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**Dissertation submitted in partial fulfilment
for degree of MSc in International Business**

TITLE:

**Artificial Intelligence Implementations in the Smartphone Industry and
their Impact on Customer Preferences (Turkey and the United Kingdom
Research)**

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Abstract :

Artificial intelligence is the general name for the study of modeling systems inspired by the way living things and humans behave. Artificial Intelligence can be deciphered as an interdisciplinary concept. Artificial intelligence relieves people's workload. Artificial intelligence technologies are attracting more and more attention every day, especially with the contribution of successful projects conducted in recent years, and research on this issue is becoming increasingly important. Artificial intelligence technologies, which have been successfully used in many sectors, have also been used in the smartphone sector. In this dissertation, the effect of artificial intelligence implementations on customer preferences in smartphones was investigated. It is thought that the research may be a source for future studies on artificial intelligence in smartphones that are becoming important, but it will also be a guide for smartphone companies.

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1-Introduction :

The artificial intelligence that people carry in their pockets is developing more and more every day. Over the past years, mobile manufacturers have joined the artificial intelligence race and started offering high-tech solutions. There are many innovations, innovations, and exciting memories in the history of smartphones. Artificial intelligence, on the other hand, is rapidly moving towards becoming the new revolution of smartphones. In order to better understand the past and present of the new artificial intelligence, studying the history of artificial intelligence will be the right starting point. The first acquaintance of science with this technology took place in 1950s, even if the settlement of artificial intelligence on smartphones dates back several years (Press,2016). It was believed that during this period there could be only three main mechanisms as talking, seeing and thinking like a person. In order to implement these three main mechanisms, computer engineers and mathematicians have been working for many years to revolutionize logic and expert systems, allowing machines to learn on their own. Despite the fact that smartphones play a big role in our lives, three main mechanisms for today's conditions will be enough for users. An artificial intelligence that removes us from touch screens, advanced photography with machine vision, filmmaking, and with it, detects users' behavior by collecting different data and optimizing their phone by determining future needs first, offers opportunities far above expectations for a great phone experience. Artificial intelligence algorithms are starting to learn which applications users use where, when and for how long, in short, these detect users behavior. Using this data, which it has learned, it adapts the phone to users needs, predicts when and how much users will need the applications, and makes them ready for use just when users need them. Artificial intelligence enables user's phone to run faster by turning off applications and features that are not used in the phone. This smart technology is able to clean applications that slow down user's system and protect user's phone in the best way. In addition, the smartphone with artificial intelligence performs all this without the user being aware of it in the background of the phone, and most importantly, it saves the user from the hassle of maintaining your phone. This means that your phone works as fast as it did the first day. That is, over time, the phone's performance does not decrease. In addition, artificial intelligence in smartphones also provides advantages in terms of battery life. The smartphone decides where to store energy, knows your behavior and habits, understands which applications to terminate. At this point, the preferences of smartphone customers come to the fore. Investments in the smartphone market are determined according to new trends. Particularly, the younger generation's transformation of mobile phones beyond a phone into a platform where they produce and consume entertainment and content stands

out. This leads to the fact that manufacturers need to transport to a much wider audience some of the features that were previously available only in the upper segment products. Features such as foldable phones, 5G connectivity, AI-powered functions, more storage space, smooth mobile gaming, face recognition, fast charging technologies are among the new trends dec the market. With the daily needs of consumers and the developing application world, a large screen and a long battery life stand out. With social media taking an important place in our lives, cameras are also becoming more and more important (Knell,2021). These trends are forcing smartphone manufacturers to compete on the use of artificial intelligence. However, it is not known whether smartphone users' knowledge about the artificial intelligence technologies they use and whether these artificial intelligence technologies affect their preferences in the process of buying a smartphone.

A study examining the implementations of artificial intelligence technology in the smartphone industry in the UK, Turkey and around the world and the effects of these applications on customer preferences has not been found in the literature. The most critical limitations of this study are the lack of data and resources. The use of artificial intelligence in smartphones does not go back to a very ancient time. For this reason, there has not yet been much research on this issue. This situation causes a lack of data. It is aimed to achieve a more realistic result by increasing the data rate available with the survey conducted in the United Kingdom and Turkey. Accordingly, the purpose of this study is to find answers to the questions of what are the areas of implementations of artificial intelligence in the smartphone industry and what kind of benefits are provided to smartphone consumers. When searching for answers to these questions, it is based on the data obtained from previous academic studies, current news stories around the sector, reports, social networks, journals and the survey study to be conducted. In this dissertation study, respectively, as a literature review, examine the concept of artificial intelligence, the historical development process of artificial intelligence, the place of artificial intelligence in businesses, and the usage areas of artificial intelligence in the smart phone industry. After that, the research method was examined and the collected data and the analyses of these data were carried out. This study is significant in terms of increasing the existing theoretical and practical knowledge in the sector, determining the information of its customers about smartphones containing artificial intelligence, and seeing the desires and needs of smartphone users about artificial intelligence. In addition, it contributes to making predictions about the future of smartphone manufacturers and helping smartphone manufacturers to take a path in this regard.

2-Literature Review :

Artificial Intelligence as Conceptual :

Artificial intelligence carries with it many capabilities such as demonstrating humanoid behavior, providing logic numerically, detecting movement, sound and speech. Thus, it incorporates software and hardware systems. Artificial intelligence is a technological characteristic that is created completely by artificial means without using a living organism and works with the working system of machines by showing humanoid movements and behaviours. From the idealistic perspective, robots are defined as robots with characteristics such as feeling, predicting behavior, making judgements, which are humanoid feelings (Duin&Bakhshi,2017). In the era when computer technologies were just emerging, 'Can machines think?' it was investigated by Alan Mathison and important steps of these machines began to be taken during this period. During World War II, artificial intelligence appeared with the development of military weapons Technologies (Copeland,2020). This development is one of the most important innovations in terms of the development of computers. In other words, artificial intelligence allows computers to think as people. When the question X is decoded to artificial intelligence, it selects and presents the most rational one among the answers to the question X that were given or defined earlier. For this reason, when it comes to the X question, each time the artificial intelligence filters the answers to the X question and presents the most rational one. Artificial intelligence is doing more than an example of the X question today (Advani,2021). It would be mistake to treat artificial intelligence under one heading. Concepts such as machine learning, deep learning are inclusive terms that edit artificial intelligence (IBM,2020). In order for artificial intelligence to create humanoid behaviors, an algorithm needs to be configured. Considering the logic of this algorithm, the capability of artificial intelligence technology to learn is significant. The capability to learn is significant in the ability of the machine order to exhibit human-specific behaviors.

Computers are also processed with numbers and symbols, just like the human brain. For example, given that there are about a million axons that go to the brain, all of these phenomena work at the same time. The fact that the brain provides many such outstanding studies attracts the attention of communicators. Although all the developments in these issues concern a small segment of people at first, when we look at it today, artificial intelligence applications that concern all disciplines reveal their weight. Artificial intelligence studies can be described as machines that are presented with tools that are not in the style of any living organism, but are not completely alive, but show human-like behavior. The concept of artificial intelligence, in fact, has an extremely ancient history. This

concept, the first steps of which are presented, has begun its development together with smartphones today. With the development of technology in the past era, the concept of artificial intelligence is taking big steps that will deeply affect every sector with the introduction of giant companies and social media (IBM,2020).

Conceptually, there are 3 types of artificial intelligence. These are artificial narrow intelligence (ANI), artificial general intelligence (AGI) and artificial super intelligence (ASI). Artificial Narrow Intelligence (ANI), also known as "weak" artificial intelligence, is the artificial intelligence that exists in the world nowadays. Artificial narrow intelligence is artificial intelligence that is programmed to perform a single task, such as analyzing raw data for controlling the weather, playing chess, or writing journalistic reports. ANI systems can participate in a task in real time, but they receive knowledge from a specific set of data. Consequently, these systems do not perform outside the single task they are designed to perform. Unlike "General" or "Super" artificial intelligence, artificial narrow intelligence; it cannot be driven by emotion, such as conscious, sensitive, or people. Artificial narrow intelligence works in a predetermined, predefined space, even if it seems much more complicated than that. Nowadays, all kinds of machine intelligence that surrounds users is artificial narrow intelligence. Siri, Google Now, Google Translate and other natural language processing tools are examples of artificial narrow intelligence. Some users may assume that these tools are not "weak" because of their ability to interact with us and process human language, but the reason they are called "Weak" artificial intelligence is that these machines are far from having human-like intelligence. Artificial Narrow Intelligence lacks the characteristics of self-awareness, consciousness and real intelligence that are appropriate for human intelligence. In other words, Artificial Narrow Intelligence can not think for itself (Dickson,2020). For example, when we chat with Siri, Siri is not a conscious machine that responds to our questions. Instead, what Siri is capable of, or is designed to do, is decode human language, input it into a search engine, and return it to the user with the results. This explains the fact that when abstract questions are asked about such topics as the meaning of life or how to approach a personal problem as Google Assistant or Siri, ambiguous answers are often received that do not make sense, or links to existing articles are received from the Internet. Moreover, when Siri is asked how the weather is outside, the correct answer is received. This is because answering basic questions about whether it is out there is between the range of intelligence that Siri is designed to work with (Jajal,2018). Secondly, Artificial General intelligence, or "Strong" artificial intelligence, refers to machines that exhibit human intelligence. In other words, artificial general intelligence is able to successfully perform any intellectual task that a person is capable of. This is the kind of artificial intelligence that we see in science fiction films, where people interact with machines and operating systems consciously, sensitively and guided by emotions and self-awareness. Nowadays, machines are able to process data quicker than humans. However people have the capability to think notionally, strategize, and take advantage of their thoughts and memories to make aware decisions or come up with creative ideas. This kind of intelligence makes people superior to machines, but it is difficult to identify. It is expected to reason from artificial

general intelligence, learn, solve problems, make decision under ambiguity, plan, integrate previous information into the decision-making process, be creative and innovative. However, in order for machines to achieve true human-like intelligence, they must be able to experience consciousness (Cheishvili,2021). Thirdly and finally, Artificial Super Intelligence (ASI) is a type of artificial intelligence that will surpass human intelligence in all aspects, from creativity to general erudition and problem solving. At this stage, artificial intelligence has a superhuman degree of ability and can perform self-learning. Artificial Super Intelligence is the kind of artificial intelligence that many people are worried about and people like Elon Musk think Artificial Super Intelligence will lead to the extinction of the human race (Cuthbertson,2020).

