staff related satisfaction, landscape watching, voyage frequency and SMS notification are the main elements that increase customer satisfaction. In addition, the ancillary service can be regarded as the most important factor in customer satisfaction title, because it is coded more than other satisfaction elements and it is directly related with staff related satisfaction and landscape watching co-titles which are also highly coded titles. Because of the importance of the place of this title in the model (Fig. 20), online user comments that coded as ancillary service, reviewed again and it is determined that 8 one of 9 comments pointed out the broadcasting of classical music on the ferry.

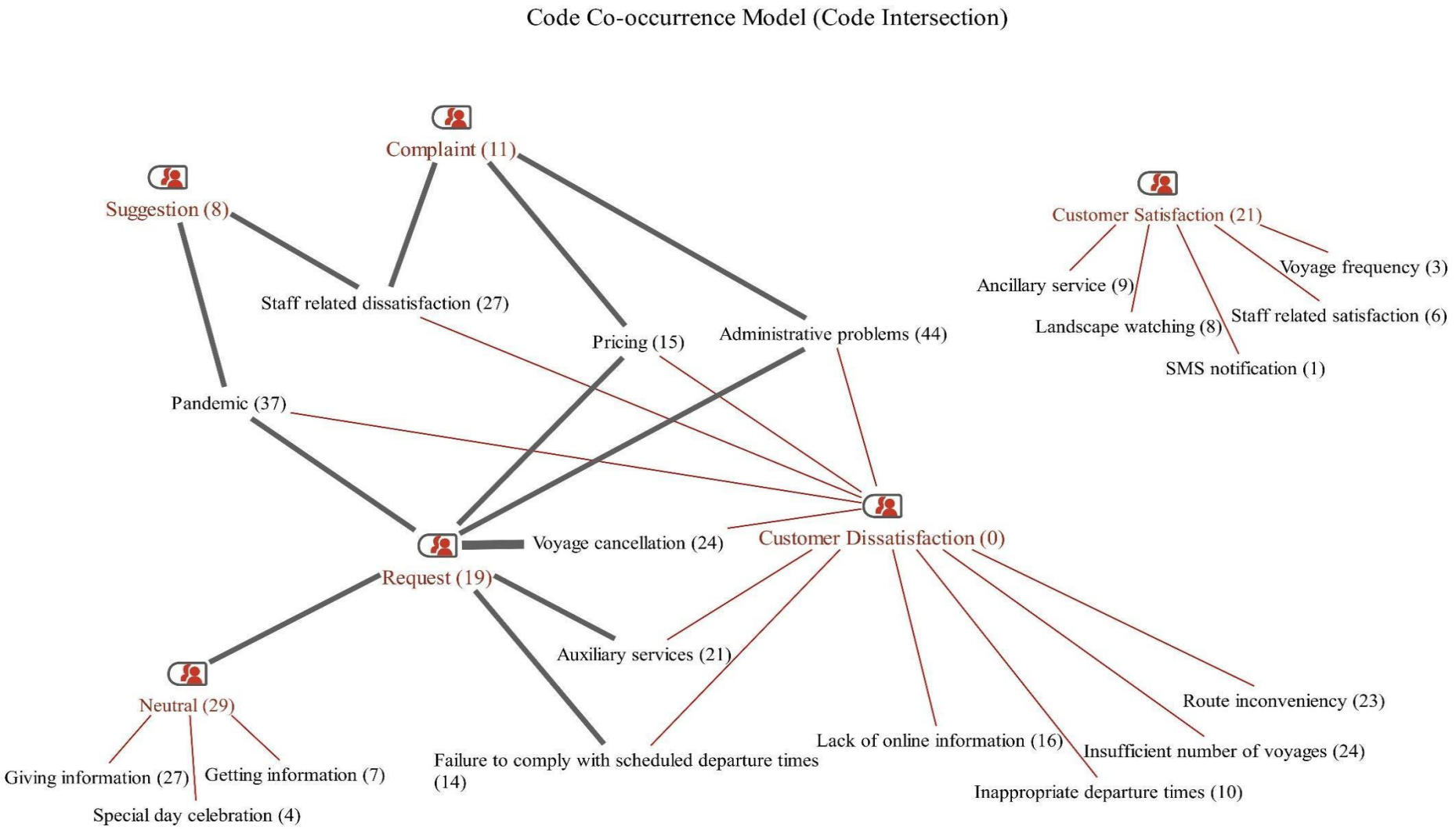
Figure 21: Hierarchical Code Model of Customer Dissatisfaction Title



Source: Prepared by Author

Figure 21 demonstrates the hierarchical code-subcode model of customer dissatisfaction title. Accordingly, administrative problems, staff related dissatisfaction and voyage cancellation were identified as the main sub-headings of customer dissatisfaction. Other headings related to these three subheadings and the intensity of the relationship between them are shown in the figure.

Figure 22: Code Intersection Model



Source: Prepared by Author

When Figure 22 is examined, it is seen that the complaint, suggestion, request and customer dissatisfaction headings are coded together and are related to each other. In other words, users express their dissatisfaction as a result of their experiences, the reasons for their dissatisfaction and the things they think should be done to eliminate these dissatisfactions through their social media accounts.

Since the data obtained from this analysis are planned to be used in experiment 2, which is the main application of the study, it was examined especially through the sub-headings collected under the headings of customer dissatisfaction, complaint and request. Accordingly; administrative problems, staff related dissatisfaction, voyage cancellation, pricing, auxiliary services and failure to comply with scheduled departure times sub-headings were identified as the most frequently mentioned topics by people receiving water-based public transportation services. In addition, although it is not coded with other titles, sub-titles detected which have been repeated quite a lot in the customer dissatisfaction title and sub-headings that create customer dissatisfaction. These are; insufficient number of voyages, route inconveniency, lack of online information and inappropriate departure times. These titles and subtitles were used for the development of experiment 2. Innovations related to intelligent transportation systems, which are thought to be the solution to these complaints, were added to the virtual ferry developed within the scope of the experiment in line with the teachings of nudge theory and it was aimed to analyze whether these dissatisfactions could be converted into customer satisfaction. In addition, the sub-headings collected under the heading of customer satisfaction shown in Figure 22 were used in the design of experiment 2 to reinforce customer satisfaction. For example, since it was determined that the ability of water-based public transport service users to watch the scenery during their travels created customer satisfaction, the virtual ferry was designed as a duplex and seascapes/landscapes were added to the upper floor. Other variables used in Experiment 2, the reasons for using these variables and the findings obtained from the experiment are included in the continuation of the study.

4.4. FINDINGS OF THE EXPERIMENT 2

Experiment 2 was developed to answer the research questions intended to be answered within the scope of the study. Experiment 2, which was shaped using findings selected from the data obtained through bibliometric analysis, experiment 1 and online user comment analysis, consists of four main scenes. In experiment 2, which was based on a completely imaginary scenario, the subjects' travels on a ferry integrated with an intelligent transportation systems serving between Bostanlı and Üçkuyular (İzmir/Türkiye), starting from the pier has been modeled via virtual reality goggles. The results of experiment 2, which was conducted on 50 adults selected by quota sampling method is given below.

4.4.1. Sampling of Experiment 2

Data from the Izmir provincial 2020 Address Based Population Registration System of the Turkey Statistical Institute (TUIK) was used to build the study's sample. The population data for the city of Izmir for 2020 has been reduced according to their age groups to produce a sample, taking into account that virtual reality studies are categorized according to the age of the participants in the available literature. The population of Izmir in 2020 as well as the sample's smaller size are displayed in Table 24.

Table 24: Population and Sample of the Experiment 2

Age Groups	Population	Sample
18-21	230.322	5
22-30	574.681	12
31-40	702.660	15
41-50	671.925	13
51-55	282.858	5
Total	**2.462.446**	**50**

Source: Prepared by Author

4.4.2. Descriptive Statistics of Experiment 2

Table 25 below summarizes the distribution of participants by gender, educational level, and health conditions.

Table 25: Educational Level and Gender of the Participants in Experiment 2

Education Level	**Frequency**
High School and below	6
Vocational School /Associate Degree	6
Undergraduate Degree	13
Master Degree	7
PhD	18
Gender	**Frequency**
Female	15
Male	35
Dizziness	**Frequency**
Positive	9
Negative	41
Nausea	**Frequency**
Positive	2
Negative	48

Source: Prepared by Author

When analyzed the participants according to education status, it is seen that the majority of the participants have doctoral degrees, followed by undergraduate and master's degree graduates. In addition, while the number of men participating in the study was 35, the number of women was found to be 15.

The participants in virtual reality trials reported feeling nausea and dizzy, according to studies that were analyzed in the literature (Kaleci et al., 2017: 676). Questions were asked to evaluate the study participants' health status for this reason. As a result, 4% of the individuals reported feeling nausea, and 18% of the participants had mild dizziness. All participants were advised prior to the experiment that they

might feel dizzy and nausea and that they should stop the experiment if they felt any discomfort, but none of them stopped the experiment early and instead completed it until the finish.

4.4.3. Reliability of Experiment 2

Cronbach's alpha has been calculated to measure the scale's reliability. The outcome showed that the Cronbach's Alpha value is 0.864. As it is seen in Table 12, this score implies a high level of reliability. In addition to the total reliability score, reliability tests also conducted according to different age groups. Findings of the reliability scores according to age groups can be seen in Table 26.

Table 26: Reliability Scores of Experiment 2 According to Age Groups

Age Groups	Cronbach's Alpha Score
18-21	0,958
22-30	0,784
31-40	0,708
41-50	0,870
51-55	0,823

Source: Prepared by Author

As it can be seen in Table 26, the reliability scores of all age groups have been found as "reliable" or "very reliable".

4.4.4. Presence in Experiment 2

To measure the perceived presence value in the experiment, the average of the values obtained through the presence scale was taken. Accordingly, the presence value felt during the experiment was determined as 3.95. Since this value obtained through the 5-point Likert scale was above the average, it was assumed that the perception of presence was felt sufficiently. Table 27 shows the perceived presence perceptions according to age groups.

