Analysis of Consumer Behavior towards Electric Vehicles: Intentions, Concerns and Policies

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Abstract

Despite the acceptance of electric vehicles (EVs) by consumers in developed countries, consumers' intentions towards these smart devices (SD) and the steps that can be taken to expand in this market continue to be investigated in developing countries such as Turkey. In this study, policies and incentives for the purchase of Electric Vehicles in different countries were examined, consumer concerns prior to the adoption of SDs were evaluated, and then consumer intentions in adopting EVs with models such as reasoned action theory, planned behavior theory, and technology acceptance model were evaluated with bibliometric analysis through conducted studies. Data from 63 publications accessed from Scopus, Web of Science, and DergiPark databases were used in the field mapping process. The results provide insights into increasing the market share of electric vehicles, which are critical in reducing the carbon footprint, by recommending the issues that need to be highlighted to the industry and researchers.

1. INTRODUCTION

Transportation in many countries and cities has recently started to be provided by low-carbon Electric Vehicles (EVs). Among these electric vehicle types, especially Battery Electric Vehicles (BEV) are considered the most environmentally friendly and zero-emission Smart Devices (SD) [1-2]. SDs are a package in which rechargeable batteries are brought together and managed [3] and have recognized environmental benefits such as reducing air pollution and saving energy, demonstrating them as important tools to achieve the target of a green and sustainable society [4].

EVs were the most common type of vehicle on the market in the early 1900s, but the market share of such vehicles has dwindled over time, thanks to the advent of internal combustion engines and efficient manufacturing methods. Transportation has become one of the biggest contributors to greenhouse gases. According to the report of the International Energy Agency, the transport sector accounts for approximately 25% of total global greenhouse gas emissions and this is expected to increase from 23% to 50% by 2030 (IEA, 2020). Therefore, transportation is an important obstacle to the realization of sustainable economies. Considering that a fuel demand of up to 40% is expected by 2035, it is predicted that vehicle use will contribute significantly to air pollution and the greenhouse effect. In the traditional sense, transportation has been dependent on petroleum fuel [5]. Today, most vehicles are powered by internal combustion engines and use fossil fuels, which account for 23% of global CO_2 emissions from the transportation sector. Due to concerns about global warming, the auto industry is under pressure to reduce its carbon footprint. In the last decade, biofuel-compatible engines, vehicles using alternative fuels such as liquid petroleum gas and compressed natural gas, as well as hybrid electric vehicles based on fossil fuels but with a lower carbon footprint, have been introduced [6]. Users face new technologies that carry risks and benefits that need to be adopted. EVs are an important and innovative technology and are expected to revolutionize the automobile industry and benefit the environment. A 2015 study reports that passenger cars are responsible

for around 60% of carbon emissions in the transportation sector and that EVs are a viable way to reduce carbon emissions. Similarly, the 2020 Electric Vehicle Outlook Report published by BloombergNEF estimates that EVs will account for 10% of global passenger car sales in 2025, 28% in 2030, and 58% in 2040 [7].

In most countries, the number of smart devices in the automobile market is still very low compared to the number of conventional internal combustion engine vehicles, but consumers' buying behavior for these vehicles in terms of environmental and economic benefits continues to increase exponentially [8]. Reasoned Action Theory (TRA) is a social psychology-based theory developed to better understand the relationships between attitudes, intentions, and behaviors of people who can make their own decisions [9]. This theory is based on assumptions about human behavior. Planned Behavior Theory (TPB) was proposed in 1991 to predict and solve the mystery of consumer behavior after the TRA theory [10]. Both theories are based on the premise that individuals make logical and reasoned decisions to engage in certain behaviors by evaluating the information provided to them. However, TPB has been modified by adding perceived behavioral control to TRA because individuals' behavior is not entirely voluntary and cannot always be controlled. The Technology Acceptance Model (TAM) theory explains the adoption of new technologies by people and evaluates the relationships between them by adding the perceived usefulness and perceived ease of use to the attitudes, intentions, and behaviors of users created based on TRA [11]. TAM's goal is to unravel the factors that influence consumers' adoption of new technologies. The study by [12] was conducted using a variety of methods to identify factors that facilitate or compel human adoption of SDs, and to identify consumer adoption [13], purchase [14], and usage [15] intentions. Consumers' intention to use electric and hybrid vehicles is related to how well factors such as technology perception, price, availability, and information are controlled. These social and psychological factors are explained by TRA, which is explored further in TPB Theory. These theories help identify factors that influence consumer behavior. The main factor identified in the literature was that confidence in new EVs is higher than in conventional diesel or petrol vehicles. A strong purchase intention ultimately increases the probability of eventual action. Behavioral attitudes that affect the purchase of electric vehicles positively or negatively can be classified. The positive aspects of electric vehicles are factors such as their environmental friendliness, low operating costs, and the existence of government policies to reduce purchasing costs. The downsides are several factors, such as the difficulty of battery recycling, limitations in the use of renewable energy sources, and less mileage.

Conducted by [16] a bibliometric and thematic analysis of 254 studies on consumer behavior in the EV market. In this regard, a clear systematization of the different research aspects related to EV consumer behavior was performed. As a result, it was found that the use of electric vehicles is still not able to fully replace other motor vehicles. However, developing countries such as Turkey were not included among the countries included in the analyses. In Turkey, which has an emerging SD market, opportunities for the consumer, manufacturer, and politician can be identified by examining consumer intentions toward EVs. The data of the study conducted on the key factors affecting market share and adoption of EVs such as incentives, policies, and additional socio-economic factors [17], and the EV market share of 20 countries were collected considering the information on policies and incentives, published reports, and electronic database. In this context, random effects model analysis was used to investigate the effects of various factors on the EV market share between 2015 and 2019. The results of the study showed that tax deduction policy, charger density, and revenue had significant positive effects on EV market entry percentages. However, except for developing countries such as Turkey, the evaluation was made on the countries that had the highest SDs.

Investigated by [18] the effects of altruism on EV adoption as an environmentally responsible behavior and aimed to identify the factors that affect consumers' EV usage intentions. To do this, a model based on TPB was developed. Experimental analysis was performed by using a structural equation model for factors affecting EV purchase intention with surveys of potential consumers in Malaysia. According to the results, perceived value, attitude, responsibility, subjective norms, personal norms, perceived consumer effectiveness and awareness of results significantly and positively affected consumers' EV purchase intentions.

Regarding consumers' intentions toward EVs, researchers in Turkey focused on the domestic and national production of these smart devices [19–21]. In this context, consumer purchase intentions for domestic SDs

were evaluated; it was ensured that consumers' purchasing intentions were evaluated in terms of proximity to their own culture and innovative features of EVs and examined by [22] whether socio-economic factors affect EV sales. Electric vehicle sales figures from 12 countries between 2012 and 2015 and per capita income, population density, education level, urbanization rates, oil prices, electric vehicle market share, and renewable energy production variables of these countries were used. As a result of the study conducted with Unbalanced Panel Data Analysis, it was found that the education level of the country, urbanization, renewable energy production, and oil prices affected the sales of electric vehicles statistically. In addition, it has been determined that the variable that has the highest effect on electric vehicle sales, among the statistically significant variables, is the urbanization variable. However, Turkey was not considered among these countries.

Conducted by [23] a study to determine the usage intentions of consumers for EVs, factors related to vehicle characteristics, environmental factors, social-symbolic factors, and political-marketing factors were evaluated on the scale of Turkey. Using TPB as a method, the study showed that hybrid vehicles are close to conventional vehicles from a consumer point of view, but consumer intentions toward EVs depend on a very complex decision-making process. As a result, it was found that the adoption of SDs is early in Turkey and the usage intention of consumers is examined.

Focused by [24] on examining the behavioral intentions of the consumer according to their demographic characteristics, their degree of personal innovation, their perceived price sensitivity, and their perception of technological risk. To better understand innovative consumer behavior, factors affecting adoption and factors affecting innovation were discussed for potential EE users in Germany and Turkey, and an analysis of the factors affecting users' behavioral intentions was made with the TAM.

Proposed by [25] an expanded TPB (E- TPB) model by adding Environmental Concerns (EC) and Green Trust (GT) to the TPB Framework to examine consumer-purchasing intentions of EVs in Turkey. Behavioral patterns affecting consumers' purchasing intentions were investigated by using the E-TPB Model. As a result, it was found that traditional TPB components and EC and GT behavioral constructs were positively related to EV purchase intentions. However, participants using traditional vehicles in two different metropolitan areas were enrolled in the survey. Also, the status of consumers' experience and usage information on SDs was not specified.