The Process of Development of Artificial Intelligence :

The concept of artificial intelligence is a concept as old as modern computers of the past. "Can machines think?" put the topic of intelligence up for discussion by asking the question " the person is Alan Mathison Turing (Copeland,2020). In 1943, computer technologies and artificial intelligence concepts were formed along with the development of electromechanical devices that were put into production by crypto analysis studies during the Second World War. Alan Turing conducted studies on the password algorithm of the Enigma machine (Borowska&Rzeszutko,2014). In Bletchley Park, England, decryption work began, and the computer prototypes created by Turing's work, the Heath Robinson, Bombe Computer and Colossus Computers, developed data processing logic based on Boolean algebra (BBC,2018). These machines, which have the main working order of a modern computer, have the qualities to be inspired by human intelligence through their programming work (The Telegraph,2016). But in the following processes, modern computers have been used to solve the problems of everyday life with much more specialized systems. Companies such as Apple, Microsoft, IBM, Xerox, which were described as the manufacturers of large computers after 1970s, have made computer technologies extremely popular thanks to personal computers (Dormehl,2021). As a matter of fact, artificial intelligence studies have continued to be developed by the research environment. Nowadays, such studies are supported more and more, and the Turing Test, presented under the name of Turing, is applied in the United States as the Loebner awards on software that supports machine intelligence features, and thus has success awards (Aron,2020). If the content of the Turing Test is summarized: a group of subjects created from several people with the ability to identify each other and an artificial intelligence's dialogue system allow them to chat for a while. By the end of the conversation, which is created only by correspondence, without providing face-to-face contact with each other, by looking at the questions asked to the subjects, information is obtained about which of the subjects is human and which is machine intelligence. And when you look at it, in most of the tests that have been done, people with machine intelligence are considered, while real people are thought to be machines. Neural networks that are artificial do not create programming within the framework of algorithms such as classical-style programming. It is provided that people are trained with similar examples within the framework of neural networks. Ensuring the learning of artificial neural networks is exactly the way a child learns (Reynoso,2021). For example, when a child is told not to touch a hot object, they

can touch an object that is less hot after a while. And when they see a glass full of hot milk, they hold it with their hands. In 1957, Herbert Simon said that surprising or shocking is not his goal, but the easiest way in this direction is for machines to think, learn and create in the world as of now. And even more assertively in this direction, their ability to do things will increase rapidly until the future, and the variety of problems that they can solve will be wide within the december of application in the human mind (COE,2021). One of the most well-known examples of dialogue systems on artificial intelligence, which have won the Loebner Award, is known as ALICE. The reasons why they have collected a lot of criticism about this and similar software is due to the fact that they are chatbots, which are a weighted dialogue system, since the test is based on talking about the criteria by which it is measured (Abushawar&Atwell,2015).

Sub-fields of Artificial Intelligence :

Machine Learning and Deep Learning :

The theoretical studies that were started with the aim of creating a machine that can think have formed the beginning of studies in the fields of robot design when we look at the present day. In order for robots to become self-mobile, make decisions, it is necessary to have another element called artificial intelligence in order to be able to be used without harming the beings living in it, in order for a person who cannot keep up with the speed of information information information not to back up this load (Burns,2020). In order for machine learning to be achieved, it should be remembered that the machine is an algorithm that produces logical and rational results along with the data. For instance, the receipt data that customers make purchases in a store is processed using an algorithm. When this algorithm is examined, it is revealed that customers who buy Chips also buy coke. For this purpose, chip shelves and coke cabinets are placed close to each other. In this regard, there is also a significant increase in sales (IBM,2020b).

People are socially qualified beings thanks to their innate rights and responsibilities. For many years, face to face communication has been widely used. When we look at the historical process, along with technological tools, they have developed forms of communication in the direction of technology rather than face to face communication. In this regard, the means of communication are developed and differentiated compared to technological means. In the perspective of the digital era, people with high self-control skills who have the ability to think and solve problems that can fight against the uncertainties of the future are being trained not according to the conditions of the past era, but in the perspective of the digital era (Grossfeld,2021). Artificial intelligence studies, which have not been based on much history, have had important and noteworthy dimensions today. Apple's Siri application is one of the leading experiences of this type of artificial intelligence applications. And in this direction, Microsoft Cortana and Google Now have analyzed mixed hospital records and made logical diagnoses and recommendations, IBM Watson has been able to understand their emotional states by analyzing customers' voice tones compared to customer service machines (Rodriguez,2015).

From the point of view of machine learning and deep learning, they are analogous to each other. Deep learning works in the style of neurons in the brain. It is possible to take a look at the concept of Deep learning with the example of grapes. From the point of view of machine learning, it can introduce the properties of grapes, while in deep learning, it can create its own rules. Thanks to this, it has the ability to distinguish by its own processes which ones are bananas and which ones are grapes. Artificial intelligence is the installation of some jobs that we believe are done by humans and require intelligence by humans on computers or robots and their programming. Artificial intelligence is also referred to as a branch of computer science that deals with equipping computers or machines with human mental states such as obtaining information, perceiving, reacting, making decisions and thinking. When reactive machines are examined, they have the ability to react to stimuli (Robins,2020). As an example, Deep Blue, which managed to defeat Kasparov, who became the world chess champion in 1997, can be cited (Anderson,2017). Machines react to warnings instantly and improve themselves along with the experiences they have experienced from the past era. In this case, machines also learn new acquisitions. Therefore, machine learning is a significant part of artificial intelligence. Artificial intelligence studies are high-level developments of algorithms, and understanding their inner workings is becoming complicated in this direction. In this case, it is necessary to ensure that the system is in a transparent structure, without complicating its functioning (Wolfewicz,2021).

Swarm Intelligence :

Swarm Intelligence, which is a sub-field of Artificial Intelligence that does not need learning processes, is based on the collective and herd problem solving of living things in nature, it is an optimization-oriented approach. Swarm Intelligence algorithms can be applied if real-life problems can be solved by continuous optimization or combinatorial optimization. Although the techniques in this sub-field do not need to be learned, they work iteratively and can produce intuitive solutions. In fact, since machine learning is also a kind of optimization, hybrid uses of Herd Intelligence techniques and Machine Learning are also often seen in the literature. Although there are hundreds of them in the literature, Genetic Algorithm, Particle Swarm Optimization, Artificial Bee Colony and Ant Colony Optimization are among the known Swarm Intelligence algorithms (McClean,2021).

Cybernetics :

Cybernetics, which has a relatively ancient history and is focused on the control and supervision of living and inanimate beings, has become a kind of sub-field of Artificial Intelligence today, especially with the support of different fields such as electronics, mechanical and materials engineering. Cybernetics carries out studies to improve and improve the existing characteristics of living beings or to support their lost limbs. Therefore, it assigns the 'intelligent system' approach in the context of Artificial Intelligence and can establish a close relationship with Robotics in this respect (Martelaro&Ju,2018).

Robotics :

Robotics, as is well known, is an Artificial Intelligence sub-field that deals with the design and improvement of intelligent robotic systems. Robotics, which is

currently divided into two types called soft robotics and hard robotics, can also produce solutions in connection with fields such as materials, electronics and mechanical engineering, and even fields such as biomedical and chemical engineering. Artificial Intelligence solutions based on the infrastructure of robotic improvements also receive support from different data processing solutions, such as signal processing and image processing (Wang,2017).

Artificial Intelligence Usage in Enterprises :

Nowadays, people use artificial intelligence systems to spend time, get services, have fun and conduct many routine, repetitive, time-consuming tasks. This is suggested that this does not mean that people are no longer dysfunctional or less intelligent, and that people use these “intelligent” machines to “save time and manpower” for a similar purpose to the reasons they use other machines. Currently, artificial intelligence technologies used in modern enterprises are narrow artificial intelligence systems that have a narrow field of expertise. There are many activities that businesses can perform using Artificial Intelligence. In fact, these activities arise in the form of maintaining known processes with innovative touches, evolving them, or participating in new processes in business activities. Enterprises can vary on a small, medium and large scale, and even differ greatly from each other in terms of production and service scope. The problem solutions of Artificial Intelligence are used in various fields in enterprises.

Activities carried out by people in enterprises and consisting of a number of routine processes on information and data can be carried out very quickly and consistently by Artificial Intelligence. At the same time, the inclusion of intelligent systems in routine processes has become one of the most basic strategies that enterprises follow in the direction of using Artificial Intelligence due to the fact that they complete many more routine processes per unit time, do not get tired and have more accurate results. Moreover, thanks to artificial intelligence, enterprises can improve their production stages, analyze them better, and even make them innovative by accelerating them thanks to applications such as robotics. Production-oriented enterprises can use different variations of intelligent systems at all stages, from production planning to realization, even after receiving feedback on products after production, analyzing these feedback. Service-oriented enterprises can also use Artificial Intelligence to optimally plan services, find ways to increase customer satisfaction, and ultimately improve services (Marr,2020). That is also very important for businesses to predict performance indicators in future processes. Similarly, businesses that can transfer their interactions with their customers to online environments can better guide their actions by predicting customer behavior. Performance and behavior forecasts can be on the scale of enterprises, as well as on the scale of employees. All these solutions can be operated with artificial intelligence-oriented planning. On the other hand, businesses can achieve more successful results by adding Artificial Intelligence to their promotion and access point plans. Due to their data-oriented nature, Artificial Intelligence techniques are able to effectively

answer questions such as which direction the future promotion processes of enterprises can be taken, which target audiences can be reached, and so on (Watters,2021). Another important issue for today's and future businesses is the rapid processing and evaluation of accurate data. Therefore, enterprises can transfer the management of their data to Artificial Intelligence-based systems. With this method, it can scale its processes and available data and take more consistent and efficient actions. However, it is an important problem in ensuring the security of these data. Artificial Intelligence-based solutions can also be used in the processes of enterprises for preventive and security purposes. Accordingly, actions such as ensuring the cybersecurity of data, detecting fraud, preventing violations are made possible by Artificial Intelligence (Roe,2020). As a result of businesses using Artificial Intelligence, many returns are obtained. Some of them are; developing innovative solutions, designing new business models, reducing costs, reaching more target audience, increasing profits and reducing losses, increasing customer satisfaction, increasing staff satisfaction, operation of correct decision processes, faster and more accurate production, faster and high-quality service (Polachowska,2019).