Table 27: Presence Values of Experiment 2 According to Age Groups

Age Groups	Presence Value
18-21	4,35
22-30	3,30
31-40	4,18
41-50	4,08
51-55	4,12

Source: Prepared by Author

As shown in Table 27, the presence value was above 4.00 for all age groups except the 22-30 age range, while the perceived presence level in the 22-30 age range was determined to be 3.30. Even though this value is above the average, it is noteworthy because it is quite low compared to other age groups.

4.4.5. Normality of Experiment 2

To test the distribution of normality of the data, Kolmogorov-Smirnov, Shapiro-Wilk Skewness and Kurtosis values of the presence scale were calculated. Obtained values are shown in Table 28.

Table 28: Normality Tests of Experiment 2

	Kolmogorov -Smirnov	Shapiro-Wilk	Skewness	Kurtosis
Presence Scale	,055	,012	-,727	-,219

Source: Prepared by Author

When the values shown in Table 28 are examined, all values except the value obtained from the Shapiro-Wilk test indicate that the data show a normal distribution. However, as explained in the title "4.2.4. Normality of Experiment 1", of this study, Kolmogorov-Smirnov and Shapiro-Wilk tests are inadequate compared to basic

sciences when testing the normality of distribution in studies in the field of social sciences (especially where human emotions and behaviors are examined and Likert tests are used). For this reason, it is recommended to analyze the Skewness and Kurtosis values of the data in studies to be carried out in the field of social sciences. When it comes to the Skewness and Kurtosis values, there are three different approaches in the literature on the interpretation of Skewness and Kurtosis values. While Hair, et al. (2013) stated that the distribution was normal if the values were between -1 and +1, Tabachnick and Fidell (2013) argued that it was acceptable between -1,5 and +1,5, and George and Mallary (2010) stated it is acceptable if the values are in between -2 and +2. Since the Skewness and Kurtosis values shown in Table 28 were acceptable according to all three approaches, it was accepted that the data had a normal distribution. Hence, it is decided to use parametric tests while answering the research questions of this study.

4.4.6. Findings Related to Research Questions

Four direct and one indirect research questions have been created to be examined within the scope of this study. The following four research questions and their answers, which are planned to be answered directly based on the findings obtained in the study, will be examined under this heading. The fifth research question (*RQ-5*), which is accepted as the indirect research question of the study is going to be discussed theoretically in the conclusion and discussion part of this study.

RQ-1. Is it possible to increase the perceived service quality in water-based public transportation services with the effective use of intelligent transportation systems?

RQ-2. Is it possible to increase customer satisfaction in water-based public transportation services with the effective use of intelligent transportation systems?

RQ-3. Is it possible to increase customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems?

RQ-4. Is it possible to direct people to environmentally friendly transportation options with the effective use of intelligent transportation systems?

RQ-5. Can any of the service marketing gaps (Parasuraman, 1985) can be filled by using intelligent transportation systems technologies in water-based public transportation?

4.4.6.1. Research Question 1 (Perceived Service Quality)

In order to answer the first research question which is "Is it possible to increase the perceived service quality in water-based public transportation services with the effective use of intelligent transportation systems?", two separate questions were asked to the experiment participants. The first of these questions was prepared to measure the effect of the wireless toll collection service (via QR Code), which is included in three of the smart transportation systems technologies, to the perceived service quality. As it mentioned in the second chapter of this study wireless toll collection service takes place in three different intelligent transportation systems applications which are; road information systems, public transportation systems and electronic toll collection systems. And the second question was designed to measure the effects of all experiences encountered during the created virtual ferry travel simulation process on the perceived service quality of customers.

Table 29: Results Regarded of Perceived Service Quality

		Positive		**Negative**	
		frequency	**percent**	**frequency**	**percent**
Q7	**The effect of electronic toll collection systems on perceived service quality**	41	%82	9	%18
Q17	**The effect of whole virtual intelligent ferry simulation experience on perceived service quality**	50	%100	-	-

Source: Prepared by Author

As it can be seen in Table 29, 82% of the participants stated that the electronic toll collection systems used when entering the ferry (via QR Code) increased the perceived service quality. All of the participants stated that the service quality they perceived increased during the virtual ferry simulation integrated with intelligent

transportation systems technologies (Appendix 2. Q7-17). In this regard, the answers obtained the questions, especially from Question 17 in the data collection form, answers the first research question. According to this; it is possible to increase the perceived service quality in water-based public transportation services with the effective use of intelligent transportation systems.

4.4.6.2. Research Question 2 (Customer Satisfaction)

In order to answer the second research question of this study which is "Is it possible to increase customer satisfaction in water-based public transportation services with the effective use of intelligent transportation systems?" three different questions were asked to the participants of the experiment. The first of these questions was prepared to measure the effect of the wireless toll collection service (via QR Code), which is included in three of the intelligent transportation systems technologies, to the customer satisfaction. The second question was designed to measure the effect of the suitable use (recommended use) of dynamic message signs on customer satisfaction and the third question was designed to measure the effects of all experiences encountered during the created virtual ferry travel simulation process on the customer satisfaction. As it mentioned in the second chapter of this study dynamic message signs service takes place in two different intelligent transportation systems applications which are; passenger information system and traffic management system.

Table 30: Results Regarded of Customer Satisfaction

		Positive		**Negative**	
		frequency	**percent**	**frequency**	**percent**
Q8	**The effect of electronic toll collection systems on customer satisfaction**	37	%74	13	%26
Q12	**The effect of dynamic message signs (DMS) on customer satisfaction**	48	%96	2	%4

Q18	**The effect of whole virtual intelligent ferry simulation experience on customer satisfaction**	46	%92	4	%8

Source: Prepared by Author

As it can be seen in Table 30, 74% of the participants stated that the electronic toll collection systems used when entering the ferry (via QR Code) increased the customer satisfaction. %96 of the participants stated that the dynamic message signs that used to give information to the passengers inside the ferry increased customer satisfaction they felt. %92 of the all participants stated that the customer satisfaction they feel increased during the virtual ferry simulation integrated with intelligent transportation systems technologies (Appendix 2. Q8,12,18). In this regard, the answers obtained the questions in the data collection form, answers the second research question. According to this; it is possible to increase the customer satisfaction in water-based public transportation services with the effective use of intelligent transportation systems.

4.4.6.3. Research Question 3 (Customer Loyalty)

In order to answer the third research question of this study which is "Is it possible to increase customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems?" four different questions were asked to the participants of the experiment. The first of these questions was prepared to measure the effect of the wireless toll collection service (via QR Code), to the customer loyalty. The second question was designed to measure the effect of the suitable use (recommended use) of dynamic message signs on customer loyalty, the third question was designed to measure the effects of all experiences encountered during the created virtual ferry travel simulation process on the customer loyalty. And the fourth question was designed to measure the effect of a firm's mobile application on customer loyalty. According to Kotler, et al., (2017: 203), businesses need to develop mobile applications to ensure customer loyalty and advocacy. To test this proposition, the effect of the mobile application in the passenger information system,

one of the smart transportation systems technologies, on customer loyalty was measured.

Table 31: Results Regarded of Customer Loyalty

		Positive		Negative	
		frequency	**percent**	**frequency**	**percent**
Q9	**The effect of electronic toll collection systems on customer loyalty**	36	%72	14	%28
Q10	**The effect of dynamic message signs (DMS) on customer loyalty**	46	%92	4	%8
Q16	**The effect of whole virtual intelligent ferry simulation experience on customer loyalty**	50	%100	-	-
Q20	**The effect of firm's mobile application on customer loyalty**	50	%100	-	-

Source: Prepared by Author

As it can be seen in Table 31, 72% of the participants stated that the electronic toll collection systems used when entering the ferry (via QR Code) increased the customer loyalty. %92 of the participants stated that the dynamic message signs that used to give information to the passengers inside the ferry increased customer loaylty. All of the participants (%100) stated that the customer loyalty they feel increased during the virtual ferry simulation integrated with intelligent transportation systems technologies. Similarly, all of the participants (%100) also stated that the firm has a mobile application that increased their customer loyalty as suggested by Kotler, et al. (2017: 203). In this regard, the answers obtained the questions in the data collection form, answers the third research question. According to this; it is possible to increase the customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems.

4.4.6.4. Research Question 4 (Directing People to the Environment Friendly Transportation Options)

Another research question of this study is about whether it is possible to direct people to something which is stated as “RQ-4. Is it possible to direct people to environmentally friendly transportation options with the effective use of intelligent transportation systems?”. In order to investigate this question, which is a more abstract concept compared to other research questions of the study, human behavior and human psychology need to be questioned and examined to a certain extent. “Why do people choose a behavior?”, “How do people decide whether to repeat a behavior?”, “Can people choose what is best for them?”, “Are people rational beings?”. All these questions were asked by the famous economist Richard Thaler and formed the basis of Nudge Theory, which earned him the Nobel Prize. As explained in detail in Chapter 3, according to the theory, humans are not rational beings (econs) (Thaler and Sunstein, 2008: 7). And the idea of nudge basically helps people make better judgments that are advantageous to both themselves and society by making slight changes to the circumstances around a decision. The goal of nudge is to influence people's decision-making in numerous ways by pushing them in the right direction (Delden and Persson; 2018: 2). The "right direction" part was particularly emphasized in the theory, and the importance of not ignoring ethical behavior in the process of nudging people was emphasized many times by the father of the theory. In this regard, the basic teachings of nudge theory are used to encourage certain behaviors and thus increase desired behaviors in this study to answer this specific research question. Variables related to nine different notions of nudge theory placed inside the experiment 2 to decide whether it is possible to direct people to environmentally friendly transportation options. Which are; anchoring, salient incentives, following the herd, mere-measurement effect, automatic system, collaborative filtering, mappings and feedback, contagion effect and default rule.