Investigated by [26] consumers' intentions to purchase EVs in terms of perceived price value and environmental concerns. Also, a different research model was developed and used, except for TRA, TPB, TAM, and the extended versions of these models. Correlation and regression analyzes were made to determine whether the purchase intention differed significantly between some groups utilizing an online survey. It was found that consumers' evaluations of EVs, their perceived price value, and environmental concerns had a statistically significant and positive effect on the intention to purchase Electric Vehicles. However, when looking at participants' intentions toward Hybrid Electric Vehicles or SDs, the survey and findings were evaluated without any distinction between these two vehicle types.

Focused by [27] on the effect of innovativeness as one of the personality traits of consumers and the need to be unique in the intention to buy SDs. Participants were reached through an online survey in Turkey and the results were analyzed with Partial Least Squares Structural Equation Modeling. It was found that there is a positive relationship between consumers' need for uniqueness and their intention to purchase SDs.

Used by [28] an online survey to evaluate the importance of consumer behavioral and experimental experience in purchasing decisions for EVs. As a result, he reported that factors such as customer experience level, satisfaction level, acceptance, and adoption of EVs are important in consumers' purchase intention.

Most SD purchases are made by consumers in developed countries (e.g., China and the USA) followed by consumers in other developed countries (e.g., Germany and the UK) (Global EV Data Explorer, 2022). However, intentions towards EVs rather than consumer adoption must be examined in many ways in developing countries such as Turkey compared to their developed counterparts. As one of the developing countries, Turkey is in a promising position with its own domestic, national, and smart vehicles. According to the cumulative increasing data of the Turkish Statistical Institute in October, the total number of fully Electric Vehicles was around 12 thousand. However, the increasing number of charging stations across the country, government incentives, the issuance of charging station operator licenses, and the fact that smart

devices to be produced with domestic facilities will soon be on the market increase the purchase intention of consumers for SDs. Also, it is predicted in the report published by the SHURA Energy Transformation Center that Turkey's total electric vehicle stock will reach 2.5 million by 2030 [29]. As a result, it is estimated that 10% of all vehicle stock in the country will be SDs. For this reason, uncertainty remains when looking at EV adoption and consumer acceptance in Turkey concerning developed countries. However, the intentions of consumers as potential EV buyers are also a reality because SDs have great future potential in the country. In this context, in the present study, the purpose was to discover the unknown aspects of consumers as potential buyers of EVs in Turkey by looking at the intentions of sample consumers in developed and developing countries. Unlike some other studies in the literature, advantageous aspects for consumers, stakeholders, and politicians were revealed in the study by evaluating consumer intentions toward EVs in Turkey in many ways.

In the next part of the current study, the effects of the policies developed to increase the use and sales of electric vehicles in the world and Turkey are evaluated on consumer intentions and the concerns that prevent consumers from adopting electrical devices are tried to be revealed. With the bibliometric analysis carried out in the study, the critical factors affecting the intentions of consumers as potential EV users in Turkey were determined by looking at the consumer intentions in the world. In the discussion section, prominent issues for consumer adoption of SDs in Turkey were evaluated, and in the conclusion section, studies that could be done for the decarbonization of Turkey were suggested to the industry and academicians in light of the current findings.

2.1. Policies for EV Sales and Usage in the World

Electric Vehicles (EVs) are considered effective technological innovations that help reduce environmental problems from road traffic emissions. EVs only run on chemical energy stored in rechargeable battery packs and have zero exhaust emissions. In addition to environmental benefits, EVs also provide economic benefits due to purchasing incentives and lower operating costs. Despite the growing interest and environmental and economic benefits of EVs, their market share among other motor vehicles is still small in many countries. The Chinese Government has taken various measures to promote the use of Electric Vehicles to reduce air pollution. With faster economic growth and urbanization, the demand for private vehicles has increased. However, the market share of Electric Vehicles is still low and one of the most important reasons for this is that users are worried about being stuck in the middle of the journey due to the limited charging time and driving distance of Electric Vehicles. In addition, charging the batteries of Electric Vehicles in the middle of the journey also creates discomfort for users [30]. Another method implemented by governments to promote the widespread use of Electric Vehicles is to make them economically competitive in the current market. To this end, many countries (members of the Electric Vehicle Initiative (EVI)) are implementing policies to encourage the adoption of electric vehicles. For example, the US Federal Government has set aside $7.5 billion to encourage the production and purchase of Electric Vehicles by 2019. Similarly, the Chinese Government spent a total of 33.4 billion Chinese Yuan between 2013 and 2015 to promote the adoption of electric vehicles. However, it has been determined that people do not prefer to have environmentalist beliefs and to buy electric vehicles [31]. The Chinese Government has implemented a series of fiscal incentive policies to increase the market share of Electric Vehicles and encourage consumers to adopt EVs. The Chinese Government has implemented the "Energy Conservation and Electric Vehicle Strategy" and conducted pilot programs to directly encourage EV buyers. Other financial incentives (e.g. tax exemptions and toll exemptions) have also been applied. Despite these efforts and supportive incentives, consumers' willingness to adopt EVs remains low and the market share of EVs remains relatively small. According to a report by the China Automobile Manufacturers Association, total vehicle sales exceeded 28 million at the end of 2016 and Electric Vehicle sales were only 409,000 units. The market share of Electric Vehicles in China was only 1.46%. This dilemma shows that EVs conflict with "hot policy" and "cold market" not only in China but also in other developed countries [32–34]. Not only freight but also passenger transport in Brazil is largely based on road transport. The transportation sector constitutes 33% of the country's total energy consumption and 93% of this amount is road transport. This sector also accounts for 81.6% of diesel consumption in the country. The automotive sector plays a high role in terms of production, consumption, and energy expenditures related to electric vehicles both at the national and global level, but it does not follow the energy and mobility trends of leading countries such as Brazil, China, the USA, and India. Currently, China has the world's largest electric car market, followed by the United States and

Europe. Many countries have phased out fossil fuel vehicles, and most are scheduled to ban the sale of internal combustion vehicles by 2030. Despite being part of such major agreements, Brazil has not taken any major steps to phase out combustion engine vehicles and promote electromobility [35]. Denmark has exempted electric vehicles from the vehicle registration tax, one of the world's highest taxes. The exemption was valid until 2016, when an electric vehicle registration tax scheme was implemented for vehicles with internal combustion engines, starting at 20% and gradually increasing to 150%. The Danish Government decided to halt the planned increase in the electric vehicle registration tax in 2018 and currently keeps it at 20%. Compensated through tax deductions of up to DKK 400,000 in 2019 and 2020. That's why the after-tax selling price of electric vehicles was similar in Norway and Denmark until 2016 and was similar in 2019-2020, except for the most expensive brands [36]. The transportation sector is the country's second-largest pollutant and carbon emissions from motor vehicles directly affect global environmental problems and the consumption of natural resources in Malaysia, which is one of the developing countries. It also plays an important role in reducing carbon emissions from motor vehicles to reduce the possibility of environmental problems. It is emphasized that the method called electrification of electric vehicles and road transport is considered a positive step towards replacing internal combustion vehicles with electric vehicles and ensuring urban sustainability. However, electric vehicle sales remain at a low level in Malaysia. One of the reasons for this is considered to be that electric vehicles are expensive. Also, the insufficient number of charging stations in the country and the short lifespan of electric vehicles are considered obstacles to the adoption of Electric Vehicles. The fact that a very high proportion of cars are domestically produced in Malaysia may also hinder the adoption of Electric Vehicles. To accelerate the adoption of electric vehicles in Malaysia, the country's government is implementing tax reductions for electric vehicles and similar measures to encourage the sale of electric vehicles [37–39].

Pakistan is exposed to climate change as one of the most vulnerable countries in the whole world. The annual average temperature and precipitation were severely affected in the country. Carbon dioxide coming from fossil fuels can be harmful to human health and cause disease spread through contaminated floodwaters. If no action is taken against climate change, the average temperature is expected to increase by 3°C in Pakistan. Although Pakistan promised to reduce greenhouse gas emissions by 20% by 2030 at the SAARC Summit, little effort has been made to manufacture and distribute electric cars in Pakistan. Economic conditions do not improve and environmental conditions suffer. The sale and use of Electric Vehicles in Pakistan are practically non-existent. There are no electric two-wheeled or four-wheeled vehicles in the private market, and Pakistan does not have the infrastructure to charge such vehicles [40].