Artificial Intelligence and Smartphone Industry :

The device in which the features of PDAs, a product of the computer world, are combined with the classic mobile phone and is known as the first smartphone in history, is IBM's Simon phone. This phone, released by the United States computer giant IBM, was part mobile phone, part mini-computer, part pager, part fax machine. The first smartphone in history also had applications such as a calculator, calendar, fihrist. it can also be said that the world's first touch-screen phone, released in 1993, is the ancestor of all current smartphones (Smith,2018). In 1996, Nokia joined the smartphone market with the Nokia 9000 Communicator. This phone also went down in history as the world's first fully QWERTY keyboard mobile phone. Another interesting characteristic of the phone, which had a folding screen, was that it housed the fax key. From this mini-computer, which was pocketed with its foldable feature, 3 different models were released until 2000 (Harper,2021). Nokia, which has lost company's popularity in the smartphone market today, has taken quite innovative steps in the early days of this technology. In 1997, Ericsson, one of the biggest mobile phone manufacturers in the world in the 1990s, was responding to Nokia's 9000 series with the GS88 model. Ericsson had given the name "smartphone" to the world phone literature with the GS88 model. in 2000, a second device called the Ericsson R380 was introduced from Ericsson to the smartphone market (Kovach,2011). In 2007, the world got acquainted with an innovation that was characterized as a revolution in the history of the smartphone. Apple has released the first iPhone model in its history under the leadership of Steve Jobs. Apart from being a mobile phone, the iPhone, which was released with Apple's iOS operating system, dec both a large and touch-screen iPod and the Internet together. With the introduction of the iPhone into the industry, the smartphone industry has completely changed. This phone was setting new standards for the smartphone market. The iPhone, which has the feature of having the first touch screen in its full meaning, has become the reference point for all smartphones introduced after it (Silver,2018). In the following months, similar phones began to arrive from such world giants as Samsung, Nokia and LG. Especially after

Samsung started using the Android operating system, it made quite a lot of noise with the phones of different models that it introduced to the market. It can be said that Samsung, which has set a record in smartphone sales, is quite strong in this sector (Gold,2011).

Until 10 years ago, the most advanced technology that a mobile phone had was trying to access the Internet with a GPRS connection, while now a constantly evolving and changing technology has managed to take the phones that we only use to talk to another dimension. Realizing the need for artificial intelligence at this stage, experts have introduced artificial intelligence technology to make smartphones even smarter. This technology, which learns people's behavior, adjusts the existing system in the best way to provide a better service to consumers and offers it to users. One of the most significant applications of artificial intelligence in smartphones is voice recognition and comprehension. In voice recognition and comprehension, all spoken content is digitized by the microphone, and these sounds turn into letters, and words begin to work towards perception. Siri, which is used in an individual direction, is one of the important examples. This is a system that creates a number of actions in this direction that has voice recognition and easily detects what is being said (Saini,2019). Another of the significant characteristic of artificial intelligence in smartphones is image processing. Thanks to the camera, various images appear. In this aspect, the information power is perceived in the digital direction. The pixels of the camera are converted into a code in a digital environment. Algorithms of artificial intelligence technologies come into play in understanding these pixels. For example, thanks to the diagnostic device located on the cameras on their smartphones, algorithms have been developed in the field of health that determine whether the symptom formed on the skin is a harbinger of a bad disease or a temporary disease (Moench,2019). In addition, among the main benefits of artificial intelligence on smartphones is to analyze the behavior of users decisively and determine their needs in advance, and to provide ease of handling all our transactions by moving us away from touch screens and only talking to the smartphone. In addition, advanced photos and videos can be taken together with the artificial intelligence on the camera. As another advantage, slowing down is not seen too much on phones with artificial intelligence technology. On the other hand, artificial intelligence closes frequently used applications in the background by tracking how often they are used in the background. Thanks to this process, the phones work less and at the same time the battery usage time increases (Jacobi,2020). The presentation of these artificial intelligence advantages to users is possible thanks to processors and processor units.

The competition to use artificial intelligence technology continues decently among giant smartphone companies. At this point, mobile processor units make the difference and make some brands stand out. CPU (Central Processing Unit), GPU (Graphics Processing Unit) and NPU (Neural Processing Unit), which have appeared in recent years, are these processor units. CPU and GPU processor units are the two most important components of a smartphone. CPU is the unit responsible for processing all information about data from applications, programs and system processes that are fixed in the background. In a physical plane, it is

a unit that solves mathematical operations and interprets them in the form of instructions. As with other components, the higher the frequency and cores, the greater the information processing capacity, the higher the performance (Triggs,2019). On the other hand, the GPU, is intended to process all information about 3D and 2D graphics. Nowadays, since its interfaces are based on complex 2D and 3D maps, it needs a second unit for working with data in a solver way. In addition to games and videos, the GPU is extremely convenient for managing system animations and high-quality video recording, as well as other superficial tasks (Khan,2021). NPU, on the other hand, is a component that directly interferes with activities related to Artificial Intelligence. NPU is a technology that offers 25 times faster processing power compared to mobile processors used up to this time, and despite this advantage, it also saves up to 50 times more power in terms of power consumption. This performance comparison clearly shows how high performance a processor with an NPU can offer compared to CPU+GPU and CPU combinations (Samsungnewsroom,2019). The main point that artificial intelligence is important for is the communication that it will establish with virtual assistants on smartphones. The NPU receives instructions from the CPU for much more efficient processing of the use of Artificial Intelligence and works in a similar way to the functions of a human brain. The CPU and GPU solve the processes predefined by the system, while the NPU solves the calculations, which may vary depending on the user. These calculations can be related to processing photos in portrait mode, fixing a video in real time, calculating the distance of various objects inside the camera in 3D, or estimating the language on the keyboard (Herget,2018). However, the real key to Artificial Intelligence is precisely related to machine learning. This term refers to the ability of a particular type of system to learn the habits of using a device over time. The NPU is responsible for solving exactly these habits and acting accordingly. Activating certain functions at a certain time, speeding up the loading of the applications that we use most on a smartphone, predicting expressions on the keyboard and adjusting the battery usage according to the time of day are the functions that the NPU achieves with machine learning (Herget,2018). Deep learning, on the other hand, refers to NPU operations that do not need human intervention to be solved. It is planned that these NPU operations, which are not so common today, will be widespread in the future (SamsungNewsroom,2019). Smartphone giants are also in great competition to produce and develop processors that enable and accelerate the use of artificial intelligence. For this reason, giant companies have NPU in the chips they produce.

The A14 Bionic processor used by Apple have an NPU and Apple has used this processor in the iphone 12 series. (Khanna,2020). Since the A11 chipsets with the Bionic name, Apple has begun to include a special hardware in the chips under the name Neural Engine. This hardware, which was designed specifically to perform machine learning and artificial intelligence operations, was initially capable of performing 600 billion operations per second. This number increased to 5 trillion in A12 sets and up to 6 trillion in A13 sets. Thanks to the 16 Neural Engine cores included in the A14, the new chipset is capable of performing 11 trillion operations per second. Neural Engine will be 80% faster, while machine learning will also be 70% faster. The A14 Bionic, which is extremely ambitious, has made a difference in many ways compared to other generations and has

provided high performance on iPhones (Takahashi,2020). Moreover, Apple, which has invested heavily in artificial intelligence in recent years, has received 25 artificial intelligence initiatives in the last five years. The manufacturer of the iPhone attaches great importance to the development of Siri and making it more powerful. At the heart of all future artificial intelligence plans of the company is Siri (Esposito,2021). For this purpose, the company has transferred an administrator who previously managed Google's artificial intelligence projects. John Giannandrea, a former Google executive, now manages Apple's artificial intelligence roadmap (Axon,2021). The machine learning startup Inductiv was acquired in order to better improve Siri's data processing capabilities. The Irish company Voysis was acquired to improve Siri's understanding of natural language. PullString, on the other hand, has made it easier for iOS developers to use Siri. It is believed that during the period when Apple was focused on selling phones, the company is now making serious preparations to confront its competitors who are developing their investments in artificial intelligence. The company continues to expand its portfolio in this field by constantly acquiring new artificial intelligence startups (Burns,2020).

Huawei has announced the Kirin 9000 series processor that it uses. Inside this processor there is also an NPU (Huawei,2020). Huawei has used the Kirin 9000 processor in its Mate 40 pro smartphone series. The brand announced that the upgraded NPU has pushed the phone's artificial intelligence capabilities to newer heights, which have found application in a number of functions such as camera features, motion controls and object recognition. In particular, with gesture controls with artificial intelligence, users can interact touch free for activities such as browsing images, turning pages in an ebook, taking screenshots, and controlling audio playback (Huawei,2020c). In addition, the Kirin 9000's AI-powered super sampling technology converts low-quality videos into high-resolution content. For example, an image with a resolution of 540p becomes 1080p thanks to this technology. The technology in question also works at resolutions as low as 270p and 360p (Arbulu,2020). The laser sensor included in the Mate 40 Pro also helps with fast focusing, and low-light areas cease to be a problem when we shoot using the HDR feature as well. With the HDR feature, even if there is light from behind, the person or object being taken is illuminated with artificial intelligence. The Artificial Intelligence Tracking feature also allows you to track the object you want to focus on together with artificial intelligence. Moreover, artificial intelligence is also of great benefit in stabilizing shots and can achieve a more striking result when riding a bicycle or when it comes to having a moving moment (Huawei,2020b). Huawei Mate 40 pro series with Kirin 9000 processor has proved its strength by taking the first place as an artificial intelligence score among the smartphones released in 2020 in the AI Benchmark ranking (AIBenchmark,2021).

Samsung Exynos 990 has an NPU on Samsung Galaxy S20, S20 Plus and S20 Ultra model phones (Samsung,2020). With the Galaxy S20 series, Samsung has unveiled a new artificial intelligence-powered camera system that the company has announced has the largest image sensor to date. Space Zoom technology used a combination of Hybrid Optical Zoom and Super-Resolution Zoom, which includes an AI-powered zoom. With the artificial intelligence feature, users can

zoom up to 30 times in the S20 and S20 plus. Moreover, the S20 Ultra has used folded lenses using artificial intelligence-assisted multi-image processing to offer users a 100 times clearer image experience (Dent,2020). Users can capture important moments using the Single Take mode in the Galaxy S20 series. Artificial intelligence displays 14 different types of photos and videos in a single take within 3-10 seconds from the time of shooting. The S20 series has come with AI-motion analysis features to make the clips look like they were shot on an action camera (Samsung,2020b).

Another processor, the Snapdragon 888, provides artificial intelligence power with an NPU called the Hexagon 780. This processor was used by Xiaomi in the Xiaomi Mi 11 series of smartphones (Singh,2020). With machine learning and artificial intelligence systems, the Mi 11s can shoot clear and bright video in very low light, such as night mode on the photo side. In addition, Mi 11s are capable of recording video in 8K resolution, as is the case with high-end new phone models. The phone, which supports many artificial intelligence features such as professional mode, video log mode, cinematic lens, can also apply a sky face filter (Schneider,2020). The Xiaomi Mi 11 series showed the best artificial intelligence performance after the Kirin 9000 in 2020 with the Snapdragon 888 processor (Benchmark,2021).