In addition, the process of encouraging people to use more environmentally friendly transportation alternatives also means giving up the transportation alternatives they currently use, or at least reducing their frequency of use. This situation can simply be described as an attempt to create a behavioral change in people. For this reason, the

teachings of the four laws of behavior change (make it obvious, make it attractive, make it easy, make it satisfying) model proposed by Clear (2020: 58) were also included in the model. In short, the model argues that in order to create a behavioral change, the phenomenon that people are asked to choose must first be visible to people. In other words, the first requirement is that the public transportation service via ferry that we recommend to people be visible/obvious to people. The second requirement is to make this visible service attractive to target customers and encourage them to choose this alternative at least once. Facilitating (make it easy) the purchasing process of this service (water-based public transportation service), which is made visible and attractive, is the third important rule of the process of creating behavioral change, as it will increase the customer's probability of purchasing that service.

The fourth rule of the process of creating behavior change is to make the experience satisfying. In other words, the water-based public transportation service to which people are directed must be visible, it must be attractive enough to encourage people to buy (campaign, promotion, etc.), the purchase of the service must be easy (the customer who decides to purchase the service and comes to the pier should be prevented from giving up and returning). To do it, supply problems, payment method problems, etc. must be prevented. And finally the customer who purchases and experiences the service must find the experience satisfactory, enjoy the process, in short, customer satisfaction must be ensured. After the successful implementation of these four rules, if the person who has learned a new behavior repeats this behavior a few times and these repetitions provide satisfaction/happiness to the person, this new behavior is gained by the individual and this behavior is entered into the person's automatic system as the default option. As a result, it is assumed that the behavior change process is completed successfully.

If any of these four steps is inadequate, it is necessary to determine which step is insufficient and start from that point and review the process again. In accordance with the scenario created in this study, it is aimed to encourage people to prefer water-based public transportation systems (ferry) among environmentally friendly public transportation alternatives. For this reason, it is thought that determining the reasons why people do not prefer ferry transportation will reveal which stage of the process should be improved. Since eliminating people's dissatisfaction will increase customer

satisfaction, online user comments regarding a water-based public transportation company operating in Izmir were analyzed and the main reasons causing customer dissatisfaction were revealed. Among the findings obtained as a result of online user comments analysis, customer dissatisfaction and some variables that cause customer satisfaction were used in the scenario and data collection form of experiment 2, which was prepared to discover whether it is possible to direct people.

After the virtual reality experiment was carried out on the scenario created by combining the teachings obtained from nudge theory and behavioral change creation rules and findings obtained from online user comment analysis, the questions in the data collection form prepared to collect feedback from the subjects were divided into three main groups according to their purposes;

- First group of questions: Questions aimed at guiding/nudging people (prepared for informational purposes),
- Second group of questions: Questions to learn people's possible choices after the given information/encountered situation
- Third group of questions: Questions that both provide information/explain the situation and learn about people's choices in that specific situation.

Detailed information about the questions in the data collection form directed to the experiment participants which are divided into 3 groups according to their purposes, the intelligent transportation systems applications used in the preparation of the scenario constructed in these questions, the nudge theory notions that are thought to make the process of guiding people possible, and the behavior change rules that these questions serve are shown in Table 32.

Table 32: Detailed Information about the Groups and the Aims of Questions Used in the Data Collection Form

Groups of Questions	Q	ITS Application	Notion of Nudge Theory	Behavior Change Rule
First group	Q1	-	Mere-Measurement Effect	Make it attractive
	Q4	Passenger information system Intelligent public transportation system	Default Rule, Automatic System	
Second group	Q5	-	Default Rule, Automatic System	Make it attractive
	Q7	Road information system Public transportation system Electronic toll collection system	-	Make it easy
	Q8			
	Q9			
	Q15	-	Mere-Measurement Effect	-
	Q16		-	
	Q17			
	Q18			
	Q20			
Third group	Q2	Traffic management system Passenger information system Public transportation system Intelligent public transportation system	Default Rule; Automatic System	Make it obvious, Make it easy
	Q6	Passenger information system	-	Make it attractive
	Q10	Passenger information system Traffic management system	Salient incentives,	Make it attractive
	Q11		Anchoring	
	Q12		Salient incentives	Make it satisfying
	Q13	Passenger information system	Mappings and Feedback, Contagion Effect	Make it satisfying
	Q14		Following the Herd, Collaborative Filtering	Make it obvious, Make it satisfying

Source: Prepared by author.

As shown in Table 32, there are 2 questions in the first group. The first of these (Q1) is aimed at ensuring that people express that they would prefer water-based public transportation and would even recommend it to their surroundings. Because, according

to the mere-measurement effect, if people are asked the question of what their behavior will be about a situation before that situation occurs, the behavior they will show when the situation occurs will be exactly the first answer they give if they remember the first answer they gave to the question. Therefore, this question was asked to people to answer "I use water-based public transportation and recommend it to those around me." In order to guarantee people's positive answer to this question, information about the severity of global warming, how global warming will affect the world in the near future, the importance of sustainable transportation systems, and how advantageous the ferry is over other modes of transportation (in terms of sustainability) has been added to the question. These informations also aimed to make ferry transportation attractive. As shown in Table 33, all of the experiment participants (100%) stated that they would prefer ferry transportation after obtaining this information and would recommend it to other people. People's answers to this question were measured by checking one of the questions in the second group (Q15). Q15 first reminded people of their answer to the first question, and then asked them whether they would use this intelligent ferry, integrated with intelligent transportation systems technologies that they had experienced in the simulation environment, in their daily lives and recommend it to other people. Just as predicted by the mere-measurement effect, all participants (100%) who answered the first question positively (see. Table 33) also answered this question positively and stated that they would use this intelligent ferry and recommend it to other people (brand advocacy).

The second question in the first group of questions is Q4. In the infrastructure of this question, electronic toll collection systems, classified under passenger information systems and intelligent public transportation system applications, have made it possible to have a database that will allow the business to recognize and classify customers through a mobile application belonging to the business. A business that has access to information such as customers' preferences and frequency of use of the service offered will be able to offer promotions to its customers in accordance with this data. In this question and in another question (Q5) that aims to control the outcome of this question, it is aimed to determine whether it is possible to teach people the option of using the ferry to their automatic system while giving promotions to people and ensuring customer satisfaction. People's automatic systems tend to make

uncontrolled, effortless, quick and mindless choices. According to the scenario, before entering the ferry, people were informed at the pier that the company had a new campaign and that they could purchase unlimited ferry use for 1 week for the price of 7 tickets for a limited time only. According to the data obtained, all of the experiment participants (100%) stated that they wanted to apply for this campaign. In Q5, which aims to learn the desired result of Q4, participants were asked whether they would try to meet all their transportation needs by using ferries for a week if they applied for this campaign. When the answers to this question (Q5) were analyzed, all of the participants (100%) stated that in such a situation, they would prefer the ferry for all their transportation needs during that week. The data obtained from these two questions will initiate the process of creating behavioral change by making the ferry option obvious and attractive, increase customer satisfaction, and most importantly, will save the ferry option to people's automatic system and make it the default rule. In addition to all these, it has been determined that it is possible to increase the demand for ferries with the answers given to these questions and similar promotions. It is evaluated that increasing the ferry demand can provide a solution to more than one customer dissatisfaction identified within the scope of this study (online user comment analysis). The relationship between these two analyzes will be discussed in the conclusions section of the study.

There are a total of 9 questions in the second group, which is prepared to learn people's possible choices after the given information/encountered situation. Two of these questions (Q5, Q15) were explained during the analysis of the questions in the first group. Three of the questions in the second group (Q7, Q8, Q9) were made possible by using the intelligent transportation systems technologies infrastructure listed under the headings of road information system, public transportation system and electronic toll collection system. In accordance with the scenario created in these questions, making payments through the mobile application installed on their mobile phones when entering the ferry (in this way, it will be possible for the business to recognize the customers, monitor them and provide services according to customer preferences) will have a significant impact on perceived service quality, customer satisfaction, customer loyalty and indirectly and indirectly on the customer's intention to choose again. The data obtained from the questions asked on this payment system,

which also aims to make ferry use easier, are shown in Table 29, Table 30 and Table 31. Accordingly, in the experiment, it was determined that the electronic toll collection systems with QR codes used to enter the ferry had a positive effect of 82% on perceived service quality, 74% on customer satisfaction, and 72% on customer loyalty and reuse intention. Similarly, the other 3 questions (Q16, Q17, Q18) in the second group aimed to measure the effect of the experiences the participants had throughout the entire virtual reality experiment on the perceived service quality, customer satisfaction, customer loyalty and indirectly on the customer's intention to choose again. As shown in Table 29, Table 30 and Table 31 it has been determined that the intelligent ferry travel created on the virtual reality platform positively affects the customer loyalty and desire to use the ferry again by 100%, the service quality perceived by the customers by 100% and the customer satisfaction by 92%. The last question in this group (Q20) aims to measure the effect of the relevant business having a mobile application and the ability to communicate with the ferry and people's mobile phones via IoT (Internet of Things) on customer loyalty and customers' revisit intentions. It was concluded that it positively affected customer loyalty and revisit intentions of customers by 100% (see Table 31).