Although Taiwan is Asia's fifth largest economy, it has high urbanization and automobile potential, which exacerbates environmental problems. Therefore, the Taiwanese Government has created a broad strategy aimed at promoting green energy-oriented transport to reduce greenhouse gas emissions. For example, the Taipei City Government launched its free electric ridesharing service "Ucar" in March 2018, which aims to operate on a small scale during the trial period using an integrated TRA and TAM model to test consumers' motivation [41]. The Thai Government has also implemented various incentives to promote the production and use of Electric Vehicles (EVs). These incentives included a 0% tariff on fully manufactured imported EVs and a 10-year corporate tax exemption for companies investing in electric vehicles to help auto companies test market demand before building a large-scale manufacturing facility. In addition, SCT reduction was made to encourage car buyers to buy electric vehicles. All these policies were aimed at meeting the government's target of having 1.2 million electric vehicles in Thailand by 2036. The government set a national economic strategy called "Thailand 4.0" in 2015 to support economic growth through innovative industries and targeted the green car industry [42]. Similarly, the Republic of Ghana has committed to reducing its carbon dioxide emissions by 15% by 2030 in the 2015 Paris Agreement [43-44]. India ranks 3rd in the worldwide CO_2 emission list and its emissions increased by 4.8% to 2.9 billion tons in 2018, with the automobile sector accounting for 87% of total emissions. For this reason, India needs energy-efficient and cleaner vehicles for a sustainable automobile scenario to contribute to climate change [45]. The market share of electric vehicles accounts for only 1% of total vehicle sales in India, most of which (95%) are two-wheeled vehicles. The Indian government reduced its 100% electric vehicle target to 30% by 2030. The biggest obstacles preventing electric vehicles from becoming more common in India include price, diversity, and changing infrastructure. For this reason, the slow growth rate of the electric vehicle sector in India shows the need for more detailed research [46].

In Indonesia, it is estimated that personal vehicles will be needed for people's mobility along with rapid economic growth and increasing urbanization. The transport sector is one of the major contributors to CO2 emissions in Indonesia and is second only to the industry sector. People's need for transportation is expected to increase with the rapid economic growth (5%) and high urbanization rate expected in 2022 after the pandemic. According to the Indonesian Central Bureau of Statistics, private vehicle ownership (e.g., motorcycles, cars, buses, and freight transport) is increasing steadily at more than 5% per year, which shows that the private vehicle market is still relatively high. Also, Presidential Regulation No. 55 of 2019 on the Acceleration Program of Battery Electric Vehicles for Road Transport was published in 2019 to establish a legal umbrella for electric vehicle development in Indonesia. This regulation enabled several ministries to initiate electric vehicle projects in the country [47].

According to the U.S.A. Energy Information Administration, international oil supplies are supplied by members of the Organization of Petroleum Exporting Countries (mainly Saudi Arabia and Iraq). As the largest oil consumer in the Middle East, Saudi Arabia shows increasing domestic consumption to power its manufacturing and transportation sectors. The CEO of the National Oil Company, Saudi Aramco, stated that "If there is no improvement in energy efficiency, domestic fluid demand will accelerate to exceed 8 million barrels of oil equivalent per day by 2030". For this reason, it is important to use energy more efficiently in various sectors of the country, especially in transportation. Many factors are driving the adoption of more efficient vehicles, such as hybrid electric vehicles, including global warming, foreign dependency, and possible oil shortages. Poor air quality can be affected by transport systems, greenhouse gas emissions, and other sources, affect health and productivity negatively and cause national economic losses. Vehicles are a major source of air pollution in Saudi Arabia and cause approximately 66% of carbon monoxide pollutants and 50% of nitrogen oxides and hydrocarbon pollutants.

Saudi Arabia is the largest importer of vehicles in the Middle East with import levels skyrocketing in recent years. Because of demographic factors, high disposable income, and low fuel prices, the US-Saudi Arabia Business Council notes that local vehicle manufacturing demand is predicting a positive outlook, triggering many ambitious local vehicle manufacturing initiatives to support this demand. The Saudi Arabian government introduced unleaded gasoline to solve the problem of reducing emissions and pollution and enacted a policy in 2009 requiring vehicle manufacturers and distributors to report appropriate fuel economy data on all new vehicles and prohibiting the importation of vehicles older than 5 years of age. However, fuel consumption is still rising steadily in Saudi Arabia and pushing emission levels to an all-time high. For this reason, novel and fuel-efficient technologies must be adopted in the transportation sector. Especially the adoption of HEVs will be a particularly effective step in reducing fuel consumption in Saudi Arabia and a stepping stone towards meeting global energy demand, which will help Saudi Arabia take a more sustainable path towards global warming by reducing emissions. Also, the adoption of HEVs might contribute to improving air quality in the country. For this reason, the adoption of HEVs in Saudi Arabia will yield several benefits with it [48–50].

The popularity of electric vehicles has increased in Turkey in recent years. According to the Automotive Distributors Association (ADA) report, 2846 electric vehicles were sold in Turkey in 2021. When compared to the previous year, this figure is an increase of 238%. In the first half of 2021, 2.6 million electric vehicles were sold globally an increase of 160% when compared to the same period last year. In a scenario in line with the Paris Agreement, it is estimated that worldwide sales of electric vehicles will exceed one billion by the year 2050. Recent studies show that although the electric vehicle market is still small in Turkey, there has been a proportional increase in annual sales in recent years when hybrid vehicles are considered, and the electric vehicles introduced to the market by Turkey's Automobile Enterprise Group (TOGG) may bring with it a rapid growth trend in the market. Also, it is emphasized that electric vehicles need further improvement with technological developments and extensive research is needed for their acceptance by consumers. However, studies on the acceptance of electric vehicles (especially TOGG and green vehicle purchase intention) are still limited in Turkey. Sales of electric vehicles continue to increase in Turkey in recent years, and a growing trend in the market is expected with the effect of electric vehicles to be launched by the Turkish Automobile Initiative Group (TOGG). According to the data of the International Renewable Energy Agency, although the global electric vehicle market was 8 million at the end of 2019, it is expected to reach 1 billion 100 million units by 2050.

On the other hand, consumers' demand shifted from fuel vehicles to electric vehicles, and countries' bans on driving vehicles with gasoline and diesel engines also contributed to the growth of the electric vehicle market. These bans encourage and force investments in electric vehicle production [51-52]. Electric and hybrid electric vehicle sales increased when compared to the previous year. Electric vehicle sales in Turkey are shown in Table 1 according to years [53]. Despite the low share of electric vehicles, 30% of all passenger vehicles are expected to be electric by 2032 worldwide. More than ten different electric vehicle models are on sale in the Turkish market. This number tends to increase over time with the number of electric vehicle charging stations.

Table 1. *The number of vehicles by year in Turkey according to engine types*

Years	Total	Benzine (%)	Diesel (%)	LPG (%)	Hybrid (%)	Electric (%)	Unknown (%)
2004	5400440	75.2	4.7	14.7	-	-	5.4
2005	5772745	67.3	6.8	21.8	-	-	4.1
2006	6140992	62.5	9.5	24.8	-	-	3.2
2007	6472156	57.4	11.8	28.2	-	-	2.6
2008	6796629	52.0	13.9	32.6	-	-	1.5
2009	7093964	47.6	15.7	35.6	-	-	1.2
2010	7544871	42.3	18.3	38.4	-	-	0.9
2011	8113111	37.4	21.6	40.2	0.0	0.0	0.8
2012	8648875	33.9	24.3	41.3	0.0	0.0	0.6
2013	9283923	31.1	26.9	41.5	0.0	0.0	0.5
2014	9857915	29.0	29.2	41.4	0.0	0.0	0.4
2015	10589337	27.6	31.6	40.3	0.0	0.0	0.4
2016	11317998	26.8	33.6	39.2	0.0	0.0	0.4
2017	12035978	25.9	35.4	38.4	0.0	0.0	0.3
2018	12398190	24.9	36.8	37.9	0.0	0.0	0.3
2019	12503049	24.2	38.1	37.3	0.1	0.0	0.3
2020	13099041	24.4	38.3	36.7	0.3	0.0	0.3
2021	13706065	25.5	37.6	35.9	0.6	0.0	0.3
2022	14213013	26.7	36.9	35.1	0.9	0.1	0.3

1.2. Consumer Concerns and Intentions for EVs in the World

This study is aimed to determine the important variables that are the antecedents of consumer intention, based on studies including TRA theory, TPB theory, and TAM model and their modifications.

First, there are some concerns raised by consumers about electric vehicles around the world, the most important of which are the nature of EVs and charging infrastructures.

Range concern: One of the major concerns about EVs is the limited range they can travel on one single charge. This can be a concern for people who constantly drive long distances or do not have easy access to charging stations.

Cost: EVs may be more expensive at first purchase than conventional petrol vehicles. This may be a concern for some consumers.