Consumer Decision Making Process Model and Consumer Decision Making Styles :

In order to investigate the impact of artificial intelligence applications on customer preferences on smartphones, it is necessary to know the decision-making processes and decision-making styles of consumers when choosing a product.

Consumers decide whether to buy a smartphone by doing research for the smartphone they are going to buy. The process that has the most important place in consumer behavior is the decision-making process. The consumer decision-making process shows how this choice is made and how the choice occurs when choosing between two or more alternatives (Milner&Rosenstreich,2013). The consumer decision-making process consists of five stages. The first stage is to identify the problem. A consumer will not start a purchase without need or desire. For this reason, in order for the purchase to take place, the customer must first have a need or desire. Problems create needs. For example, if there was no need to use phones other than talking and texting, there might not be a need for smartphones either. The problems that arose here led to the need for these devices, and smartphones were produced. The second stage is for consumers to conduct information research after strongly motivating themselves about what their need is. At this point, manufacturers can promote their smartphones by reaching consumers through advertising. The third stage is the evaluation of alternatives. When choosing a smartphone, more than one smartphone can attract the attention of consumers. At this point, the consumer will start thinking about alternatives that will best solve their needs. At this stage, companies should reflect their products in the best way. They should present their product descriptions in detail and present them to the consumer in a visually rich way (Abimbola,2021). The fourth stage is the making of a

purchase decision. This stage is the stage of the consumer's purchase of the product after smartphone comparisons. At this point, the customer will be satisfied with the results they have found and buy the product or they will not make the purchase because they do not like these alternatives. The fifth and final stage is the post-purchase evaluation stage. There are also things to do after completing consumer shopping. Although it seems that this process is over for the consumer, in fact, brands can still interact with consumers at this point. At this stage, providing very good customer support to customers can allow these people to shop from the same company again in the coming periods. In addition, e-mail activities are also carried out to cross-sell to consumers, thank them, and provide them with new opportunities (Millwood,2021).

The decision-making style, on the other hand, is seen as a patterned, mental and cognitive orientation towards shopping and purchases that dominates the consumer's choice and leads to a relatively permanent consumer personality (Bandara,2014). Long-standing consumer classification studies in the marketing and consumer behavior literature have aimed to classify consumers into a certain number of classes and types based on why and how they buy. In this way, it is aimed to help managers in determining the marketing strategies to be applied to these groups that show similar expectations and behavior. According to the criterion based on the classification, many different consumer classes can arise. One of the criteria of this classification is the way consumers make decisions about purchasing. Sproles & Kendall conducted one of the most comprehensive studies in this field that continues today (1986 cited by Bandara,2014). According to Sproles and Kendall, among the consumer decisionmaking characteristics, the eight most basic mental characteristics covering both emotional and cognitive characteristics were determined (1986 cited by Lysonski&Durvasula&Zotos,1995).

Perfectionist consumers are a group of conscious consumers with high quality. Consumers of this type are quite careful before shopping. Before buying the product, they very carefully compare the product and make their decisions based on it. Brand-conscious consumers are consumers who believe that the quality of the product will increase as the price increases. They usually use their preferences in favor of well-known, best selling and highly advertised brands. Consumers with innovative fashion sense are the type of consumers who like to show flashy behavior. Entertainment and pleasure-oriented shopping jun conscious consumers are consumers who do their shopping just for fun and to pass the time. This group is the consumer group in which extravagance is most often observed during shopping. Price-conscious consumers are usually consumers who prefer to buy products at a low price. Consumers in this group, when comparing products, compare only their prices and want to get the best product with the money they have. Careless consumers are consumers who perform an instant purchase action. They do not make any planning before the purchase action and sometimes feel uncomfortable with the product they are buying. Consumers who are hesitant about choosing are consumers who are trying to make decisions in the face of the options offered by many brands.They have a fairly high level of knowledge and experience in relation to the product they are going to buy. Consumers who make purchases based on habit and

brand are consumers who have a preferred brand because of their habits. Consumers in this group prefer a brand that has habits when they are going to shop (Sproles&Kendall,1986 cited by Lysonski&Durvasula&Zotos,1995).

3-Research Method :

The main purpose of this research is to measure the impact of artificial intelligence applications on customer preferences on smartphones. Due to the fact that there are no studies on this topic in the literature and the effect of artificial intelligence applications on smartphones on customer preferences has not been previously determined, this research has been conducted. In addition, this study is a study that will benefit for later studies and for smartphone companies. The methodologies used to reveal the impact of artificial intelligence applications on customer preferences in smartphones are presented in this section. This section presents the 'Onion' research. It will then be divided into six parts. These are research philosophies, research approaches, research strategies, research methods, time horizon and data collection and data analysis The research onion model was presented by Saunders et al. (2007 cited by Crossley&Jansen,2021).

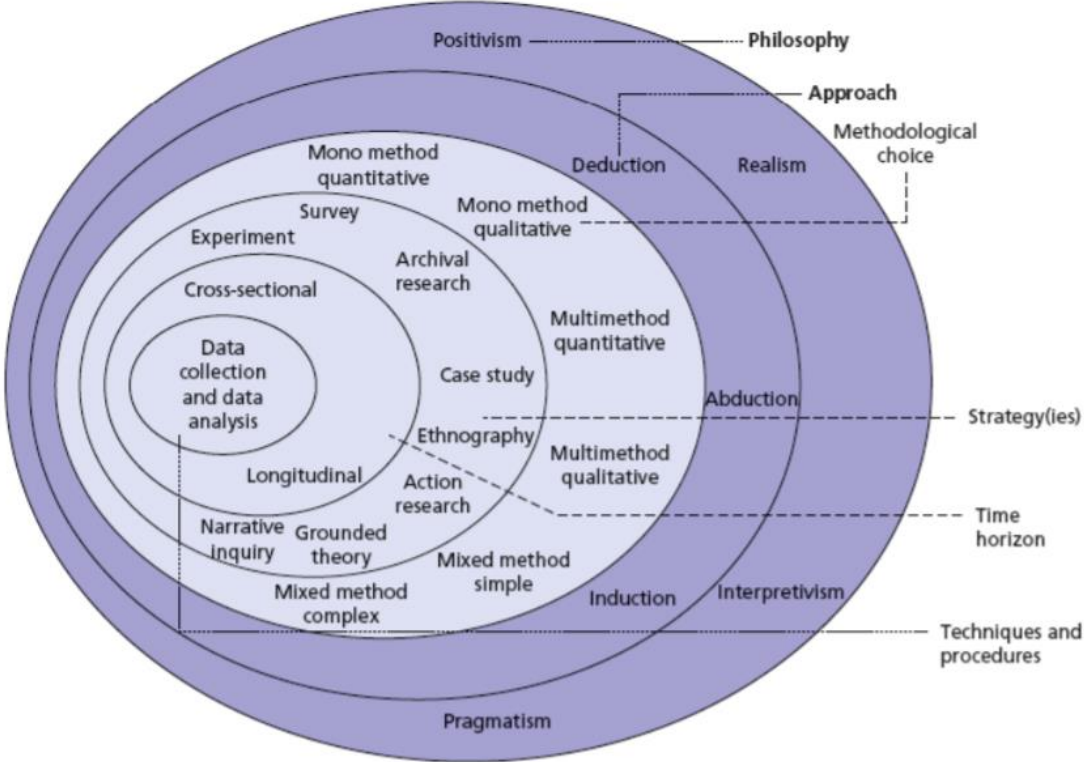


Figure 1 : Research Onion Model (Saunders et al.,2007 cited by Crossley&Jansen,2021)

Research Philosophy : Pragmatism

The philosophy of the research was determined as pragmatism. The philosophy of pragmatism requires researchers to use a mix of approaches or approaches that work best in the real world according to the degree to which they give their

study results. According to philosophy of pragmatism, it can be said that the unification or comparison of quantitative and qualitative approaches is being considered, whether it is confirmed in practice. The philosophy of the research was determined as pragmatism due to the use of quantitative and qualitative data together in the research and acting on the basis of utilitarianism (Saunders et al., 2007 cited by Crossley&Jansen, 2021). Also, the philosophy of pragmatism has suggested that researchers find the truth instead of believing what is being said. This proposal is another reason why the philosophy of pragmatism is used when investigating the impact of artificial intelligence applications on customer preferences on smartphones (Kelly&Corderio, 2020).

Research approach: Inductive

The theory development approach of the research was determined as inductive. In order to draw meaningful conclusions from the data obtained thanks to the survey, the induction method was used. Inductive is a method of reasoning that continues from the private to the general, reaching from parts to the whole. This method of reasoning gives the opportunity to achieve new and unknown results (Gabriel, 2013).

Research strategy: Survey

The survey method was used as the research strategy in this dissertation research. In this context, a 15-question survey was conducted to 100 smartphone users living in the United Kingdom or Turkey, and answers were received. In addition, closed-ended questions were used, in which the answer options were determined in advance. The closed-ended question type was preferred because the questions were relatively easy to answer for the participant. This survey was conducted to measure the participants' knowledge about artificial intelligence on smartphones and to measure whether artificial intelligence applications affect the participant's purchasing preferences, it was stated in the introduction section of the survey to the participants. In addition, the participants were informed that this research was conducted by Enes Berk Sahin for the purpose of Enes Berk Sahin's dissertation. Again, it was clearly stated to the participants in the introduction section of the survey that their data would be kept confidential and used only for academic purposes. According to the content of the study, the participants were selected as smartphone users only. Participants were instructed not to continue the survey if they were not smartphone users. In addition, in order to obtain more specific data, the survey was conducted only for participants in the United Kingdom and Turkey. Participants were instructed not to continue the survey if they lived in another country. Due to the lack of necessary data in existing publications or reports, it was decided to use a primary source. The survey method was chosen due to the fact that it was not possible to collect the necessary data by experiment, observation or other means.

Surveys are among the primary sources, along with other data collection methods, interviews, observation and focus groups. Surveys are designed to find answers to specific questions. It involves collecting data from a group of people to generalize the findings to a wider audience. Both quantitative and qualitative measurements and analyses can be carried out through the questionnaire.