Table 33: Results Regarded of Directing People to the Environment Friendly Transportation Options

		Positive		Negative		Neutral	
		frequency	**percent**	**frequency**	**percent**	**frequency**	**percent**
Q1	**First group of questions**	50	%100	-	-	-	-
Q4		50	%100	-	-	-	-
Q5	**Second group of questions**	50	%100	-	-	-	-
Q15		50	%100	-	-	-	-
Q2	**Third group of questions**	43	%86	-	-	7	%14
Q6		42	%84	8	%16	-	-
Q10		46	%92	4	%8	-	-
Q11		-	-	50	%100	-	-
Q12		48	%96	2	%4	-	-
Q13		46	%92	4	%8	-	-
Q14		33	%66	17	%34	-	-

Source: Prepared by Author

The first of these questions (Q2) uses intelligent transportation systems technologies listed under the headings of traffic management system, passenger information system, public transportation system, intelligent public transportation system. While the question places ferry transportation as the default rule in people's automatic systems, it also aims to realize two of the rules that create behavioral changes (make it obvious, make it easy). People's automatic systems tend to make uncontrolled, effortless, quick and mindless choices. When the mindless choice behavior managed by the automatic system is combined with the tendency of people to loss aversion, individuals who are asked to make a choice will be prone to prefer the "default option" offered to them by the system implementers, as they will show risk-averse behavior. According to the scenario developed within the scope of the experiment, the participants were given a 10-minute notice from the departure times of the ferries serving the routes they frequently use, if they entered a 1 km radius of the piers they frequently use, through the mobile application of the ferry company installed on their phones. It was stated that a notification would be sent to them if they allow their phone to use location information and they would be informed that the relevant ferry was about to depart. And users were asked how their likelihood of choosing a ferry as a means of transportation would be affected in such a situation. While 86% of the participants stated that being informed of upcoming ferry departures would positively affect their intention to choose the ferry, 14% stated that this notification would not affect their intention to choose the ferry. None of the participants stated that such a practice would negatively affect their intention to choose the ferry.

Another question in the third group (Q6) is about making ferry transportation attractive through an application that identifies customers with the passenger information system infrastructure and the company's mobile application, calculates the frequency of visits and offers special campaigns/incentives for individuals, and accordingly positively influence customers' intention to choose again water-based public transportation services. In this regard, during the experiment, the participants received a notification when they entered the ferry, saying "Congratulations, you have won a concert ticket for choosing the ferry for the 20th time this month". At the end of the experiment, the participants were asked whether winning this ticket had a positive

impact on their intention to choose the ferry again and 84% of the participants stated that winning a concert ticket when entering the ferry positively affected their intention to choose the ferry again.

Three different questions (Q10, Q11, Q12) in the third group were asked using the same variables. These variables include instant comparisons of ferry, bus and private vehicle alternatives in terms of duration, distance, price, CO2 and SOx emissions at the time of the participants' trip (see. Figure 13). It is made possible by variable passenger information system and traffic management system technologies, which aim to make ferry transportation attractive and satisfying (due to being environmentally friendly) by making it obvious to customers that ferry transportation is a more efficient alternative in terms of all these parameters. The first of these questions (Q10), which tests the doctrines of salient incentives, one of the nudge theory notions, aims to find out whether the participants' perception that the ferry is a cheaper, faster and more environmentally friendly form of transportation compared to other transportation options positively affects their intention to choose the ferry in their next choices. According to salient incentives notion, in free markets, it is assumed that decision makers really pay attention to the incentives in front of them. However, whether non-econ people can detect these incentives in their daily lives is open to debate. It is therefore recommended that choice architects make incentives visible. According to the answers obtained from this question, 92% of the participants stated that clearly seeing that the ferry is a cheaper, faster and more environmentally friendly transportation alternative positively affected their intention to choose the ferry on their next trip. Similarly, in Q12, it was emphasized that the same data showed the amount of time and money that users did not lose during this trip, and the participants were asked whether seeing this amount of money and time that they did not lose positively affected their customer satisfaction. 96% of the participants stated that seeing the amount of time and money they did not waste had a positive impact on their customer satisfaction. Q11 was created based on complaints about pricing (customer complaints about high ferry prices) obtained as a result of online user comment analysis. In this question, the anchoring notion of nudge theory was tested by making visible the higher prices of transportation vehicles, which are alternatives to ferries (See Figure 13). According to the anchoring approach, anchors can affect people's decision making

without people even realizing it. Although the fact that ferry fares are expensive was an important finding obtained during the online user comment analysis, it was concluded that all of the participants (100%), who saw that ferry transportation was the cheapest among all transportation alternatives during the experiment, did not think that ferry transportation fees were expensive in their answers after the experiment.

According to mappings and feedback notion, most people have trouble understanding how the savings they make today will affect themselves or the universe in the future. However, it is possible to make these abstract concepts easier to understand by transforming them into concepts that everyone can easily understand. Showing people, the possible consequences 50 years from now of the choices they make today is one way to make this possible. Making it visible that a person will suffer a great loss 20 years from now due to the choice they make now will motivate people not to perform that behavior, or visa versa. Similarly, according to contagion effect notion, the influence of social processes on human decisions is very important. That is, if people realize that a problem occurs due to their own mistakes, they will be more willing to fix that problem and mistake. In order to direct people to use water-based public transportation, Q13 was created to use and test these two concepts and to make ferry transportation satisfying. According to the scenario in the virtual reality experiment, in the closed passenger area inside the ferry, a video (dynamic message signs) was shown the passengers consisting of visuals of two different futures, the world that will exist after 50 years (the utopian version) if people use environmentally friendly transportation systems and care for the environment, and the world that will exist after 50 years (the dystopian version) if people do not maintain environmentally friendly transportation systems and harm the environment. In order to make the impact of the videos more felt on people, help was also taken from audio stimuli, and Lugwig van Beethoven's "Moonlight Sonata" was added to the background of the images of the dystopian world, and Johann Strauss II's "Tritsch Tratsch Polka" was added to the background of the images of the utopian world. At the end of the experiment, the participants were asked whether seeing that they had to make the right choices today in order for the utopian world shown in the video to exist had a positive impact on their intention to choose the ferry in their next choices, and 92% of the participants stated that their preferences were positively affected by this variable.

Similarly, in Q14, participants were shown a video in a virtual reality experiment and their feedback was obtained. A video was prepared consisting of images of people sharing the photos they took on their social media accounts in the instagramable area prepared on the upper floor of the intelligent ferry in VR environment, and information was added to the video about how people protect the environment from harm while having a pleasant time in the bay. At the end of the video, the participants were told about the confidence that they would make the right decision and protect the environment. With this variable and question, following the herd and collaborative filtering notions of nudge theory, were used. Following the herd means that people have a desire to adapt, so they are easily influenced by other people. In short, if choice architects want behavior change and aim to do it through nudges, it will suffice to inform people of what others are doing. Another notion used in that variable is collaborative filtering can be defined as the filtering of options by using the judgments of people with similar tastes when they make a choice. It is aimed to measure whether sharing the pleasant moments spent during ferry trips on people's social media accounts with their followers, just like the impact influencers have on their followers on social media, will increase the likelihood of people choosing the ferry. In addition, it is aimed to make ferry transportation obvious and satisfying with the correct use of this variable. According to the data obtained as a result of the study, 66% of the experiment participants stated that seeing people having a pleasant time in the instagramable area and sharing them on their social media accounts positively affected their intention to choose the ferry again. In this regard, the answers obtained the questions in the data collection form, answers the fourth research question. According to this; it is possible to direct people to environmentally friendly transportation options with the effective use of intelligent transportation systems.

CONCLUSION

Although the concept of "service" has been discussed academically since the 1700's (Kılıç, 1998: 6), it was only in the 1980's that the concept of "services marketing" entered the literature as it is known today (Mucuk, 1994: 317). And from the moment it entered the literature until today, the main purpose of the services marketing concept has been to increase marketing power and create better customer relations (Hole, et al., 2018: 182). In order to achieve this goal, Kotler (1994) suggested that not only customers but also company employees should be included in the services marketing concept and stated with the service marketing triangle model that customers, employees and company are the three important actors in the service marketing system (see. Figure 1). In 1996, Parasuraman emphasized the necessity of rapid adaptation of the developments in technology to the service sector and the importance of technology in service marketing, and transformed Kotler's (1994) model into a service marketing pyramid model by placing technology at the top of three important actors (see. Figure 2).

One of the most developed areas of Industry 4.0 technologies, which emerged in the 2010's and changed the direction of many sectors with the digital technologies it offered, was intelligent transportation systems. Since the 1960s, intelligent transportation systems technologies, which have been trying to increase the quality of service in the transportation sector by using basic technologies such as electronic sliding boards and cameras placed on highways, have almost stepped up with the possibility of Industry 4.0 technologies. The willingness of the bodies responsible for the transportation infrastructures of the states all over the world to integrate the technologies of intelligent transportation systems into their own transportation systems has of course increased the speed of development of both the sector and the technologies to an incredible extent.

At this point, the purpose and research questions of this study have emerged. Basically the impact of using intelligent transportation systems technologies with optimum efficiency on the service marketing sector will be analyzed detailed in this study. In this direction, the aim of the study have been established, which is to examine, a) whether it is possible to increase the perceived service quality, customer satisfaction

and customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems technologies, and b) whether it is possible to direct people to more environmentally friendly transportation alternatives (e.g. water-based public transportation) with the effective use of intelligent transportation systems technologies. To reach this specific aim qualitative and quantitative methods were used together and four scientific methods were employed; bibliometric analysis, online user comment analysis and two different virtual reality experiments.

At the beginning of the study, a solution was sought to create the environment in question in a cost-effective way in order to examine intelligent transportation systems, which are one of the high-cost infrastructure investments, and it was decided that virtual reality technology, which is also one of the Industry 4.0 technologies, is one of the most useful solutions to create the environment where the tests will be carried out. Before creating the main frame of the experiments used in the study, the usage examples and application methods of virtual reality technologies in the field of marketing were investigated in detail by referring to the existing literature. The data obtained as a result of bibliometric analysis are given in detail in the fourth part of the study. As a result of this analysis, the majority of the studies published in this field are on consumer marketing (22.73%), the number of studies on virtual reality applications in the field of marketing has increased in recent years, when the WOS research areas are examined, most of the marketing and virtual reality-based studies are listed under the title of business & economics (22.39%), and the majority of the studies in the literature have used the experiment method (30.95%). These results have led to the conclusion that the study's foundation is solid, as they showed that the virtual reality platform planned to be created within the scope of this study had been used in marketing studies before and consistent results were obtained.