Charging stations: The availability of charging stations can be a concern for some users, especially in areas with limited infrastructure.

Battery life: Battery life is a concern for some users because it is expensive to replace.

Performance: Some users may be concerned about underperformance when compared to conventional petrol vehicles, such as acceleration or control.

Environmental impact: Some users may be concerned about the environmental impact of electric vehicles, such as the materials used to manufacture batteries. In addition, some chemicals used in battery production can have negative effects on the environment. Battery manufacturers are trying to take measures to control materials that may cause adverse effects on the environment during the production process so that they do not harm the environment. Some metals and metal derivatives used in battery production are filtered in wastewater and air by using specially designed industrial filters to reduce their negative effects on the environment, such as the electricity source used for charging.

Power generation plants using fossil fuels such as coal, oil, or natural gas can cause air pollution and climate change. For this reason, it is important whether the electrical energy used by electric vehicle charging stations has negative effects on the environment. However, the negative effects of electric vehicle charging stations on the environment do not depend only on energy sources. Depending on the location, design, and installation of these stations, they can have adverse environmental impacts. For example, areas, where charging stations are built for electric vehicles, can destroy natural habitats. In addition, the design and installation of these stations may have the potential to harm the environment. For electric vehicle charging stations not to have negative effects on the environment, the locations, designs, and installations of these stations should be planned correctly. In addition, it is important to use renewable energy sources so that the energy sources used in electricity production do not have negative effects on the environment [54-55].

Secondly, government policies directly affect the intention to purchase, use and adopt EVs. Here, incentives and subsidies specific to EVs come first.

Subsidy: A subsidy for electric vehicles (EVs) is a financial assistance given by the government of a country or region to purchase EVs. This assistance can increase adoption intention by reducing the initial cost of EVs. However, cutting the subsidy may reduce the intention to adopt, as EVs may become more difficult to purchase as potential buyers fail to take advantage of financial incentives. The cut of the subsidy may affect the intention to adopt, especially if it is designed as a long-term plan [56-57]. Understanding the role of people in EV purchase intention with surveys can help companies and policymakers better understand the motivations and needs of Italian youth and develop strategies for EV adoption. They can determine the importance of electric vehicle purchase intention by analyzing the survey results along with potential barriers to adoption, such as concerns over the cost and availability of charging stations [58-59]. The fact that the prices of electric vehicles are generally higher than gasoline vehicles is a factor that makes it difficult for low- and middle-income people to buy them. However, electric vehicles have advantages such as less maintenance and lower fuel costs. Subsidies and other incentives are often implemented by governments and other institutions to encourage the sale of electric vehicles. These incentives make electric vehicles more affordable and more attractive to low- and middle-income people.

Thirdly, although some consumers have high intentions to purchase EVs, demographic-independent variables can also be an obstacle to activating one's potential behavior. Income level, which is a demographic characteristic of a person, is an important factor affecting people's opinions about purchasing electric vehicles. Incentives and subsidies by governments and other institutions are important to make low- and middle-income people become more enthusiastic to purchase these vehicles [60]. The choice of a person considering the purchase of an electric vehicle may be oriented toward both rational reasons and norms. People consider purchasing an electric vehicle for rational reasons such as low fuel costs, low maintenance requirements, and environmental advantages. However, there may be other factors that influence an individual's choice to purchase an electric vehicle. Purchasing an electric vehicle may be a behavior in line with the norms of adopting these vehicles in society. Also, purchasing an electric vehicle may be a choice for which they want to be respected in their environment and society. For this reason, the choice of purchasing an electric vehicle can be for both rational reasons and norms. Although rational reasons may be related to features such as low fuel costs, low maintenance requirements, and environmental advantages of vehicles, normative reasons may be about behavior following the norms of adopting these vehicles in society [61–63].

In addition to these factors, the policies and preferences of individuals are also of great importance. The following different factors may have an impact on the establishment of a low-emissions environment as a political choice.

Age: In general, individuals in the older population may be less likely to cite low-emission charging zones as a political preference. Therefore, the attitudes of older audiences towards the adoption of hybrid and electric vehicles may be less positive.

Income level: Low-income individuals are less likely to care about policies for low-emission charging zones; Their attitudes toward the adoption of hybrid and electric vehicles may be less positive.

Level of education: Individuals with lower levels of education may have less positive attitudes toward the adoption of hybrid and electric vehicles.

Residential area: The probability of voting for low-emission charging zones is also related to where individuals live. For example, individuals living in cities may be more likely to stand out in their political preferences for low-emission charging zones than those living in rural areas. Therefore, the attitudes of the masses living in cities towards the adoption of hybrid and electric vehicles may be more positive.

Individuals' priorities: People with more environmental concerns may be more likely to vote for low-emission charging zones. Similarly, populations with more environmental concerns about the adoption of hybrid and electric vehicles may have more positive attitudes [64, 65].

The payment parameter is an important issue for consumers to purchase electric vehicles. Payment terms can affect consumers' intention to purchase electric vehicles. Offering very long-term payment options when purchasing electric vehicles can increase consumers' purchase intention.

Payment security: Consumers' disbelief in the security of payment methods when they purchase may reduce purchase intention. Similarly, the use of unsecured payment methods during the EV purchasing process may reduce consumers' purchase intention.

Payment options: Consumers' intention to purchase electric vehicles also depends on payment options. Providing consumers with too few payment options when making a purchase can reduce purchase intention. Similarly, offering different payment options when purchasing electric vehicles can increase consumers' purchase intention [66, 67].

2. MATERIALS AND METHODS

In this study, in which the prominent issues regarding the adoption of electric vehicles, the situation in different countries regarding the level of use of these vehicles, and the measures and incentives to increase the use of these environmentally friendly vehicles are evaluated, academic publications are analyzed within the framework of prominent theories in the literature to determine consumer intentions towards EVs. The findings are shown in a systematic structure. Bibliometric analyzes were performed using Bibliometrix [68] and VOSViewer [69] software, and critical factors encountered in consumer intentions were determined with thematic analysis.

3. RESULTS

3.1. Pre-processing of the Documents

Scopus, Web of Science (WoS), which includes a wide range of reputable journals with generally accepted quality publications, and the articles on DergiPark, a database that contains national journals in Turkey supported by the Turkish Scientific Research Institution, were used to reach the articles published on the subject of "consumer intent" determined as the field of study. In the first step of the pre-processing, a collection process was performed by identifying the publications in the literature about consumers' intentions toward EVs. All possible terms for consumer intentions were used to be comprehensive in the detection of articles [70]. For this purpose, instead of search criteria with Boolean mathematics on Scopus and WoS, the following coding was used to detect articles on the subject: (TI=("electric vehicle*" OR "electric car*")) AND TS=("consumer behavior*" OR "customer behavior*" OR "Buyer*" OR "customer*" OR "consumer*") AND TS=("technology acceptance model" OR "TAM" OR "TPB" OR "theory of planned behavior" OR "Theory of Reasoned Action" OR "TRA") AND TS=(intention*). The meaning of this transaction is the main title of the electric vehicle or automobile, the subject of consumer behavior, buyer, customer or consumer, and the theory of reasoned action, theory of planned behavior, or

technology acceptance model, and containing "intention or other appendices" to show the articles to the reader. It was necessary to search using Turkish characters and words in DergiPark because it includes research at the national level. For this, abstract: electric* OR abstract: "domestic vehicle" OR abstract: "domestic car" AND abstract: intention* was written in the summary section for the search engine for a detailed search. The datasets found in this way in different file formats were standardized to be used in the Biblioshiny program. As a result of the search carried out in all databases, a total of 63 articles with consumer intentions for EVs were identified in the literature. All the details of these articles (e.g., information such as responsible author, keywords, abstract, references, author keyword plus, titles, publication years, all author names, publisher, printing house, and publication language) were brought together in R programming language and converted into a single excel file. According to the search conducted, the articles before 2014 were not included. In this study, the mapping process was created from the articles published in journals in Turkish and English in editorial and blind peer-reviewed journals. In this context, the Excel file created through the Biblioshiny interface, which is included in the Bibliometrix library developed as a package in the R programming language, was integrated into the system. As a result, summary information of the articles to be used in the analysis process is shown in Table 2.