Investment, production, consumption, income, wages, salaries, expenses, household, business, employment, unemployment, etc. in addition to quantitative data such as; intelligence, success, tolerance, patriotism, satisfaction, expectation, stress, burnout, etc. qualitative characteristics are also measured through surveys (Ainsworth,2021). In this study, quantitative data such as income, year of smartphone use and frequency of smartphone replacement were collected through a survey. Besides that; quantitative data such as educational status, customer satisfaction and customer expectation were again collected through a survey. In order to use the survey method, some issues must be clarified beforehand. Among the important issues; the subject of the research is suitable for the survey method, the subject is facts that people can provide information through the survey, the questions asked are related to the subject and expressed in an appropriate scale, forbidden and objectionable information is not requested, people are not forced to give information and they are not directive, information is obtained from a sufficient number of individuals, necessary training, communication and organizational measures should be taken to reduce errors, the information obtained by the survey method should be supplemented and examined with literature data, the data obtained should allow data entry, analyzes and tests in the computer environment (Ainsworth,2021). In this survey study; the questions were asked in appropriate scale and relevant to the subject, no coercion was applied to the participants, data was collected from a sufficient number of participants, the obtained data were supported by the literature data and the data were collected in accordance with the analysis in the computer environment. In summary, the intended research was completed by analyzing and reporting the valid and reliable data obtained using an appropriate survey.

In surveys, data is collected face-to-face, by mail, by phone, at a kiosk or online. This survey was conducted online using google forms. Participants were asked to participate by sending a link. Online surveys are systems in which questions are answered or scored via the Internet. The online survey is a way that takes less time than the traditional method of collecting information through one on one interaction, and is also easier to reach participants due to online survey's low cost. In this study, data were collected in a shorter time compared to traditional data collection methods using an online questionnaire. After preparing the questionnaire presented in electronic form once, there were no costs such as duplication of the questionnaire. Due to the fact that graphical representations and analyzes can be displayed and there is no need for data entry for this process, it was not necessary to wait for the end of the data collection process to perform the analyzes and present the results with graphs and tables without the need to transfer the answers received electronically to the data analysis programs. The results could be updated as the answers were received with the previously prepared analysis programs. The distance problem, which was an important obstacle in field research, was eliminated. On the other hand, the online survey depends on the honesty of the participants about basic demographic information such as age, gender and race, as the participants are not interviewed one on one.

Research methods: Mixed method

In this dissertation work, quantitative and qualitative data types were used together. As a research methodology, it was decided to use the mixed method in which the quantitative and qualitative data types are used together. Mixed method research is defined as the combination of qualitative and quantitative methods, approaches and concepts by a researcher in one study or in successive studies (Wisdom&Creswell,2013). It includes the collection and analysis of quantitative and qualitative data in a single study or multiple studies conducted within the framework of a research program of mixed method studies. In general, researchers can collect quantitative data in the first stage in large-scale, financially supported projects, collect qualitative data in the second stage and quantitative data again in the third stage. In this type of research, called a "multiple study", each project is reported separately as an independent study, but the project being investigated is generally called a mixed method study. Multiple studies are usually encountered in large-scale health science projects. However, the "single study", in which both quantitative and qualitative data are collected in a single study, is generally called the studies preferred by graduate students rather than conducting multiple time-dependent studies (Schoonenboom&Johnson,2017). This dissertation research is a study classified as a "single study". The reason for choosing the mixed method in this study is the advantages it provides. With the use of quantitative and qualitative techniques within the same framework, mixed method research has strengthened the advantages of both techniques. More importantly, using a mixed method has increased the chances of choosing methods and approaches that are related to the identified research questions. Thanks to the mixed method research, the researcher's options were not limited, on the contrary, multiple approaches were used when searching for answers to research questions. Another purpose of using a mixed method is not to confirm or support an idea in many cases, but to expand a person's understanding of the event. With the mixed method, a comprehensive, pluralistic, complementary and elective approach was demonstrated for the researcher to choose methods and design about the research. Many research questions could be answered completely with the solutions offered by the mixed method. However, there have been some limitations of using a mixed method. It has been challenging to use the mixed method for a single researcher. Using quantitative and qualitative work together, especially using both methods at the same time, requires teamwork. In addition, analyzing both numerical and verbal data at the same time caused the researcher to spend a lot of time.

Time Horizon : Cross-sectional

As for the time horizon, a cross-sectional study was carried out. A survey was conducted with the smartphone users participating in the study between 15.10.2021 and 15.11.2021 and their answers to the questions were recorded.

Data Collection

The results of the survey aimed at investigating the effect of artificial intelligence applications on customer preferences on smartphones are evaluated in this section. The survey was conducted in 2021 by the author of the

dissertation. Survey questions were sent to smartphone users participating in the study through an online link. In addition, the survey was conducted only in English in England and Turkey. This is assumed that people who speak English in both countries answered the survey. The participants were informed at the beginning of the survey. People who agreed were included in the survey. A total of 102 answers were received for the questionnaire. One of the 102 answers received was canceled because the participant stated that he did not live in Turkey or the United Kingdom. Another one was canceled because there was a missing answer. The answers given by 100 users participating in the study were shown and analyzed using Excel charts. In order to better reflect the results visually and to present the results in a more understandable way, an analysis was performed using Excel. The 15 questions asked within the scope of the study are as follows (Appendix C):

- Are you a smartphone user?
- Are you living in Turkey or United Kingdom?
- Please indicate your gender?
- Which of the following age groups do you belong to?
- What is the highest degree of education you have completed?
- What is your annual income?
- How many years have you been using a smartphone?
- Which brand of smartphone are you using?
- How often do you change your smartphone?
- Do you feel the desire or need to buy a new smartphone when smartphone companies create a new phone?
- To what extent do you know about artificial intelligence?
- Do you think artificial intelligence technology is useful or scary?
- Do you think artificial intelligence technology is used in your smartphones?
- Does the fact that artificial intelligence technologies have been used when buying a smartphone encourage you to buy one?
- What do you think is the most important advantage of smartphones using artificial intelligence technology?

4- Analysis and Findings :

The first question of the questionnaire is a qualifying question that was asked to reach the right group of participants. The survey was conducted in order to reach smartphone users, and therefore participants were informed not to continue the survey if they were not smartphone users. All 100 people surveyed declared that they are smartphone users.

The second question is again one of the qualifying questions of the survey. Turkey and the United Kingdom were determined as the scope of the survey. The participants were instructed not to continue the survey if they did not live in Turkey or the United Kingdom. 100 Percent of the participants declared that they lived in Turkey or the United Kingdom.

Demographic Information :

In the survey, demographic information was asked and the gender, age, education and income status of the participants were determined. Demographic information, especially in scientific and academic research, has an important place in the classification of target groups and the examination of the accuracy of research results. Through collecting demographic information, closer recognition of the participating group was achieved. With this information, the identities, needs, wishes and concerns of the participants could be understood.

Please indicate your gender?

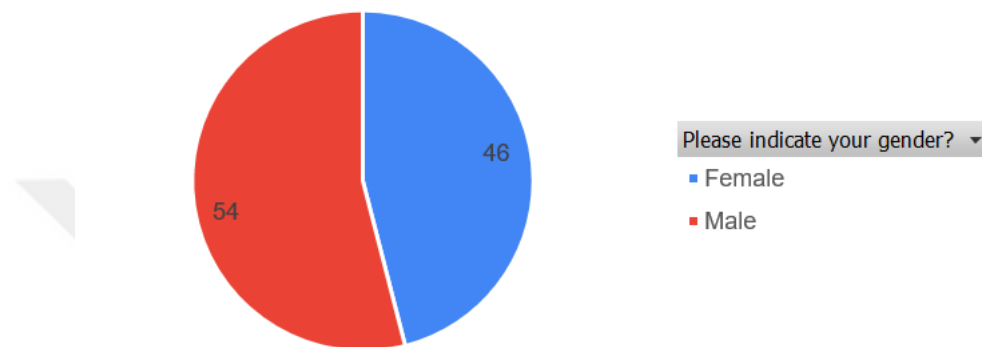


Figure 2: Gender of the Participants

As a gender, participants were offered "female", "male" and "prefer not to say" options. 54 percent of the participants declared that they were "male". 46 percent of the participants declared that they were "female". There has not been a participant who has chosen the "Prefer not to say" option. As for the number of male and female, it was seen that the survey went well balanced and that no gender came to the fore. It can be said that the survey is reliable in terms of gender distribution.

Which of the following age groups do you belong to?

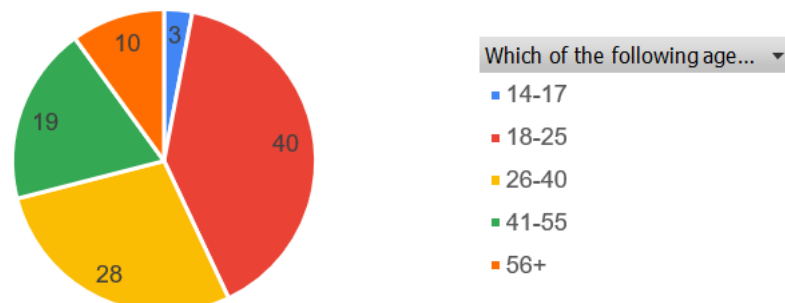


Figure 3: Ages of the Participants

Five options are presented to the users as the age range of "14-17", "18-25", "26-40", "41-55", "56+". Although surveys are generally conducted for those

aged 18 and over, due to the decrease in the age of smartphone use in recent years, those aged 14 and over were allowed to participate in the survey. Three people between the ages of "14-17" participated in the survey. 40 people between the ages of "18-25" participated in the survey. The majority of the participants in the survey were between 40 and "18-25" years old. 28 people aged between 26 and 40 participated in the survey. The age range of "26-40" was the second most participated age range in the survey. 19 people between the ages of "41-55" participated in the survey. 10 people aged 56 and over also participated in the survey. There was a balanced distribution in terms of age range as well as gender. A study conducted in the United Kingdom in 2020 showed that the age range with the highest rate of smartphone use is the "16-44" age range (O'Dea,2021). Most of the respondents are in this age range. This is important in terms of proving the reliability of the survey.