After controlling the basis of the study with the help of literature and deciding that it was solid, the technical infrastructure of virtual reality applications was examined and the undisputed importance of the presence phenomenon emerged. In virtual reality literature, the feeling of being in an environment is referred to as "presence", a term derived from the term "telepresence" (Kerrebroeck, et.al; 2017). It has been concluded that the existence of a sense of presence in the virtual universe where the research questions are planned to be tested is essential for the reliability and

validity of the study. For this reason, a preliminary experiment was designed to measure the reliability, validity and perception of presence of the answers given by the participants and to find clues that will help shape the technical infrastructure of the virtual environment to be created in the main experiment (experiment 1). When the findings obtained as a result of the experiment conducted with 100 adult participants were evaluated, no significant difference was found between the participants' educational status, gender, age, whether they experienced dizziness or not, and their feelings of being in virtual reality environments. In short, the results obtained within the scope of the sample included in the study indicate that there is no difference in the feelings of being in virtual reality environments between all men and women between the ages of 18-55, with primary school to doctoral level education. This finding has been interpreted as marketing activities using virtual reality technology can appeal to a very wide target customer base. With the results obtained from this experiment, it was accepted that the analyzes to be carried out in the virtual universe where the research questions of the study were planned to be tested were reliable and valid, and the details of the technical infrastructure were decided.

After the conceptual basis of the virtual test area to be created within the scope of the study is approved by the literature and its technical infrastructure is supported by the developed virtual reality experiment (experiment 1), the focus is on the question of what variables could increase perceived service quality, customer satisfaction and customer loyalty. Starting from this point, user generated content analysis on the internet regarding a water-based public transportation service provider operating in Izmir was carried out. In the analysis that aims to identify the main variables that create customer dissatisfaction and customer satisfaction, the data obtained from www.twitter.com, www.eksisozluk.com and www.sikayetvar.com websites were analyzed through the MAXQDA 2020 (Professional Data Analysis Software for Qualitative and Mixed Methods) program. In total 440 coding was done in the data set consisting of 326 comments. Of these 440 encodings; 6 main titles were obtained as demand, complaint, suggestion, neutral, customer satisfaction and customer dissatisfaction. When code intersection model obtained from the online user comment analysis (see. Figure 22) is examined, it is seen that the complaint, suggestion, request and customer dissatisfaction headings are coded together and are related to each other.

In other words, users express their dissatisfaction as a result of their experiences, the reasons for their dissatisfaction and the things they think should be done to eliminate these dissatisfactions through their social media accounts. Administrative problems, staff related dissatisfaction, voyage cancellation, pricing, auxiliary services and failure to comply with scheduled departure times sub-headings were identified as the most frequently mentioned topics by people receiving water-based public transportation services. In addition, although it is not coded with other titles, sub-titles detected which have been repeated quite a lot in the customer dissatisfaction title and sub-headings that create customer dissatisfaction. These are; insufficient number of voyages, route inconveniency, lack of online information and inappropriate departure times. After the main reasons causing customer dissatisfaction were identified, it was decided to test these dissatisfactions in the virtual test area (virtual intelligent ferry) planned to be created within the scope of the study. For this reason, possible solutions to be tested in the experiment were also developed for these dissatisfactions, which were simplified as shown in Table 34.

Table 34: Customer Dissatisfactions in Water-Based Public Transportation and Suggested Solutions

Customer Dissatisfaction Reasons in Water-Based Public Transportation Process	**ITS integrated Solution Proposals**
Pricing	Anchoring notion of nudge theory
Problems related voyage process and routes (insufficient number of voyages, inappropriate departure times, voyage cancellation, failure to comply with the planned departure times, route inconsistency)	- Increasing demand to increase supply via various nudge theory notions - Developing a mobile application
Lack of online information	Developing a mobile application
Personnel related problems	-
Management related problems	-

Source: Prepared by Author

As shown in Table 34, the factors causing customer dissatisfaction obtained as a result of online user comment analysis are grouped under five main headings; pricing, lack of online information, problems related voyage process and routes,

personnel related problems and management related problems. Since most of the complaints and dissatisfactions examined within the scope of the study are personal and low generalizable events, and also because the ultimate goal of this study is to direct the behavior of consumers, who are the parties receiving the service, problems related to personnel and management have been ignored in this study. As shown in Table 34, the first variable obtained as a result of online user comment analysis and planned to be tested in the planned virtual test area (virtual intelligent ferry) was complaints about pricing. Since consumers found that ferry transportation fees were high, it was deemed appropriate to use the anchoring technique, one of the notions of nudge theory, to solve this problem. Thus, traveler information boards, shown in Figure 13, were placed in the virtual ferry area and it was made visible that ferry transportation fees are quite advantageous compared to other transportation alternatives. When this variable was tested on the virtual ferry, it was concluded that all of the study participants (100%) did not find ferry transportation expensive. With this finding, both the notion of the theory (pricing) was confirmed and the complaints about high prices, which is one of the most important customer complaints, were eliminated. Five variables that are frequently encountered during online user comment analysis and are basically related to voyage process; insufficient number of voyages, inappropriate departure times, voyage cancellation, failure to comply with the planned departure times, route inconsistency are combined under the title of "problems related voyage process and routes". It has been observed that the problems under this heading are generally complaints about the imbalance of supply and demand (insufficient number of voyages, inappropriate departure times, voyage cancellation, failure to comply with the planned departure times, route inconsistency). Since it is thought that the increase in demand for ferry use will increase the supply, it is thought that all of these complaints will be solved indirectly by increasing the demand for ferries. For this reason, in the planned virtual test area (virtual intelligent ferry), using the teachings of nudge theory, variables were included to increase people's use of ferries, to make them prefer ferries more, and to make this behavioral change permanent by teaching people to use ferries to their automatic system. In order to increase the demand for ferries, increasing perceived service quality, customer satisfaction and customer loyalty has been accepted as the starting point. Therefore, in the study,

research questions were created about whether it is possible to increase these three phenomena and the findings were presented. The last finding of high importance obtained from the online user comment analysis is the lack of online information. To solve this problem, it was suggested to create a mobile application for the business, which was recommended by Kotler, et al., (2017: 203) as one of the important conditions of providing customer loyalty and advocacy, and was tested within the scope of the study. When the data obtained as a result of this variable, tested under the heading of customer loyalty, was examined, it was concluded that all of the study participants (100%) stated that the presence of a mobile application belonging to the business increased their customer loyalty. Therefore, in the age of technology we live in, it has been proven that all service businesses, in particular, need to develop a mobile application for their company and keep customer loyalty alive with campaigns and promotions appropriate to customer characteristics.

Other variables used in the virtual test area (virtual intelligent ferry) planned to be created by obtaining online user comment analysis are the variables that cause customer satisfaction. Accordingly, staff related satisfaction, landscape watching, voyage frequency and SMS notification are the main elements that increase customer satisfaction. In addition, the ancillary service can be regarded as the most important factor in customer satisfaction title, cause it is coded more than and other satisfaction element and it is directly related with staff related satisfaction and landscape watching co-titles which are also highly coded titles. Because of the importance of the place of this title in the model (see. Figure 16), online user comments that coded as ancillary service, reviewed again and it is determined that 8 one of 9 comments pointed out the broadcasting classical music on the ferry. Hence, Lugwig van Beethoven's "Moonlight Sonata" and Johann Strauss II's "Tritsch Tratsch Polka" was added to the background of the images in different places inside the virtual ferry. Also, since it was determined that the ability of water-based public transport service users to watch the scenery during their travels created customer satisfaction, the virtual ferry was designed as a duplex and seascapes/landscapes were added to the upper floor.

These findings obtained from the first three analyzes carried out within the scope of the study were used in the development and implementation of the last method (experiment 2) developed to answer the research questions appropriate for the

purposes of the study. In this direction, a ferry integrated with intelligent transportation systems technologies was created in a virtual environment (VR) and study participants were asked to travel on the Bostanlı-Üçkuyular route using this ferry through virtual reality goggles. The data collected through the data collection form after this trip was analyzed in line with the purposes of the study.

The first aim of this study is determined as; a) to examine whether it is possible to increase the perceived service quality, customer satisfaction and customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems technologies. For this purpose, three research questions were created and analyzed in detail in the study. These first three questions are basically sought to answer some specific questions: "is it possible to increase the perceived service quality, customer satisfaction and customer loyalty in water-based public transportation services with the effective use of intelligent transportation systems?". To measure whether it is possible to increase the perceived service quality in the service sector with the efficient use of intelligent transportation systems technologies, two questions were asked to the participants. The first of these is about QR Code integrated boarding systems, which also help businesses identify customers and personalize the service they offer to customers, and the second is about the change in the level of service quality that participants perceive throughout their entire travel experience. While all participants of the study (100%) stated that the quality of service they perceived during their travel with the virtual ferry integrated with intelligent transportation systems increased, 82% of the participants stated that boarding systems with QR Code increased the quality of service they perceived. The positive impact of QR Code boarding systems on perceived service quality was measured as 82%, the positive impact on customer satisfaction was 74%, and the positive impact on customer loyalty was measured as 72%. When the reasons for the decrease in this rate were examined in line with the feedback received from the participants during the experiments, it was determined that the participants thought that they were exposed to QR Code systems too much and that this was no longer very effective in creating customer satisfaction and customer loyalty. However, when the feedback of nine participants who stated that electronic toll collection systems did not increase the perceived service quality was examined, it was found that these users already made

payment transactions through public transportation cards of the city they were in or credit cards, so, they were already using a different electronic toll collection system. Participants stated that they thought the system they used (credit card or public transportation card) was easier than taking out their phones, opening the application and scanning the QR code on the screen. However, when it was stated that if they make payment through the mobile application, the transportation company they use is also authorized to identify them and inform them about various campaigns related to their spending and preferences, it was learned that they would prefer to pay with the method defined for them through the application, even if it was technically more difficult. Hence, since QR Code integration also includes the use of a mobile application in addition to being a payment method, it also allows the business to get to know the customer better with its algorithms running in the background, its importance and its positive impact on service quality, customer loyalty and customer satisfaction have been confirmed by other questions asked within the scope of the study.