***Table 2.** Basic information on the articles used in the analyzes*

Explanation	*Result*	*Explanation*	*Result*
Data Distribution		*Collaboration of Authors*	
Time range	*2014:2022*	*Documents with one single author*	*6*
Sources (Journals, books, etc.)	*45*	*Number of common authors per document*	*3.22*
Documents	*63*	*International common authors rate %*	*6.349*
Annual development rate %	*43.52*	*Document Type*	
The average age of the documents	*1.98*	*Article*	*55*
Average reference of each document	*25.91*	*Early view article*	*1*
References	*3767*	*Book part*	*1*
Content		*Conference article*	*4*
Indirect keywords	*314*	*Proceeding article*	*2*
Author's keywords	*208*		

VOSviewer is a scientific mapping tool for visualizing bibliometric networks. In this way, it can visualize many bibliometric network analyses such as co-founding analysis of keywords and co-authoring analysis. It also enables the extraction of important terms on a scientific topic using the text-mining function. VOSviewer builds bibliometric networks according to the degree of similarity and differences between terms using the similarity visualization algorithm. In addition, the VOSviewer software provides visualization of the usage weights of the terms used by years. The software can perform scientific visualization using many different file formats from the database, such as Web of Science, Scopus, and PubMed. In this context, co-occurrence analysis of keywords was performed using VOSviewer in section 3.2.

3.2. Co-occurrence Analysis with VOSviewer

Regarding the analysis in this study, first, the retrieved articles were converted into a .ris file type and used as input to the VOSviewer to visualize the similarities between the articles. In this way, the mapping of the articles retrieved with the VOSviewer Software was made in Figure 1 and the networks of their occurrences with the keywords were determined.

The result of the VOSviewer Analysis is expressed in the form of circles in different colors. Label and circle size is based on the weight of the item. The weight of an item is directly proportional to the item's label and circle size. For example, the weight of items is 11.26%, consumer behavior 6.92%, electric vehicle 6.13%, theory of planned behavior 6.13%, adoption intention 5.73%, purchase intention 4.94%, subjective

norm 3.36%, sales 3.16%, purchasing 2.96%, It was determined that the percentage weight of technology acceptance model 2.37%, surveys 2.37%, environmental concerns 2.37%, domestic car 1.78%, extended full 1.58%, mobility 1.58%, intention to use 1.19% and other items is below 1%.
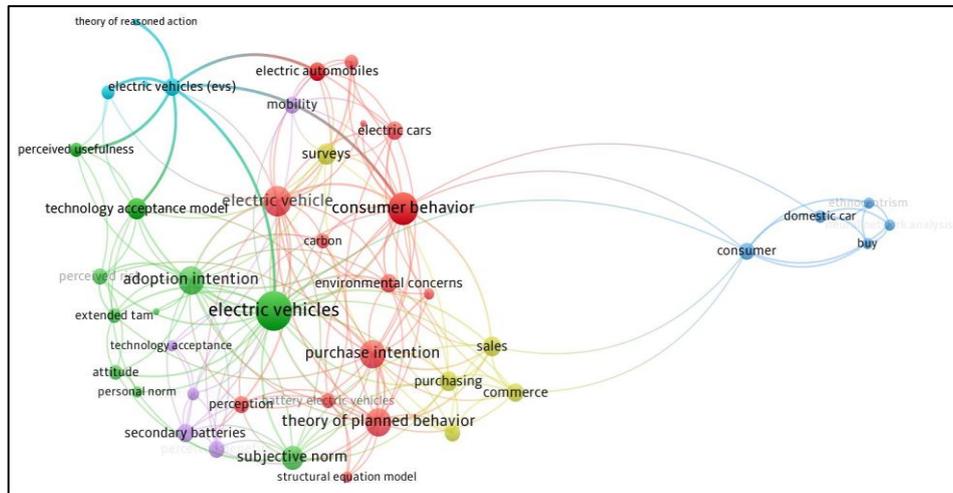

Figure 1. *The keywords and their co-occurrence in VOSviewer*

According to the co-occurrence analysis, TRA, TPB theories, and the TAM model came to the forefront in the studies conducted on consumer intentions for EVs in the world. These theories played major roles in the formation of 6 different color classes with 43 different terms. On the left in blue, electric vehicles are in formation together with reasoned action theory, consumer behavior, and sustainable development, respectively. According to the purple circles below, the usage intention of the EVs, the technology acceptance model, and the perceived benefits are information together with the secondary batteries. According to the yellow circles below, purchasing is associated with behavioral research, survey, and commerce. According to the circles given in closed blue on the right, cultural centralism consists of domestic vehicles, consumers, and purchasing. EV adoption intention, technology acceptance model, perceived usefulness, perceived risk, psychological factors, subjective values, personal moral value, attitude, and extended technology acceptance model appear to be in significant co-occurrence in the green-colored terms shown below.

Finally, in the red circles, it was determined that electric vehicles are in formation together with purchase intention, consumer behavior, structural equation model, and environmental concerns. Also, in the co-occurrence analysis, different colors and links are shown in Figure 2 to represent the associations of keywords over time from 2019 (dark blue) to 2022 (yellow).
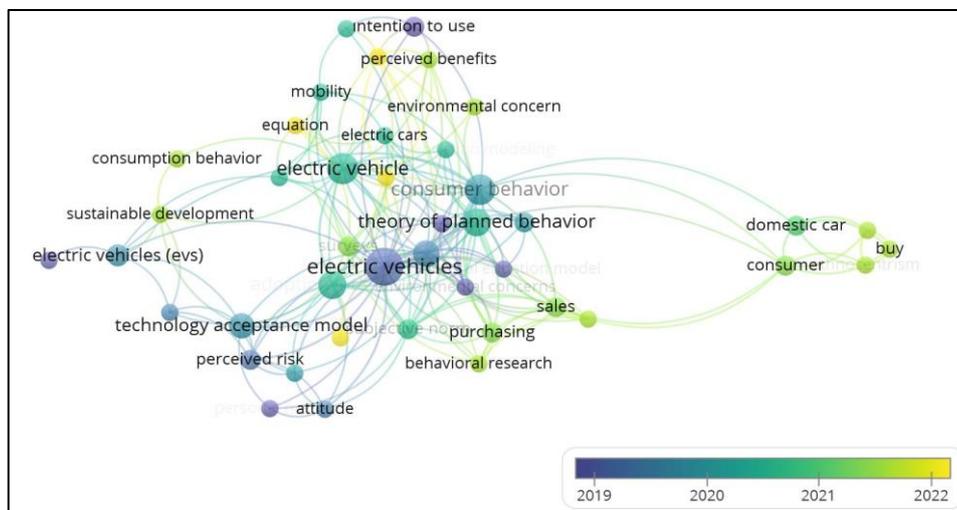

Figure 2. *The co-occurrence of the terms according to years over VOSviewer*

According to the results of the co-occurrence analysis of electric vehicles according to years, terms such as sustainable development, consumer behavior, purchasing, consumer, domestic vehicle, sales, behavioral research, perceived benefit, and environmental concerns came to the forefront. As well as these factors, the technology acceptance model, the planned behavior theory, and its modified versions were also preferred more in recent studies to determine consumer intentions towards EVs than the reasoned action theory.

3.3. Thematic Analysis

It was built based on the 10 most frequently used keywords in the three area charts. The relationship between the keywords (middle), the words in the article titles (left), and the abstract words (right) are given in Figure 3 on three area plots. The most frequently used keywords by the authors in their studies on "electric vehicles" are consumer intention, electric vehicles, consumer behavior, theory of planned behavior, hybrid electric vehicles, intention to adopt, intention to purchase, structural equation model, perceived risk, and technology acceptance model appears to be out.
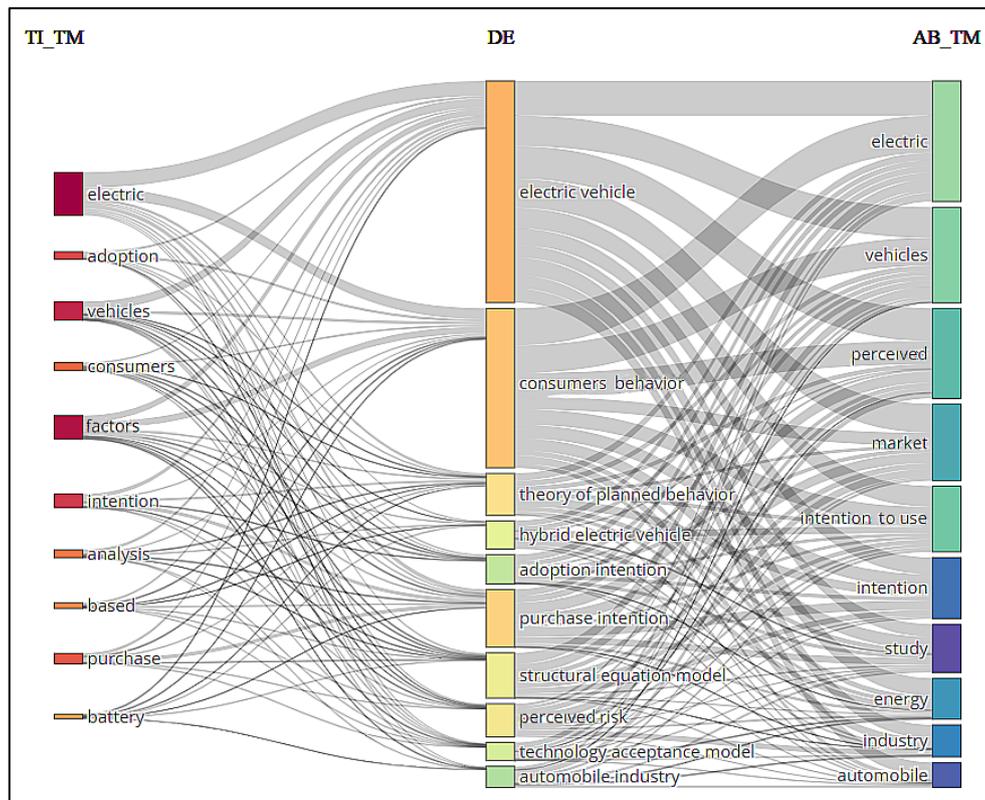