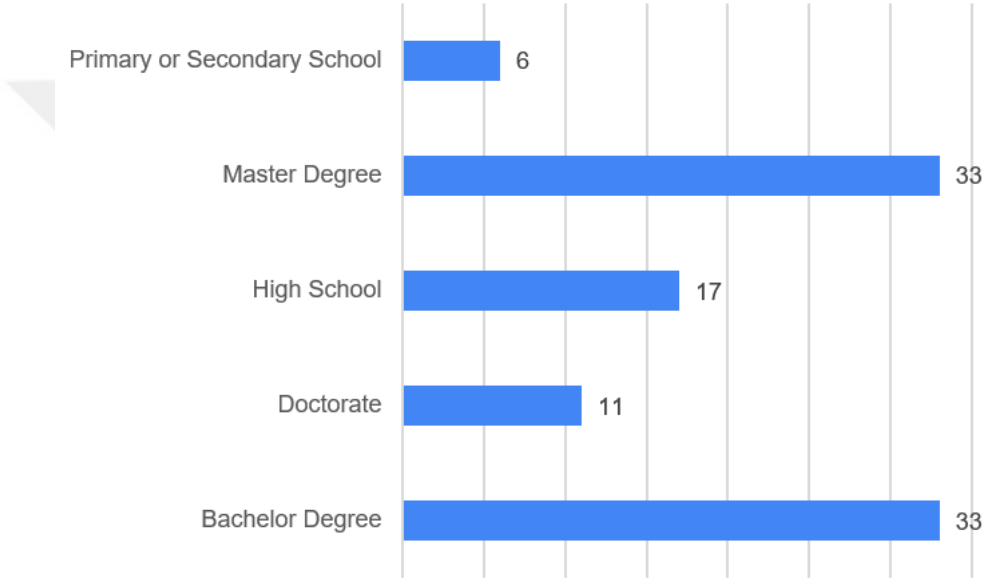


Figure 4: Education of the Participants

As an educational status, the participants were asked about the last degree they had completed. "Primary or secondary school", "High school", "Bachelor degree", "Master degree" and "Doctorate" options were offered to the participants. 33 Percent of them were selected for "Bachelor degrees" and 33 percent for "Master's degrees". The number of University and Master's graduates participating in the survey is equal. Graduates of these two degrees made up the vast majority of the survey. 17 high school graduates participated in the survey. 11 people with doctoral degrees participated in the survey. Along with these, 6 people who graduated from primary or secondary school also participated in the survey. The fact that the vast majority of the participants in this survey, conducted for academic and scientific research, are bachelor graduates and above, is important from the point of view of the intelligibility and reliability of the survey.

What is your annual income?

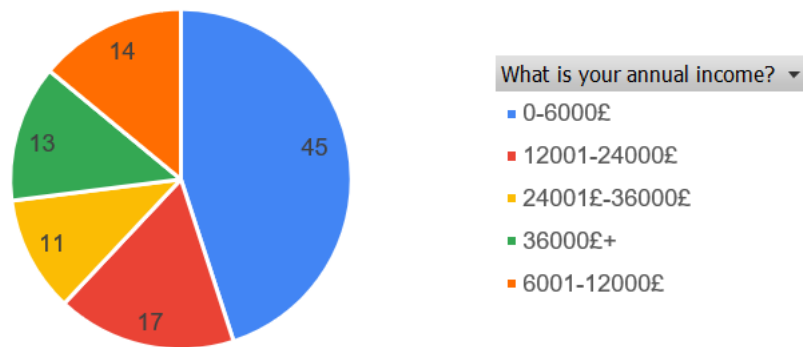


Figure 5: Income of the Participants

As annual income, "0-6000£", "6001-12000£", "12001-24000£", "24001-36000£" and "36000+£" options were offered to the participants. 45 percent of the respondents declared that their annual income is between £0-6000. 17 percent of the respondents stated their annual income between as £12001-24000. 14 percent stated that their annual income is between £6001-12000. 13 percent of the respondents declared that their annual income is over £36000. 11 percent of the participants stated that their annual income is between £24001-36000. People living in Turkey and the United Kingdom were asked about their annual income in pounds. Participants living in Turkey responded by converting their annual income into pound currency. The fact that the income in Turkey is low in terms of pound foreign currency is thought to be the biggest factor in choosing the annual income option between £0-6000. Learning about the annual income of the participants was helpful in measuring customer preferences.

Main Questions :

How many years have you been using a smartphone?

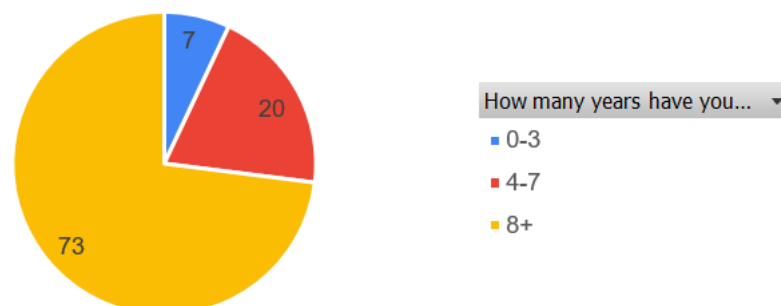


Figure 6: Participants' Years of Smartphone Use

In the seventh question of the survey, participants were asked how many years they have been smartphone users. 73 percent of the participants stated that they had been using a smartphone for 8 years and over. 20 percent of them declared that they had been using smartphones for between 4 and 7 years. 7

percent said they had been using a smartphone for 0-3 years. The main purpose of this question was to measure the participants' experience with the smartphone. It has been observed that the vast majority of the participants have 8 years and more experience in using smartphones. The fact that the participating group had experience in using smartphones ensured that a reliable result was obtained during the continuation of the survey.

Which brand of smartphone are you using?

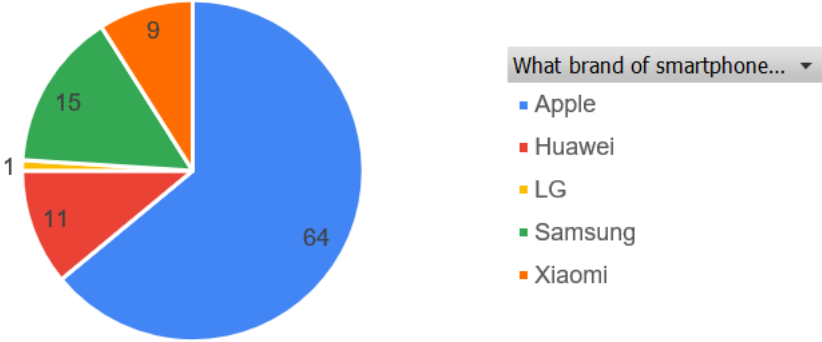


Figure 7: The Smartphone Brands Used by the Participants

In the eighth question of the survey, the participants were asked which smartphone brand they used. It is important to find out the market shares of smartphone companies in the UK and Turkey in terms of comparing the survey with real results. In addition, it is important to know the market share of smartphone companies in terms of seeing which brands of phones users have experienced artificial intelligence technology with. According to the smartphone industry market shares, it was seen that different results were obtained in the United Kingdom and Turkey. Looking at the market share for the United Kingdom in 2021, Apple was the most used smartphone brand with a 50.16 percent market share. Samsung ranked second in the United Kingdom with a 28.97 percent market share, Huawei ranked third with a 7.65 percent market share, and Xiaomi ranked fifth with a 2 percent market share (Das,2021). According to the data announced by the Information Technologies and Communication Institution in Turkey, over 870 thousand Samsung brand phones were sold in the first three months of 2021. This information has shown that Samsung's market share was 37%. Apple, which was in second place, had a 33% market share in Turkey with the sale of more than 770 thousand phones. Huawei ranked ninth with a 1.5 percent market share, and Xiaomi ranked tenth with a 1.1 percent market share (BTK,2021).

In the survey which has conducted by author, participants were presented with "Apple", "Samsung", "Huawei", "Xiaomi" and "Other" options. 64 percent of the participants stated that they use Apple. 15 percent have declared that they use Samsung. 11 percent of respondents use a Huawei smartphone. 9 percent of the participants declared that they used a Xiaomi smartphone and 1 percent declared that they used an LG smartphone. According to the results of the survey, the majority of the participants experience the artificial intelligence technology in

smartphones with the Apple brand. In addition, when the market shares in the United Kingdom and Turkey and the survey result were compared, it can be said that the participants were selected in accordance with their market shares. This has increased the likelihood of obtaining accurate data from the survey.

How often do you change your smartphone?

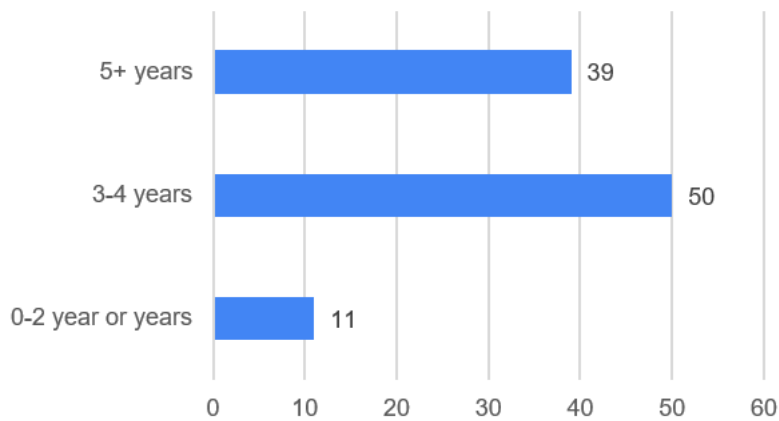


Figure 8: Frequency of Smartphone Replacement of Participants

In the ninth question, the participants were asked how often they changed their smartphones. With this question, it was understood how often smartphone customers need a new phone. In other words, the life cycle of smartphones was measured. According to research conducted by Ng in 2019, it was seen that the average smartphone replacement time increased from 23.4 months to 26.2 months in studies conducted in France, Germany, Italy, Spain and the United Kingdom between 2016 and 2018. In 2018, the smartphone replacement period in the UK was 27.3 months, that is, approximately 2.5 years (Ng,2019). According to a study conducted in 2016 in Turkey, the average smartphone refresh time is 2.5 years (Daily Sabah,2016).

In the survey which has conducted by author, "0-2 years", "3-4 years" and "5+ years" options were presented to the participants. 11 percent of the participants declared that they changed smartphones in 0-2 years. Half of the participants, 50 percent, declared that they change their smartphones every 3-4 years. On the other hand, 39 percent of the participants stated that they used their smartphones for 5 years or more and then changed them. The vast majority of respondents, 61 percent, said that they renew their smartphones every 0-4 years. In other words, in the survey, results were obtained in accordance with the average 2.5 year smartphone replacement period in Turkey and United Kingdom. Also, the "identify the problem" step, which is the first step of the consumer decision-making model, occurs on average once every 2.5 years (Abimbola,2021).

Do you feel the desire or need to buy a new smartphone when smartphone companies create a new phone?