Apart from this, when the effect of dynamic message signs on customer satisfaction and customer loyalty was measured, it was concluded that the efficient use of DMSs was 96% successful in increasing customer satisfaction and 92% successful in increasing customer loyalty. At the end of the entire intelligent ferry experience, 92% of the participants reported that their customer satisfaction increased, while all (100%) of the participants reported that their customer loyalty increased and they wanted to experience the same experience again. Having a mobile application belonging to the business increased the customer loyalty of all participants (100%) and the proposition presented by Kotler, et al., (2017: 203) was confirmed within the scope of the study.

In light of all these findings, this study concluded that it is possible to increase perceived service quality, customer satisfaction and customer loyalty through the effective use of intelligent transportation systems technologies in businesses providing water-based public transportation services. It is evaluated that this finding, which answers the first three research questions of the study, will contribute to both the service marketing literature, the intelligent transportation systems literature, which is a relatively new subject, and the literature on public transportation, whose importance

has become more evident in these times when global warming seriously threatens the world.

Another concern of this study is sustainability, which has become one of the most important problems of our age. According to the UN (2020), nearly one-fourth of all energy-related worldwide greenhouse gas emissions are attributed to the transportation industry. Particularly, vehicle emissions are a substantial source of the nitrogen oxides (NOx) and fine particulate matter (PM2.5), which are major contributors to urban air pollution. In fact, the 11th sustainability goal determined by the UN (Goal 11: Make cities inclusive, safe, resilient and sustainable) focuses exactly on this issue. In this direction, the second aim of the study was created as; b) to examine whether it is possible to direct people to more environmentally friendly transportation alternatives (e.g. water-based public transportation) with the effective use of intelligent transportation systems technologies. And for this purpose, the fourth research question of the study was created and analyzed in detail in the study. The fourth research question of the study is decided as, "RQ-4. "Is it possible to direct people to environmentally friendly transportation options with the effective use of intelligent transportation systems?". In the scenario developed to find the answer to this question, in addition to intelligent transportation systems technologies, the teachings of nudge theory and the four rules of behavior change have been used in the process.

In order to answer this question, a virtual reality experiment was designed using the findings obtained as a result of the first three analyzes of the study, as well as certain parts of nudge theory and behavior change creation laws. Participants in this experiment traveled on a ferry with integrated intelligent transportation technologies on a virtual reality platform and gave feedback about the trip after the experiment. The feedback of the participants was obtained through a survey form, and the effect of the variables the participants encountered on the intelligent ferry on the perceived service quality, customer satisfaction, customer loyalty, as well as the customers' intention to revisit, was measured. According to this; when it was emphasized to the participants how global warming would affect the world in the near future and the importance of choosing the environmentally friendly transportation alternatives to be protected from this, and when it was stated that ferry transportation was the most environmentally friendly transportation alternative, all of the participants (100%) stated that they would

prefer ferry transportation more often and recommend it to their near circle. In order to confirm this finding, the same question was asked to them in a similar way at the end of the experiment, and again all of the participants (100%) stated that they wanted to use the intelligent ferry they simulated in the experiment in their real trips and recommend it to their near circle. At this point, another important finding obtained from the participants, one participant stated that he was in a similar choice situation two days after the experiment and that during the transportation alternative selection process, he automatically turned to the ferry due to the information he obtained in the experiment and perhaps due to conditioning. The suggestion from the participant is that he believes that giving the information given to him and the experience he gained during the experiment to younger sample groups (ex: high school students) will reveal much greater differences in terms of environmental contribution.

When a fictitious promotion is created to make ferry transportation the default option for users (pay x times, use x+y times), all participants (100%) will choose to pay x times to benefit from this promotion and will try to use ferry transportation whenever possible. To further measure the impact of the promotions, participants won concert tickets when they boarded the ferry during the experiment. And, 84% of the participants stated that winning this concert ticket positively affected their intention to choose the ferry again. The findings obtained from these variables also showed that it is possible to increase ferry demand with the help of small campaigns, and revealed that it would be a solution to all customer dissatisfaction listed under the heading "problems related voyage process and routes" obtained as a result of online user comment analysis. Also, 92% of the participants, who obtained the information conveyed to the participants through intelligent boards (see. Figure 13) placed inside the ferry and comparing the ferry, bus and private vehicle through parameters such as time spent on the ferry journey, distance traveled, price, CO2 and SOx emissions caused, stated that their intention to use again increased. In addition to this information, it was observed that customer satisfaction and revisit intentions increased by 96% when the amount of time and money they would not lose if they preferred ferry transportation was emphasized. In addition, all of the users (100%) who obtained this information stated that the ferry fees were not expensive. While one of the most important customer complaints obtained from online user comment analysis is that

prices are high, it has been revealed that this customer complaint can be prevented before it occurs when the prices of other alternatives are visibly displayed to users. Therefore, this finding is presented as a solution to an important customer complaint. In addition, users were shown scenarios about what kind of world would exist in 50 years if they used or did not use environmentally friendly transportation alternatives, and it was concluded that seeing the utopian world that could exist as a result of the choices they made today positively affected the intention of 92% of the participants to use the ferry again.

According to the results obtained from all these findings, the answer to the fourth research question of the study was reached. According to this; it is possible to direct people to environmentally friendly transportation options with the effective use of intelligent transportation systems. When we summarize the findings based on the ferry transportation example, it is possible to ensure that people choose environmentally friendly transportation alternatives when it is emphasized to the participants how global warming will affect the world in the near future and how important it is to turn to environmentally friendly transportation alternatives to be protected from this, or through promotions to encourage customers to purchase, by providing visible and understandable comparisons in terms of different parameters regarding the alternatives of the choices they will make, when the things they didn't lose because of the choices they made (time, money, etc.) are emphasized, by visibly presenting them with the possible effects of the choices they make 50 years from now. It is thought that this finding will contribute to both practice and literature, in addition to being the most important finding of the study, and undoubtedly making the world a more sustainable place.

In addition to all these, this study also sought the answer to the question of whether it is possible to contribute to the solution of service marketing gaps revealed by Parasuraman, et al. (1988) with the efficient use of intelligent transportation systems technologies strengthened by developing technologies. In this direction, the fifth research question of the study (RQ-5. Can any of the service marketing gaps (Parasuraman, 1985) be filled by using intelligent transportation systems technologies in water-based public transportation?) was created and discussed theoretically in this conclusion part of the study. It is forecasted that with the final outcome of this study

three of these gaps are going to be solved or it will become possible to solve these gaps with the help of the suggested intelligent transportation system technologies in water-based public transportation. These three gaps are; Gap 1, Gap 2 and Gap 5.

"GAP 1: The gap between consumer expectations and management perceptions: Management cannot always feel what customers want appropriately."

With the VR application and experiment model created in the scope of the study, it will be possible to find out what customers want and how companies can create a behavioral change with the help of nudge theory. In this study, it can be clearly observed what customers want from businesses that provide water-based public transportation services and which parameters/services are added to create customer satisfaction, loyalty and even brand advocacy.

"GAP 2: Gap between management perception and quality specification services: Management able to feel exactly what is desired by the consumer, but does not draw up a standard of performance certain."

With the existing intelligent transportation technologies, management can draw up a standard performance when analyzed the consumer desires correctly, at least a few problems that cause dissatisfaction can easily be solved with these technologies (ex. mobile application).

"GAP 5: The gap between expected services and perceptions of services delivered: In this case, customer expectations are influenced by the level of personal needs, word of mouth recommendations and past experiences."

With the recommended ITS technologies, findings related to online user comment analysis and the imaginary scenario of their usage, this experiment is going to try to shape personal needs and word of mouth recommendations of customers in line with nudge theory propositions and conjectures.

Finally, since virtual reality experiments were used in the application part of this study and virtual reality technology is a relatively new field in both literature and practice, it was evaluated that the findings obtained from the two virtual reality experiments would also contribute to the literature. For this purpose, a question was added to the data collection form regarding whether virtual reality/augmented reality/mixed reality applications facilitate the purchasing process and increase customer satisfaction during the service or product purchasing process. 98% of the test

participants stated that virtual reality/augmented reality/mixed reality applications increase customer satisfaction and that increasing the number of such applications will make it easier for them to make a purchasing decision. Therefore, the necessity of using mixed reality applications, which is a relatively new field that emerged with Industry 4.0, especially in the marketing sector, is supported and recommended by the study findings.

One of the important problems with virtual reality applications is complaints from users about dizziness and nausea. When we compared the results obtained from experiment 2 regarding dizziness and nausea with experiment 1, it was determined that in the second experiment, the complaint of dizziness decreased from 45% to 18%, and the complaint of nausea decreased from 10% to 4%. Since subjects may experience nausea and dizziness during virtual reality experiments, it is a frequently discussed issue in the literature, so possible causes have been focused on. When the two experiments in question were compared structurally, in experiment 1 the subjects were allowed to stand and move, while in experiment 2 the subjects were allowed to sit and to turn 360 degrees around themselves only via a chair. In the first experiment, in which an imaginary holiday scenario was created, visual effects such as sea waves or palm trees moving with the wind were emphasized in order to increase the subjects' perception of presence. In Experiment 2, in order to increase the perception of presence, emphasis was placed on sensation-oriented effects, such as making the subjects feel the wind with the help of an external fan and spraying sea scent on the experimental area, and visual effects to direct the subject's perception in virtual reality were limited as much as possible. It is predicted that these technical differences in the test images may be one of the reasons for reducing the complaints of dizziness and nausea. Finally, since it was observed that subjects who had suffered from vertigo in the past reported complaints of severe dizziness in experiment 1, subjects who had previously suffered from vertigo were not included in experiment 2. This is also thought to be a factor that reduces the dizziness complaints in the subjects. Additionally, in Table 27, it was determined that the presence value felt by individuals between the ages of 22-30 in experiment 2 was quite low compared to other age groups. To find possible reasons for this situation, the feedback obtained from the participants during the experiment was examined and it was determined that the

majority of the participants complained about the image quality. Comparing the image quality with their past experiences, the participants stated that if the resolution quality of the device used increases, their perception of presence will increase, but in this case they are unfortunately disconnected from reality. In the experiment, no other age group, including Generation Z, which was born into technology, gave feedback on image quality. The fact that this age group, representing the end of the Y generation, gave feedback on image quality was considered as one of the noteworthy findings of the study that attracted attention and should be examined with additional research.