Figure 3. Three area plots between titles, keywords, and abstract

Among the study titles, it is seen that studies on the research of consumer intentions regarding the purchase and adoption of electric vehicles are predominantly carried out, and the critical issue in these studies is the batteries of EVs. It has been determined that consumer behaviors towards electric and hybrid electric vehicles in keywords are handled within the framework of adoption and purchase intention, and the perceived risk issue and various concerns about EVs are evaluated.

As can be seen in Figure 4, where the thematic evaluation of the most frequently used keywords by years is made, the prominent words between 2014 and 2019 left their place to different trend terms after 2019.
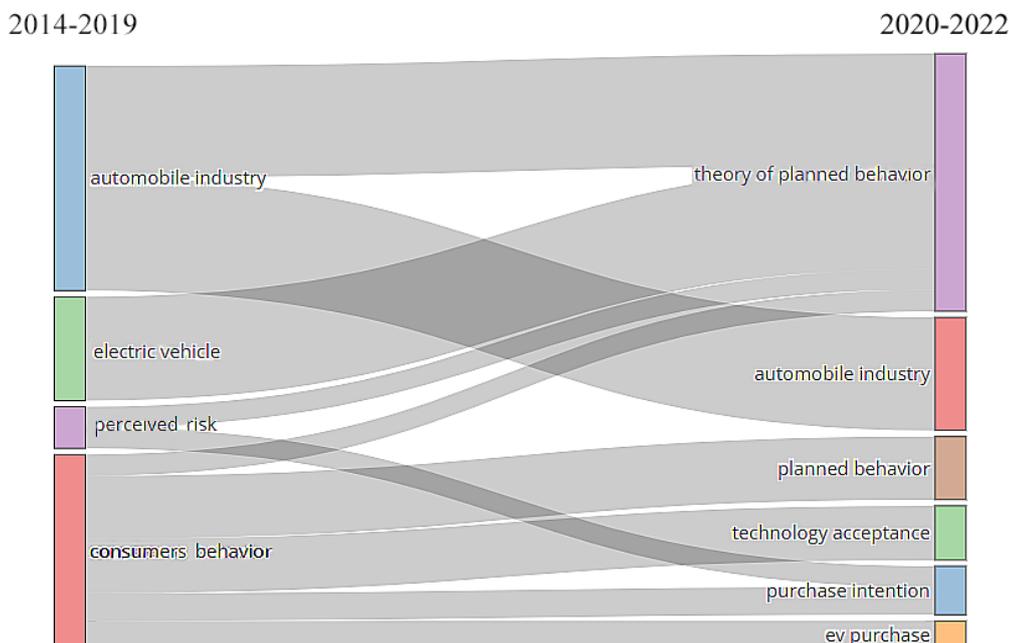

Figure 4. *The thematic evaluation of the most frequently used keywords according to years*

From the beginning of 2019, researchers examined consumer behavior and perceived risks to electric vehicles and EVs in the automotive industry, then researchers focused on the theory of planned behavior and technology acceptance models of electric vehicles in the auto industry. The most frequently used keyword in consumer intent research on EVs in today's articles is obtained objectively from the thematic evaluation of studies based on the theory of planned behavior and technology acceptance model. The Word Cloud of the title, abstract, and keywords and the word cloud of publications related to electric vehicles with the theme of consumer intentions are shown in Figure 5.

Figure 5. *Word clouds for titles, abstracts, and keywords of source publications (top: title, bottom left: abstract, bottom right: keywords)*

The first variable, in which the most recurring words were visualized in the titles of the studies conducted on consumer intention-themed electric vehicles, was determined as the most repetitive term. The following words were followed by adoption intention, vehicle adoption, consumer purchase, planned behavior,

electric vehicle purchase, technology acceptance model, consumers' intention, expanded TAM, and technological acceptance.

In the abstracts of the studies conducted on consumer intent-themed electric vehicles, the first variables, in which the most repetitive words were visualized, were the most recurring terms, the intention to adopt and the theory of planned behavior. Then, perceived risk, structural equation model, perceived usefulness, subjective norm, subjective norms, purchase intentions, technology acceptance models, behavioral control, consumer intention, incentive policies, and perceived behaviors came to the forefront in the abstracts.

The first variable (the theory of planned behavior) in which the most frequently repeated words in the keywords of the studies on consumer intention-themed electric vehicles were visualized, was determined as the most repetitive term. Then, the most frequently faced keywords were the technology acceptance model, adoption intention, perceived risk, purchase intention, consumer behavior, usage intention, reasoned action theory, environmental concern, expanded planned behavior model, expanded technology acceptance model, perceived usefulness, and structural equation. model, attitude, consumer innovation, and domestic vehicles.

The collocation networks of the above-mentioned abstract sections and keywords in studies conducted on consumer intention-themed electric vehicles are given in Figure 6. The circle sizes are larger compared to the number of terms used for all collocation networks. Also, the collocation network is expressed as circles of one color within a single cluster according to the degree of closeness of the terms.
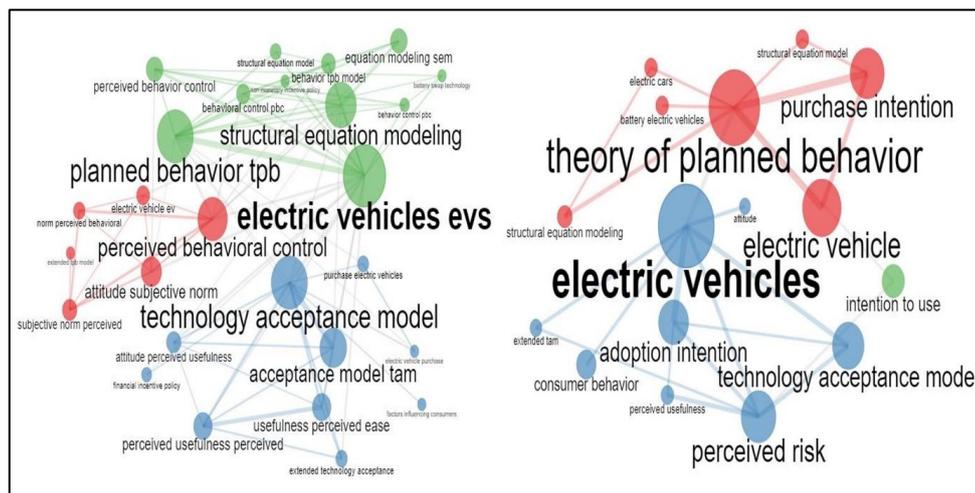

***Figure 6.** The collocation network of abstract parts (left) and collocation network of keywords (right)*

While doing this process in the abstract section, first terms were chosen as triple-word groups. When the collocation network in the abstract section is examined, regions in 3 different colors have occurred according to the degree of closeness of their terms to each other. The largest of these regions is the network where green electric vehicles, planned behavior theory, structural equation model and derivatives, perceived behavioral control, behavioral control, behavioral TPB model, battery swap technology, and non-monetary incentive policies are brought together. Next comes the network region with the largest blue color technology acceptance model, TAM, perceived usefulness in attitude, electric vehicle purchase, factors affecting consumers, perceived usefulness of convenience, perceived use, expanded technology acceptance model, and financial incentive policies. In the summary sections, the red circle shapes with the smallest collocation network include the electric vehicle, perceived behavioral control, the subjective norm in attitude, subjective norm perception, expanded planned behavior model, and norm perceived behavior terms.