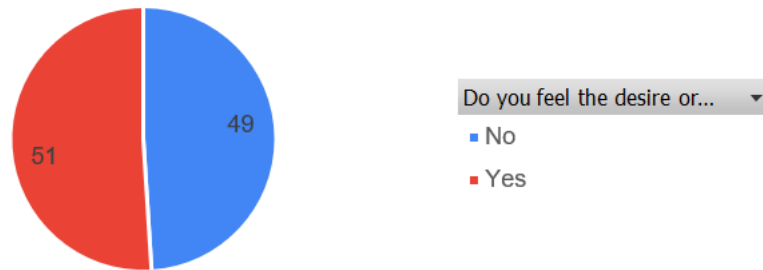


Figure 9: Participants' Desire for New Smartphone

In the tenth question of the survey, respondents were asked if they felt the need or desire to buy a new phone when it went on sale. Those who felt the need or desire answered "Yes", and those who did not answered "No". There was no profound difference between the participants in this question. 51 percent of the participants answered Yes. 49 percent of the participants chose the No option. Smartphone companies often release a new model every year. Despite this, as seen in the previous question, consumers change their phones once in 2.5 years on average. With this question, it was seen that smartphones, which were renewed with artificial intelligence and similar developments that are developing more and more every year, did not create a need or a desire to buy in half of the participants. However, the other half of the participants said that they felt the desire or need to buy newly released phones. According to consumer decision-making styles, customers who show a desire to buy smartphones with every new release can be defined as customers who are focused on innovation and fashion (Sproles&Kendall,1986 cited by Lysonski&Durvasula&Zotos,1995).

To what extent do you know about artificial intelligence?

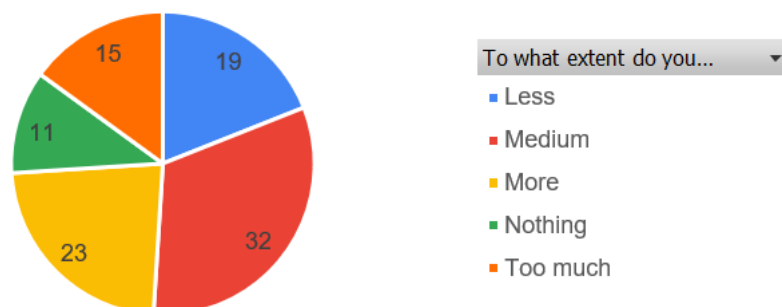


Figure 10: Artificial Intelligence Knowledge of the Participants

In the eleventh question, participants were asked how much they knew about artificial intelligence before they were asked questions about artificial intelligence applications on mobile phones. Participants were offered "Nothing", "Less",

“Medium”, “More” and “Too much” options. According to survey which has conducted by Byer in the United States with the participation of 1000 people, about 43 percent of respondents reported that they were not entirely sure what artificial intelligence is or how it is currently used. About 7% of the respondents stated that they do not know what artificial intelligence is and do not care. In other words, it was seen that the knowledge rate about artificial intelligence was 50 percent (Byer,2020).

In the survey survey which has conducted by author, 15 percent of the respondents stated that they have “Too much” knowledge about artificial intelligence. 23 percent of the participants declared that they had “More” information. The majority of the participants, that is, 32 percent, declared that they had a “Medium” level of knowledge about artificial intelligence. 19 percent of the participants said that they had “Less” knowledge about artificial intelligence, while 11 percent said that they knew “Nothing” about this topic. 70 percent of the participants declared that they have intermediate and higher knowledge about artificial intelligence. This ratio is compatible with the general level of artificial intelligence knowledge and made the result of the sample reliable.

Do you think artificial intelligence technology is useful or scary?

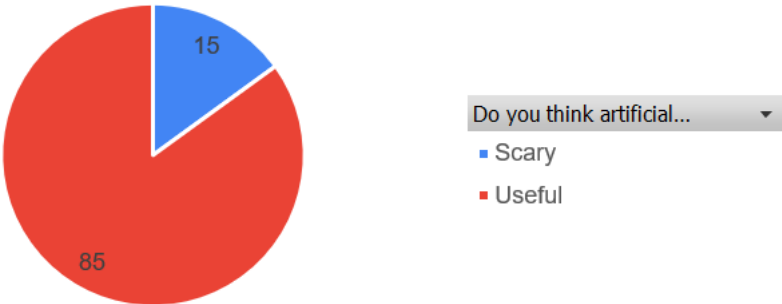


Figure 11: Artificial Intelligence is Scary of Useful?

In the twelfth question, participants were asked whether they found artificial intelligence useful or scary. With this question, the participants' feelings about artificial intelligence were learned. In the survey, conducted by Cave, Coughlan and Dihal with a total of 1078 people in the UK, participants were asked 'How would you describe artificial intelligence to a friend?' the question has been asked. Only 12 percent of the participants described artificial intelligence as a 'scary robot' (Cave&Coughlan&Dihal,2019). In another survey which has conducted by Byer with 1,000 people in the United States, 26% of respondents reported feeling “great” about Artificial Intelligence. The majority of respondents, namely 60%, allowed the ultimate future potential of artificial intelligence, but at the same time drew attention to the fact that attention should be paid to how it is used. Only 6% of respondents said that they feel “bad” about artificial intelligence, and artificial intelligence technology poses an imminent threat to humanity (Byer,2020).

In the survey which has conducted by author, 85 percent of the participants declared that they found artificial intelligence useful. Only 15 percent of the participants declared that they found artificial intelligence scary. This result was consistent with other results in the literature, indicating that participants had a generally positive outlook on artificial intelligence.

Do you think artificial intelligence technology is used in your smartphones?

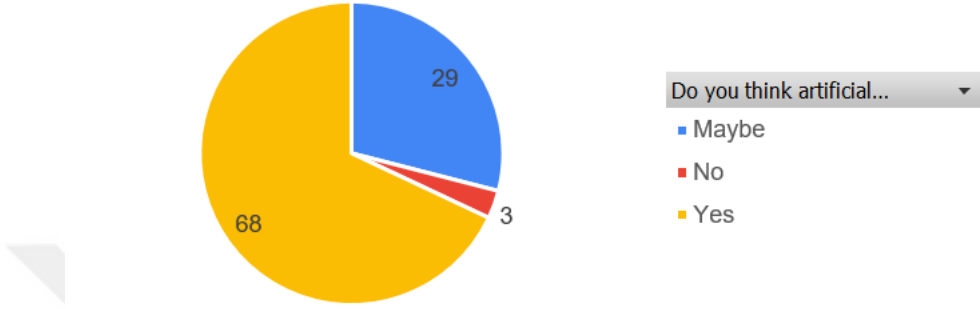


Figure 12: Your Smartphone Have Artificial Intelligence?

In the thirteenth question, participants were asked if artificial intelligence was used in smartphones. "Yes", "No" and "Maybe" options were offered to the participants. In order to measure whether artificial intelligence applications on smartphones have an impact on customer preferences, smartphone users are primarily expected to be aware of whether artificial intelligence technology is being used on their smartphones. In a study conducted by Deloitte in Belgium, 75 percent of smartphone users surveyed are aware of at least one feature on their phone that includes machine learning or artificial intelligence. About 60 percent of smartphone users use at least one machine learning or artificial intelligence feature (Deloitte,2017). In addition, another study conducted by Deloitte in Switzerland found that 79 percent of smartphone users are aware of intelligence applications on artificial smartphones. Despite this, less than 50 percent have specific knowledge about artificial intelligence applications (Deloitte,2018).

In the survey which has conducted by author, 68 percent of the respondents answered "Yes". In other words, they stated that they are aware that there is artificial intelligence technology in their smartphones. 29 percent of the participants chose the "Maybe" option. These participants are not entirely sure that they have artificial intelligence applications on their smartphones. Only 3 percent of the smartphone users surveyed stated that they think that artificial intelligence is not available on their smartphones. It has been observed that the vast majority of the participants are aware of the artificial intelligence technology on their smartphones. The surveyed group is an accurate sample of people in order to be able to measure the impact of artificial intelligence applications on customer preferences on smartphones.

Does the fact that artificial intelligence technologies have been used when buying a smartphone encourage you to buy one?

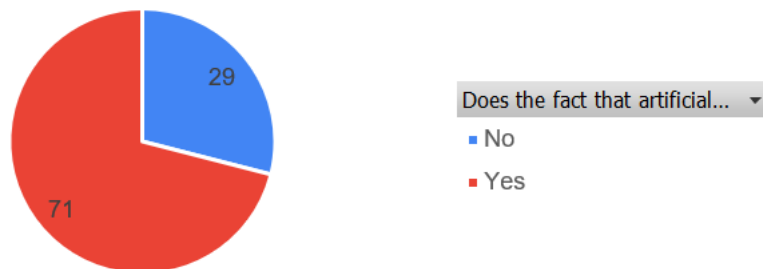


Figure 13: ArtificialThe Influence of Artificial Intelligence on the Smartphone Purchase Process

In the fourteenth question, the smartphone users participating in the survey were asked whether the use of artificial intelligence technology on that smartphone while buying a smartphone affected their preferences. In other words, the effect of artificial intelligence applications on smartphones on customer preferences was measured for the participant group. In the previous questions, it was proven that the participant group was the appropriate demographic structure and this participant group was the right sample group with their smartphone usage years, brand preferences, smartphone switching frequencies, artificial intelligence information and thoughts about artificial intelligence. Regarding this question, 71 percent of the participants stated that the use of artificial intelligence technology in the smartphones they will receive encourages them to purchase. In contrast, 29 percent of them declared that artificial intelligence is not an incentive element in their smartphone preferences. Along with this result, it has been proven that artificial intelligence applications on smartphones have an effect on customer preferences and this effect is positive.

What do you think is the most important advantage of smartphones using artificial intelligence technology?

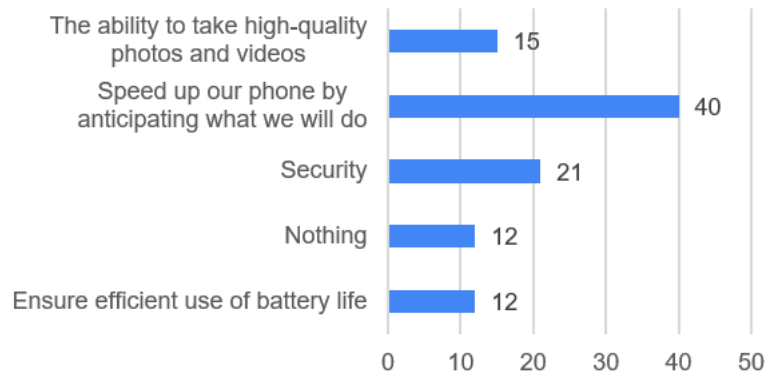


Figure 14: The Biggest Advantage of Artificial Intelligence in Smartphone

In the last question, the participants were asked what is the biggest advantage of artificial intelligence applications on smart phones. Participants were presented with the options "The ability to take high-quality photos and videos", "Speed up our phone by anticipating what we will do", "Ensure efficient use of battery life" and "Security". These options were created using the advantages identified in the literature review. "Nothing" and "Other" options were also presented to the participants. With this question, the most important advantage affecting customer preferences has been determined. 40 percent of the participants chose the option "Speed up our phone by anticipating what we will do". According to 21 percent of respondents, "Security" is the most important advantage. 15 percent of the participants chose the option "The ability to take high-quality photos and videos". In the survey, "Ensure efficient use of battery life" and "Nothing" options were selected with an equal number of votes with a 12 percent vote share. There is no participant in the survey who chooses the "Other" option. A large part of the participants, 40 percent, consider it the greatest advantage that artificial intelligence technology speeds up our smartphone.