The most important limitation of this study is that although the sample size is higher than the few experimental virtual reality studies in the literature, it is insufficient to reach generalizable inferences. Another limitation is that the study was carried out with the help of Samsung brand virtual reality goggles, a Samsung brand smartphone and an external remote control, which can be described as less professional. It is thought that experiments carried out in future studies by increasing the number of samples and using more professional and higher-cost devices with "all-in-one" features such as Oculus will contribute to the literature and practitioners greatly.

Since this study aims to direct people to more environmentally friendly transportation alternatives and find a solution to road based traffic congestion, people's choices have been tried to be directed by managing customer satisfaction, loyalty and service quality perception through the teachings of nudge theory. However, it is predicted that intelligent transportation systems will have positive effects on customer satisfaction, loyalty and service quality, even without the notions of nudge theory. Therefore, it is thought that supporting the effects of integrating intelligent transportation systems technologies into public transportation services on consumer satisfaction with similar studies and measuring the perceptions of customers who are not guided by theoretically supported notions will make a unique contribution to the literature and is recommended for future studies.

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APPENDICES

Appendix 1: Volunteer Participant Consent Form

Arş. Gör. Nergis ÖZİSPA ve Doç. Dr. Gamze ARABELEN tarafından yürütülen "***Akıllı Ulaşım Sistemlerinin Hizmet Pazarlamasında Kullanımı: Bir Sanal Gerçeklik Deneyi***" başlıklı **araştırmaya** davet edilmiş bulunuyorsunuz. Bu araştırmaya katılıp katılmama kararını vermeden önce, araştırmanın neden ve nasıl yapılacağını bilmeniz gerekmektedir. Bu nedenle bu formun okunup anlaşılması büyük önem taşımaktadır. Eğer anlayamadığınız ve sizin için açık olmayan şeyler varsa, ya da daha fazla bilgi isterseniz sorabilirsiniz. Bu çalışmaya katılmak tamamen **gönüllülük** esasına dayanmaktadır. Çalışmaya **katılmama** veya katıldıktan sonra herhangi bir anda çalışmadan **çıkma** hakkına sahipsiniz. **Çalışmayı yanıtlamanız, araştırmaya katılım için onam verdiğiniz** biçiminde yorumlanacaktır. Size verilen **formlardaki** soruları yanıtlarken kimsenin baskısı veya telkini altında olmayın. Bu formlardan elde edilecek bilgiler tamamen araştırma amacı ile kullanılacaktır.

Araştırmayla İlgili Bilgiler:

a. Araştırmanın Amacı: Doktora tez çalışmasının amacı doğrultusunda tasarlanan sanal gerçeklik deneyi kullanılarak katılımcıların deney içerisinde yer alan değişkenlere verdikleri tepkilerin incelenmesi amaçlanmaktadır.
b. Araştırmanın Nedeni: □ Bilimsel araştırma **X** Tez çalışması
c. Araştırmanın Öngörülen Süresi: 12 ay
d. Araştırmaya Katılması Beklenen Katılımcı/Gönüllü Sayısı: 100 kişi
e. Araştırmanın Yapılacağı Yer(ler): Araştırmacı tarafından deney ortamı olarak tasarlanan, katılımcının dış sesler ve nesneler ile bağlantısının olmayacağı bir ortamda, araştırmacının gözetiminde sanal gerçeklik gözlüğü yardımıyla deney yapılacaktır.

Çalışmaya Katılım Onayı:

"Yukarıda yer alan ve araştırmadan önce gönüllüye / katılımcıya verilmesi gereken bilgileri gösteren Aydınlatılmış Onam Formu adlı metni kendi anadilimde okudum ya da bana okunmasını sağladım. Bu bilgilerin içeriği ve anlamı, yazılı ve sözlü olarak açıklandı. Aklıma gelen bütün soruları sorma olanağı tanındı ve sorularıma doyurucu cevaplar aldım. Çalışmaya katılmadığım ya da katıldıktan sonra çekildiğim durumda, hiçbir yasal hakkımdan vazgeçmiş olmayacağım. Bu koşullarla, söz konusu araştırmaya hiçbir baskı ve zorlama olmaksızın gönüllü olarak katılmayı kabul ediyorum. Bu metnin imzalı bir kopyasını aldım."

Katılımcının (Kendi el yazısı ile)

Adı-Soyadı:

İmzası:

Not: *Bu form, iki nüsha halinde düzenlenir. Bu nüshalardan biri imza karşılığında gönüllü kişiye verilir, diğeri araştırmacı tarafından saklanır.*

Appendix 2: Data Gathering Form

1. "A Global Carbon Project (GCP) report published by the United Nations (UN) predicts that the increase in global temperatures will exceed 1.5 degrees in the next 9 years. Due to this increase;

- More than 10 million people will lose their homes to rising sea levels.
- The number of people who cannot or rarely have access to clean drinking water will increase by 50 percent.
- The sea level in Izmir will rise by 80 meters and the city will be completely submerged."

In the light of this information, would you approve, encourage and recommend to those around you to choose water-based public transportation, which causes less carbon emissions, safer, more environmentally friendly and has lower energy consumption than other types of transportation? **Yes/No**

2. The notification sent to your phone before the experiment started was automatically delivered to you because your phone's location services were turned on and you were close to the relevant pier. When your departure time approaches, with the help of an algorithm that can predict your movements within your daily routine, how does the notification/reminder of the upcoming ferry departure time affect your choice of ferry as a means of transportation? **Effects positively/ Effects negatively/ Does not affect**

3. Determine your degree of agreement with the statements below.

Absolutely not agree	**Not Agree**	**Neutral**	**Agree**	**Absolutely Agree**
1	**2**	**3**	**4**	**5**

		1	**2**	**3**	**4**	**5**
P1	After the experiment, I felt like I came back to the "real world" after a journey					
P2	The experiment created a new world for me, and the world suddenly disappeared when I finished the experiment					
P3	While the experiment, I felt like I was in the created world					
P4	While the experiment, I sometimes forgot that I was in the middle of an experiment					
P5	While the experiment, my body was in the room, but my mind was inside created world					
P6	That created world seemed to me only "something I saw" rather than "somewhere I visited"					
P7	While the experiment, the created world was more real or present for me compared the real world"					
P8	While the experiment, my mind was in the room, not in the created world					

4. Have you wanted to apply the "For a limited time, 1 week free ferry use for only 7 tickets. Apply now, don't miss the opportunity" campaign that you saw in the first scene of the experiment? **Yes/No**

5. If you apply for the campaign (one-time fee, unlimited transportation for a week), can you meet all your transportation needs via ferry for a week? **Yes/No**

6. You won a concert ticket for choosing the ferry for the 20th time during the experiment. Will winning this concert ticket make you prefer the ferry as your priority in your next transportation mode choice decisions? **Yes/No**

7. Did you feel that the service quality you received increased while entering the ferry by scanning the QR code with your phone? **Yes/No**

8. Did boarding the ferry by scanning a QR code using your phone positively affect your overall satisfaction with the trip? **Yes/No**

9. Did boarding the ferry by scanning the QR code with your phone positively affect your intention to use the ferry again? **Yes/No**

10. When you first entered the ferry and inside the ferry, you saw intelligent boards containing information that the ferry is the cheapest, fastest and most environmentally friendly form of transportation compared to traveling by bus and private vehicle. Did this information increase your likelihood of choosing the ferry on your next trip? **Yes/No**

11. When you first entered the ferry and inside the ferry, you saw billboards containing information that the ferry is the cheapest, fastest and most environmentally friendly form of transportation compared to traveling by bus and private vehicle. Did you think that the ferry transportation fee was expensive? **Yes/No**

12. You saw the amount of money and time you **did not lose** during this trip, through intelligent boards containing information that the ferry is the cheapest, fastest and most environmentally friendly form of transportation compared to traveling by bus and private vehicle. Did seeing the amount of time and money you **did not lose** have a positive impact on your overall satisfaction with the trip? **Yes/No**

13. In the video we watched inside the ferry, we saw that if we do not start using environmentally friendly alternatives such as ferries more during our travels, we will deprive the world of all its existing beauties after 50 years, but if we start to use environmentally friendly transportation alternatives, a recovered world that we can leave to our grandchildren after 50 years may be possible. Would knowing that we have the chance to contribute to the existence of the healthy world shown in the video make you prefer the ferry as your priority in your next transportation choices? **Yes/No**

14. On the upper floor of the ferry, you watched a video consisting of images showing how the people of Izmir saved the environment from damage by using ferries in the last month and the pleasant moments they shared on social media while enjoying the bay. Would seeing these photos shared with the hashtag "Life is on the ferry" and witnessing that people protect the environment while doing this make you prefer the ferry as your priority in your next transportation choices? **Yes/No**

15. At the beginning of the experiment, you stated that you would/would not recommend to those around you to choose public transportation by sea, which causes less carbon emissions than other types of transportation. So, would you recommend to those around you the ferry transportation that you simulated in the experiment, which is not only more environmentally friendly but also integrates intelligent transportation systems technologies? **Yes/No**

16. Considering your entire experience, would you like to use this virtual ferry equipped with intelligent transportation technologies on your real trips? **Yes/No**

17. Considering your entire experience, did you feel that the quality of service you received during your trip increased? **Yes/No**

18. Considering your entire experience, did you feel that your customer satisfaction increased during your trip? **Yes/No**

19. Do you think that experiencing this and similar simulation environments for the products and services you plan to purchase in the future will make it easier for you to make decisions and increase your customer satisfaction? **Yes/No**

20. Did the integration of the mobile application and intelligent transportation systems of the ferry company you travelled with in the experiment increase your customer loyalty and your desire to experience the same experience again? **Yes/No**

21. Did you feel dizziness during the VR experiment? **Yes/No**

22. Did you feel nausea during the VR experiment? **Yes/No**

DEMOGRAPHICS

Gender: Female ☐ Male ☐

Age: 18-21 ☐ 22-30 ☐ 31-40 ☐ 41-50 ☐ 50+ ☐

Education:

High School and below ☐
Vocational School /Associate Degree ☐
Undergraduate Degree ☐
Master Degree ☐
PhD ☐

Appendix 3: Veri Toplama Formu (Türkçe)

1. "Birleşmiş Milletler'in (BM) Küresel Karbon Projesi (GCP) tarafından yayınlanan yeni bir rapor, gelecek 9 yıl içinde küresel sıcaklıklardaki artışın 1,5 dereceyi aşacağını öngörmektedir. Bu artış sebebiyle;

- 10 milyondan fazla insan yükselen deniz seviyelerine karşı evlerini kaybedecek.
- Temiz içme suyuna erişemeyen ya da nadiren erişen insanların sayısı yüzde 50 artacak.
- İzmir'de deniz seviyesi 80m yükselecek ve şehir tamamen sular altında kalacaktır."