When the collocation network was examined for the keywords in the same way, circle shapes in 3 different colors were formed according to the degree of closeness of the terms to each other. However, more meaningful results stand out with fewer connections than the summary section collocation network. At this point, in consumer intention-themed electric vehicle studies, electric vehicles, expanded TAM, technology acceptance model, consumer behavior, perceived usefulness, perceived risk, and attitude were found in the common network concerning the adoption intention in blue-colored shapes. On the other hand, in the red

figures, it is seen that planned behavior theory, battery electric vehicles, electric vehicles, and structural equation models, or models are closely related to purchase intention. In the literature, the intention to use green color is only related to the perceived risk and electric vehicles, so a clear interpretation cannot be given.

The first variable, in which the most recurring words are visualized in the titles of the studies on consumer intention-themed electric vehicles, was determined as the most repetitive term. The following words are followed by adoption intention, vehicle adoption, consumer purchase, planned behavior, electric vehicle purchase, technology acceptance model, consumers' intention, expanded TAM, and technological acceptance.

In the summary sections of the studies on consumer intent-themed electric vehicles, the first variables, in which the most repetitive words were visualized, were the most recurring terms, the intention to adopt, and the theory of planned behavior. Then, perceived risk, structural equation model, perceived usefulness, subjective norm, subjective norms, purchase intentions, technology acceptance models, behavioral control, consumer intention, incentive policies, and perceived behavior come to the fore in the summary section. The thematic map of the first 50 variables most frequently encountered in the keywords section of the studies on consumer intention-themed electric vehicles was created in Figure 7.

The first variable, the theory of planned behavior, in which the most frequently repeated words in the keywords of the studies on consumer intention-themed electric vehicles were visualized, was determined as the most repetitive term. Then, the most frequently encountered keywords are technology acceptance model, adoption intention, perceived risk, purchase intention, consumer behavior, usage intention, reasoned action theory, environmental concern, expanded planned behavior model, expanded technology acceptance model, perceived usefulness, and structural equation. model, attitude, consumer innovation, and domestic tools.

The collocation networks of the summary sections and keywords in studies on consumer intention-themed electric vehicles are given in Figure 7. The circle sizes shown are larger relative to the number of terms used for all collocation networks. In addition, the collocation network is expressed as circles of one color within a single cluster according to the degree of closeness of the terms.
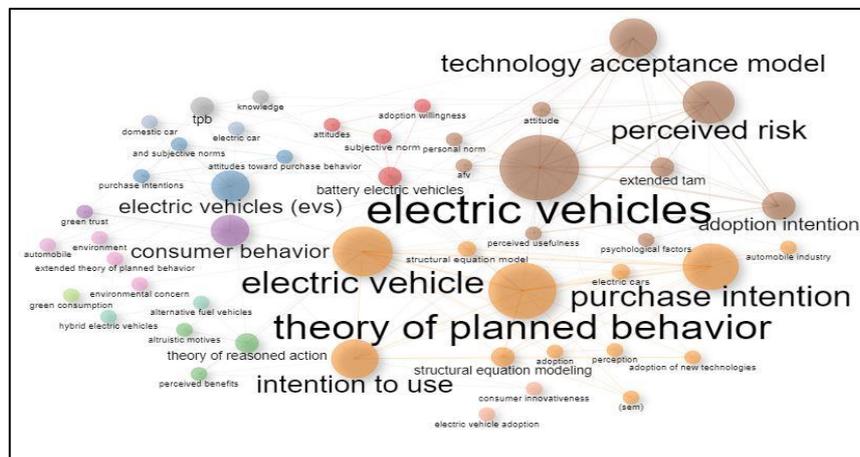

Figure 7. *The thematic map of articles examining consumer intent toward EVs*

As seen in the figure, the technology acceptance model of electric vehicles is the variable that creates the brown zone, and this model was preferred for consumers' adoption intentions. Also, the theory of planned behavior led to the formation of the orange cluster, and it became a theory that forms the basis for purchase intentions and usage intentions. The theory of reasoned action was the main variable forming the green cluster and was associated with altruistic motives and perceived benefits. The extended theory of planned behavior was the factor that played role in the creation of the cluster about the environment, green trust, green consumption, and consumer behavior. It is difficult to specify a meaningful expression because the other parts are minorities.

An analysis was made to obtain geographic information on the relational networks among those who contributed the most to the subject studied. The bibliometric analysis of the countries in which articles published on consumer intent-themed electric vehicles were published is given in Figure 8.
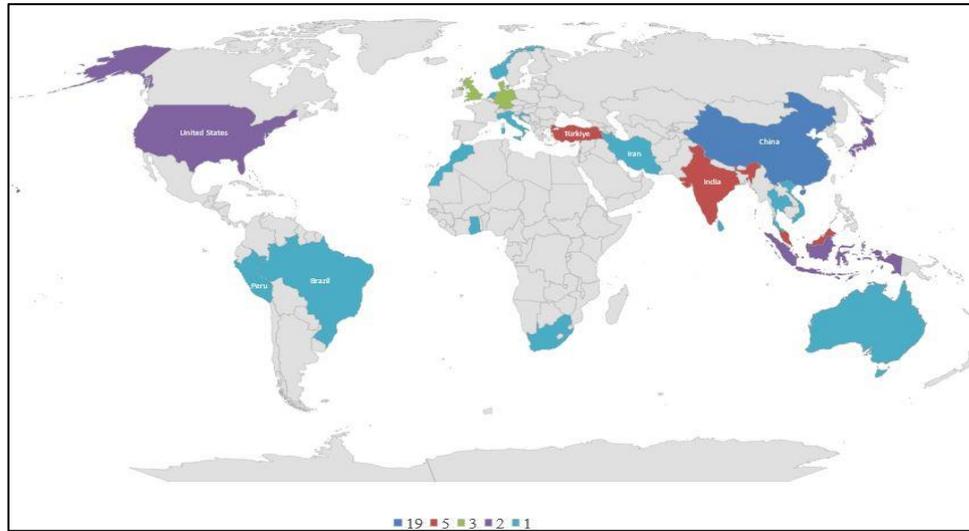

Figure 8. Prominent countries in consumer intent-themed electric vehicle surveys around the world

The number of countries' scientific production on the subject is given in this map. In this respect, China 19, Turkey 5, Malaysia 5, India 5, Germany 3, Denmark 3, United Kingdom 3, Japan 2, Indonesia 2, Korea 2, United States 2, Brazil 1, Italy 1, Norway 1, Sri Lanka 1, Iran 1, Australia 1, Croatia 1, Morocco 1, Peru 1, Thailand 1, Ghana 1, Netherlands 1, Vietnam 1, and South Africa produced 1 publication. The conceptual structure map was performed to identify critical concepts affecting consumer intentions toward electric vehicles.

According to the Multidimensional Scaling Method [71] used, the critical factors affecting consumer intentions are given in Figure 9.
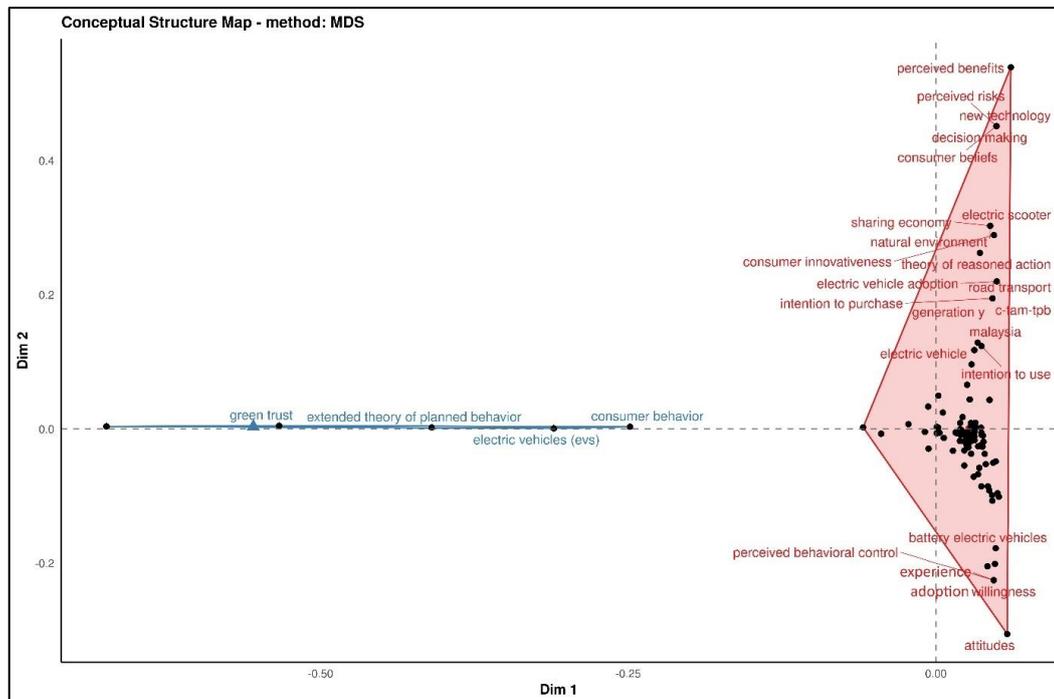