5-Conclusion and Recommendations :

In this dissertation study, the effect of artificial intelligence applications applied in the smartphone industry on customer preferences was examined and the study was presented in a layout. As a result of the literature review, artificial intelligence was first emphasized as a concept. Later, information was given about the historical development process of artificial intelligence. In addition, information is given about machine learning, deep learning, swarm intelligence, cybernetics and robotics, which are sub-fields of artificial intelligence. It has been stated that Artificial Intelligence has already taken place in all aspects of life, especially thanks to its effective sub-fields such as Machine Learning. After that, the topic of artificial intelligence in enterprises was studied. The usage and importance of artificial intelligence has been emphasized in all business areas, especially production-oriented and service-oriented. The literature review also mentioned artificial intelligence in the smartphone industry. First of all, the history of smartphones was researched and the first smartphones were mentioned. The introduction of artificial intelligence to smart phones and the

development process are explained. "Processing units" named CPU, GPU and NPU have been explained and especially Neural Processing Unit (NPU), also known as artificial intelligence accelerator, has been defined in all its aspects. In addition, information was given about the processors in the NPU used by smartphone brands such as Apple, Huawei, Samsung and Xiaomi. Moreover, artificial intelligence applications provided by these smartphone brands were explained and examples were given on some smartphone series. Finally, in the literature review, consumer decision-making process model and consumer decision-making styles were explained in order to understand customer preferences more easily. As a research method, a mixed method was used in which quantitative and qualitative data were examined together. Since both qualitative and quantitative data were used together in the study, it was decided to use a mixed method. The survey method was also used as the data collection method. The online survey method was chosen because it provides the advantages of using time constraints and technology. The survey was applied only to smartphone users living in Turkey and the United Kingdom. The survey was completed on November 15 and a total of 100 people participated in the survey. The survey results were presented and analyzed using Excel charts. The survey results showed that an accurate sample was selected from the demographic point of view and from the point of view of the relevant information of the participants. As a result of the survey conducted by author, 71 percent of the respondents stated that artificial intelligence applications were encouraging in their smartphone preferences (Figure 13). With this result, it was concluded that artificial intelligence applications on smartphones have a positive effect on customer preferences. Again, according to the survey, the main advantage of using artificial intelligence on smartphones was determined as "Speed up our phone by anticipating what we will do", which received 40 percent of the vote from the participants (Figure 14).

In light of all these results, smartphone manufacturers should increase their investment in artificial intelligence. Processors that provide a higher artificial intelligence experience should be developed and made available to smartphone customers. The fact that artificial intelligence is now more known to customers and is considered the reason for choice in the smartphone purchase process should be accepted by manufacturers. "Speed up our phone by anticipating what we will do", which is seen as the most important advantage as a result of the survey, should be further developed. More work should be done on features such as "Security", "The ability to take high-quality photoa and videos" and "Ensure efficient use of battery life", which are other advantages of artificial intelligence. Customer expectations should be met with developing technology and increasing artificial intelligence investments.

Appendix 1 :
Ethical Approval Form :



**Application for Ethical Approval for a
Research Project involving Human Participants
(Ulster Business School Research Ethics Approval Form)**

This form should be completed by the student undertaking the research in association with the student's supervisor. The form **MUST** be completed and signed at the end of the form before any research / fieldwork is carried out. Reference should be made to the University Guidance on Ethical Standards* for Research involving Human Participants.

The completed and signed Ethical Approval Form **MUST** be attached to the final dissertation report (the dissertation will not be marked if the Ethics Form is not attached in the Appendix).

Name of Supervisor:	Asim Majeed
Student Name:	Enes Berk Sahin

Student ID:	B00825423
Project Title:	Artificial Intelligence Implementations in the Smartphone Industry and their Impact on Customer Preferences (Turkey and the United Kingdom Research)

Course:	International Business with Data Analytics		
Attendance Mode (FT/PT):	FT	Year of Study:	1
Project Type (PG/UG):	PG		

Summary of proposed research (including planned start and end dates):			
A survey will be conducted with people living in the UK and Turkey to find out whether artificial intelligence applications on smartphones affect preferences in the process of buying a phone. The survey will be conducted online from 15 th of October to 15 th of November.			
Start Date:	20.09.2021	End Date:	13.12.2021

Does your proposed research involve any of the following (Please choose Yes or No):

Deception of participants? (i.e. do they understand the implications of participating in a research study?)	Yes / No
Inducements to participate? (i.e. are participants being offered any 'prize' for agreeing to participate in the study?)	Yes / No
Possible psychological stress? (i.e. will you be asking about potentially sensitive personal issues)	Yes / No
Any other special circumstances?	Yes / No

If you have answered "yes" to any of the above, please provide details regarding how you will deal with these issues?

Please provide details of the likely participants involved in the research (i.e. details of vulnerable groups* e.g. children, the elderly, people with a learning disability):

The people who are living in United Kingdom or Turkey.

Please provide details and justification for the methodology to be used in the proposed research (please attach copy of questionnaires/interview routines):

https://docs.google.com/forms/d/e/1FAIpQLSf_QzMsYLhCoYWh-of3PzgNZhtZJKQWM9FHlvLDkt-OKI8o8Q/viewform

If you are using interviews no participant should be engaged or approached to take part in the research without obtaining informed consent (Please attach copy of information sheet and consent form or use the space below to provide justification why informed consent does not need to be sought):


Confidentiality of Data (Please choose Yes or No):

Have steps been taken to ensure confidentiality of data? (rationale for anonymity and data storage, etc)	Yes / No
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Please provide details on what steps have been taken to ensure confidentiality of data:

It is only kept in a encrypted folder that only the author has access to.

Signatures:

Staff / Supervisor:	Asim Majeed 15-10-21	Student:		Date:	14.10.2021
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**Appendix 2 :
Copyright Statement :**



Dissertation Copyright Statement - Ulster University


QAHE Course Director	
Name of Supervisor	Asim Majeed
Name of Student & ID	Enes Berk Sahin & B00825423
Dissertation Title	Artificial Intelligence Implementations in the Smartphone Industry and their Impact on Customer Preferences (Turkey and the United Kingdom Research)

YES

"I hereby declare that with effect from the date on which the dissertation is deposited in the Library of the University of Ulster I permit the Librarian of the University to allow the dissertation to be copied in whole or in part without reference to me on the understanding that such authority applies to the provision of single copies made for study purposes or for inclusion within the stock of another library. This restriction does not apply to the copying or publication of the title and abstract of the dissertation. "IT IS A CONDITION OF USE OF THIS DISSERTATION THAT ANYONE WHO CONSULTS IT MUST RECOGNISE THAT THE COPYRIGHT RESTS WITH THE AUTHOR AND THAT NO QUOTATION FROM THE DISSERTATION AND NO INFORMATION DERIVED FROM IT MAY BE PUBLISHED UNLESS THE SOURCE IS PROPERLY ACKNOWLEDGED"

NO

"I hereby declare that for a period of * ____ years following the date on which the dissertation is deposited in the Library of the University, the dissertation shall remain confidential with access or copying prohibited. Following the expiry of this period I permit the Librarian of the University to allow the dissertation to be copied in whole or in part without reference to me on the understanding that such authority applies to the provision of single copies made for study purposes or for inclusion within the stock of another library. This restriction does not apply to the copying or publication of the title and abstract of the dissertation. IT IS A CONDITION OF USE OF THIS DISSERTATION THAT ANYONE WHO CONSULTS IT MUST RECOGNISE THAT THE COPYRIGHT RESTS WITH THE AUTHOR AND THAT NO QUOTATION FROM THE DISSERTATION AND NO INFORMATION DERIVED FROM IT MAY BE PUBLISHED UNLESS THE SOURCE IS PROPERLY ACKNOWLEDGED."

Course Director/Supervisor Signature	Asim Majeed – 03-12-2021
Student Signature	
Date	02/12/2021

Appendix 3 :

Survey Questions :

Artificial Intelligence in Smartphones

This survey was conducted to measure participant's knowledge about artificial intelligence on smartphones and to measure whether artificial intelligence applications affect participant's purchasing preferences. This survey conducted by Enes Berk Sahin for the purpose of Enes Berk Sahin's dissertation. The data of the participants will be kept confidential and will be used only for academic purposes.

Are you a smartphone user? (If the answer is no, please end the survey) *

- YES
- NO

Are you living in Turkey or United Kingdom? (If the answer is no, please end the survey) *

- YES
- NO

Please indicate your gender? *

- Female
- Male
- Prefer not to say

Which of the following age groups do you belong to? *

- 14-17
- 18-25
- 26-40
- 41-55
- 56+

What is the highest degree of education you have completed? *

- Primary or Secondary School
- High School
- Bachelor Degree
- Master Degree
- Doctorate

What is your annual income? *

- 0-6000£
- 6001-12000£
- 12001-24000£
- 24001£-36000£
- 36000£+

How many years have you been using a smartphone? *

- 0-3
- 4-7
- 8+

What brand of smartphone are you using? *

- Apple
- Samsung
- Huawei
- Xiaomi
- Other...

How often do you change your smartphone? *

- 0-2 year or years
- 3-4 years
- 5+ years

Do you feel the desire or need to buy a new smartphone when smartphone companies create a *
new phone?

- Yes
- No

To what extent do you know about artificial intelligence? *

- Nothing
- Less
- Medium
- More
- Too much

Do you think artificial intelligence technology is useful or scary? *

- Useful
- Scary

Do you think artificial intelligence technology is used in your smartphones? *

- Yes
- No
- Maybe

Does the fact that artificial intelligence technologies have been used when buying a smartphone encourage you to buy one? *

- Yes
- No

What do you think is the most important advantage of smartphones using artificial intelligence technology? *

- The ability to take high-quality photos and videos
- Speed up our phone by anticipating what we will do
- Ensure efficient use of battery life
- Security
- Nothing
- Other...

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