Bu bilgiler ışığında, Diğer taşıma türlerine göre **daha az karbon emisyonuna sebep olan, daha güvenli, daha çevre dostu ve daha düşük enerji tüketimine sahip** deniz yolu ile toplu ulaşımın tercih edilmesini onaylar, teşvik eder ve çevrenizdekilere önerir misiniz? **Evet / Hayır**

2. Deney başlamadan önce telefonunuza gönderilen bildirim telefonunuzun konum servisleri açık olduğu için ve ilgili iskeleye yakın konumda bulunduğunuz için size otomatik olarak iletildi. Sizin günlük rutininiz dahilinde hareketlerinizi tahmin edebilen bir algoritma yardımı ile hareket saatlerinize yakın, yaklaşan vapur kalkış saati bildirimi/hatırlatması ulaştırma aracı olarak vapuru tercih etmenizi nasıl etkiler? **Olumlu etkiler/ Olumsuz etkiler/ Etkilemez**

3. Aşağıda verilen ifadelere katılım derecenizi belirleyiniz.

Kesinlikle Katıl**mı**yorum	Katıl**mıy**orum	Karasızım (nötr)	Katılıyorum	Tamamen Katılıyorum
1	**2**	**3**	**4**	**5**

		1	2	3	4	5
P1	VR deneyiminden sonra, bir yolculuktan "gerçek dünyaya" geri döndüğümü hissettim.					
P2	VR benim için yeni bir dünya yarattı ve deney sona erdiğinde bu yeni dünya bir anda yok oldu.					
P3	VR deneyimi sırasında kendimi vapurun içinde hissettim.					
P4	VR deneyimi sırasında, bir deneyin ortasında olduğumu unuttuğum anlar oldu.					
P5	VR deneyi sırasında aklım yaratılan sanal dünyanın (vapurun) içindeydi.					
P6	VR deneyi sırasında vapurun içinde olduğumu **hissetmedim.**					
P7	Deney sırasında kendimi denizin ortasında, bir vapurun içinde hissettim. Vapur benim için **o an,** fiziken içinde bulunduğum odadan daha gerçekti.					
P8	VR deneyi sırasında aklım vapurda değil, bedenimin bulunduğu odadaydı.					

4. Deneyin ilk sahnesinde görmüş olduğunuz "Sınırlı bir süre için, sadece 7 bilet ücretine 1 hafta vapur kullanımı bedava. Hemen başvur fırsatları kaçırma" kampanyasına başvurmak istediniz mi? **Evet/ Hayır**

5. Kampanyaya başvurmanız halinde (tek sefer ücret ödeyerek, bir hafta sınırsız ulaşım) bir hafta boyunca tüm ulaşım ihtiyaçlarınızı vapur yoluyla sağlar mısınız? **Evet/ Hayır**

6. Deney sırasında 20. Kez vapuru tercih ettiğiniz için konser bileti kazandınız. Bu konser biletini kazanmış olmanız sonraki ulaşım seçeneklerinizde vapuru öncelikli olarak tercih etmenizi sağlar mı? **Evet / Hayır**

7. Vapura telefonunuz yardımıyla karekod okutarak giriş yaparken, aldığınız hizmetin kalitesinin arttığını hissettiniz mi? **Evet / Hayır**

8. Vapura telefonunuz yardımıyla karekod okutarak giriş yapmanız seyahate ilişkin genel memnuniyetinizi olumlu etkiledi mi? **Evet / Hayır**

9. Vapura telefonunuz yardımıyla karekod okutarak giriş yapmanız vapuru tekrar kullanma niyetinizi olumlu etkiledi mi? **Evet / Hayır**

10. Vapura ilk girdiğinizde ve vapurun içerisinde, vapurun, otobüsle ve özel araçla seyahate **kıyasla en ucuz, en hızlı ve en çevre dostu** ulaşım şekli olduğuna ilişkin bilgiler içeren billboardlar gördünüz. Bu bilgiler bir sonraki seyahatinizde vapuru tercih etme olasılığınızı arttırdı mı? **Evet / Hayır**

11. Vapurun, otobüsle ve özel araçla seyahate **kıyasla en ucuz, en hızlı ve en çevre dostu** ulaşım şekli olduğuna ilişkin bilgiler içeren billboardları gördünüz. Vapur ulaşımı ücretinin pahalı olduğunu düşündünüz mü? **Evet / Hayır**

12. Vapurun, otobüsle ve özel araçla seyahate **kıyasla en ucuz, en hızlı ve en çevre dostu** ulaşım şekli olduğuna ilişkin bilgiler içeren billboardlar sayesinde, bu seyahat sırasında kaybetmediğiniz para ve zaman miktarını gördünüz. Kaybetmediğiniz zaman ve para miktarını görmek seyahate ilişkin genel memnuniyetinizi olumlu etkiledi mi? **Evet / Hayır**

13. Vapurun içinde alt katta, seyahatlerimiz sırasında vapur gibi çevre dostu alternatifleri daha fazla kullanmaya başlamazsak 50 yıl sonra dünyayı var olan tüm güzelliklerinden yoksun bırakacak bir hale getireceğimizi, buna karşın çevre dostu ulaştırma alternatiflerine yönelirsek 50 yıl sonra torunlarımıza bırakabileceğimiz, kendini toparlamış bir dünyanın mümkün olabileceğini gösteren bir video izledik. Videoda gösterilen mutlu dünyanın var olabilmesine katkıda bulunma şansımızın olduğunu bilmek sonraki ulaşım seçeneklerinizde vapuru öncelikli olarak tercih etmenizi sağlar mı? **Evet / Hayır**

14. Vapurun üst katında İzmirlilerin son bir ayda vapur kullanarak çevreyi ne kadar zarardan kurtardıkları ve bunu yaparken körfezin tadını çıkardıkları anları sosyal medyada paylaştıkları keyifli anları içeren görüntülerden oluşan bir video izlediniz. Hayat vapurda hashtagi ile paylaşılan bu fotoğrafları görmek ve o insanların bunu yaparken çevreyi de koruduklarına şahit olmak sonraki ulaşım seçeneklerinizde vapuru öncelikli olarak tercih etmenizi sağlar mı? **Evet / Hayır**

15. Deneyin başında diğer taşıma türlerine göre daha az karbon emisyonuna sebep olan deniz yolu ile toplu ulaşımın tercih edilmesini çevrenizdekilere önereceğinizi/önermeyeceğinizi belirtmiştiniz. Peki deneyde simülasyonunu tecrübe etmiş olduğunuz daha çevre dostu olmasının yanında akıllı ulaştırma sistemleri teknolojileri de entegre edilmiş vapur ulaştırmasını çevrenizdekilere önerir misiniz? **Evet / Hayır**

16. Tüm deneyiminizi göz önünde bulundurduğunuzda yolculuk yaptığınız bu akıllı ulaştırma teknolojileri ile donatılmış sanal vapuru gerçek seyahatlerinizde de kullanmak ister miydiniz? **Evet / Hayır**

17. Tüm deneyiminizi göz önünde bulundurduğunuzda, seyahatiniz sürecinde aldığınız hizmet kalitesinin arttığını hissettiniz mi? **Evet / Hayır**

18. Tüm deneyiminizi göz önünde bulundurduğunuzda, seyahatiniz sürecinizde müşteri memnuniyetinizin arttığını hissettiniz mi? **Evet / Hayır**

19. Gelecekte, satın almayı planladığınız ürün ve hizmetlere ilişkin bu ve bunun gibi simülasyon ortamlarını tecrübe etmenin karar vermenizi kolaylaştıracağını ve müşteri memnuniyetinizi arttıracağını düşünüyor musunuz? **Evet / Hayır**

20. Deneyde seyahat ettiğiniz vapur firmasına ait mobil uygulama ve AUS, müşteri sadakatinizi ve aynı deneyimi tekrar yaşama isteğinizi arttırdı mı? **Evet / Hayır**

21. VR deneyi sırasında baş dönmesi hissettiniz mi? **Evet / Hayır**

22. VR deneyi sırasında mide bulantısı hissettiniz mi? **Evet / Hayır**

DEMOGRAFİK BÖLÜM

Cinsiyet: Kadın ☐ Erkek ☐

Yaş: 18-21 ☐ 22-30 ☐ 31-40 ☐ 41-50 ☐ 50+ ☐

Eğitim:

Lise ve altı ☐
Meslek Yüksekokulu /Ön lisans ☐
Lisans ☐
Yüksek Lisans ☐
Doktora ☐