Figure 9. The critical factors identified in the conceptual structure map

When this process was done in the abstract section, firstly, terms were chosen in triple-word groups. When the collocation network in the abstract section is examined, regions in 3 different colors occurred according

to the degree of closeness of their terms to each other. The largest of these regions is the network where green electric vehicles, planned behavior theory, structural equation model and derivatives, perceived behavioral control, behavioral control, behavioral TPB model, battery swap technology, and non-monetary incentive policies. The network region with the largest blue color technology acceptance model, TAM, perceived usefulness in attitude, electric vehicle purchase, factors affecting consumers, perceived usefulness of convenience, perceived use, expanded technology acceptance model, and financial incentive policies were also detected. In the abstract sections, the red circle shapes with the smallest collocation network include the electric vehicle, perceived behavioral control, the subjective norm in attitude, subjective norm perception, expanded planned behavior model, and norm perceived behavior terms.

When the collocation network was examined for the keywords in the same way, circle shapes in 3 different colors were formed according to the degree of closeness of the terms to each other. However, more meaningful results were detected with fewer connections than the abstract section collocation network. At this point, electric vehicles, expanded TAM, technology acceptance model, consumer behavior, perceived usefulness, perceived risk, and attitude were found in the common network concerning the adoption intention in blue-colored shapes in consumer intention-themed electric vehicle studies. On the other hand, it is seen in the red figures that planned behavior theory, battery electric vehicles, electric vehicles, structural equation models or models are closely related to purchase intention. In the literature, the intention to use green color is only associated with the perceived risk and electric vehicles, and therefore, a clear interpretation cannot be given.

The thematic map of the first 50 variables most frequently found in the keywords section of the studies on consumer intention-themed electric vehicles is given in Figure 10.
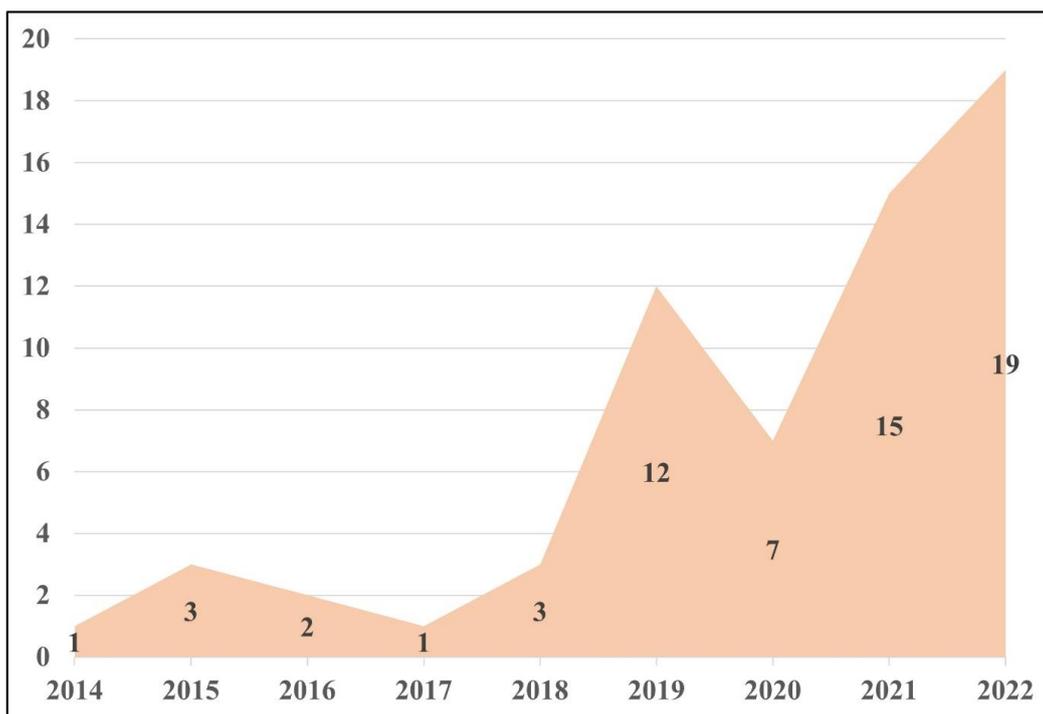

Figure 10. *The distribution of the number of articles produced on the subject according to years*

4. DISCUSSION

Consumer behavior should be examined with a scientific and systematic approach due to factors such as the growing business world, the increase in the number of consumers and they are becoming more conscious consumers and the transformation of consumption from a rational phenomenon to an emotional phenomenon. As the life cycle of products shortens, more innovations are required, and the level of consumers' adoption of these innovations is shaped by different factors.

Many factors influence consumer behavior such as values, attitudes, personality, ability, motivation, perception, and learning. It is tried to be revealed through the types of decisions that the consumers go

through which stages and what they do at these stages. The purchasing process, which includes the stages of recognizing the needs of consumers, collecting information, evaluating alternatives, purchasing decisions, and implementation and post-purchase evaluation, is evaluated with a wide variety of research.

Behavioral theories, which have developed and changed over the years with a multidisciplinary approach, are especially important in terms of evaluating the acceptance of new technologies and the innovations they bring. For this purpose, the factors affecting the adoption of electric vehicles are also discussed in terms of the intention, attitude, and behavior of consumers' approaches to electric vehicles through different models.

Eco-friendly and zero-emission electric vehicles are predicted to capture more than half of the automobile market by 2040, with promises to save energy and reduce their carbon footprint. To develop and support this increasing trend in the market, studies are carried out on various theories in the literature. Among them, the Reasoned Action Theory and Technology Acceptance Model come to the fore. Studies in the field reveal that socio-economic factors such as per capita income, population density, education level, urbanization rates, oil prices, electric vehicle market share, and renewable energy production are determinants of EV sales. Especially the education level of the country, urbanization, renewable energy production, and oil prices statistically affect electricity significantly. Studies including GET theory, PDT theory, and TAM model and their modifications try to determine important variables of consumer intention. The issues that consumers around the world are concerned about with electric vehicles are affecting the level of adoption of Evs. Range concerns, battery replacement cost, the prevalence of charging infrastructure, battery life, and performance emerge as consumer concerns. Due to the limited charging time and driving distance of electric vehicles, users are worried about being in the middle of the journey. In addition, the necessity of charging the batteries of electric vehicles in the middle of the journey creates discomfort for users. Despite the low operating costs of electric vehicles, the fact that their sales prices are higher than their peers or that there are insufficient charging stations in the country raises concerns, while increasing urbanization, payment facilities, tax reductions, and incentives increase the level of preference of Evs. Factors such as environmental impact, subsidies, age, income level, education level, place of residence, individual priorities, payment security, and payment options shape the growth rate of the market.

5. CONCLUSION AND RECOMMENDATIONS

This study has tried to reveal which behavioral models in the field come to the fore in the examination of consumers' approaches to electric vehicles, and which concepts and subjects are shaped by the studies. Such mapping studies are valuable in terms of identifying trends in the literature, identifying lost views, and guiding future studies. By revealing which subjects the studies in the literature focus on, it can be determined that the same subjects are overworked with similar theoretical frameworks and similar methods, and it can enable the subject to be examined in different dimensions. In this case, the studies carried out do not go beyond the repetitive testing of existing theories with different data sets, rather than serving to reveal the behaviors. In this respect, as in many other innovative products and services, research in terms of electric vehicles should be examined within the framework of different dimensions based on different theories.

Marketing communication, which includes all kinds of communication activities and processes established between the company and consumers, is mainly carried out to inform, persuade, empowering-supporting and make significant use of consumer behavior. In marketing communication, four independent variables are affected by source-related variables such as attracting attention, understanding, persuading, and keeping in mind, message-related variables, recipient variables, and environment. All these variables can support efforts to adopt relatively innovative technologies such as electric vehicles and increase market share efforts. Within the framework of the findings in the literature, it is possible to increase the level of adoption of environmentally friendly electric vehicles by using marketing communication tools. Expanding the market by eliminating technological, economic, etc. Concerns considering current findings will be an important step for a sustainable future.

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