UNIVERSITY OF LJUBLJANA
SCHOOL OF ECONOMICS AND BUSINESS

MASTER THESIS

DIGITALIZING THE PROCESS OF SEARCHING FOR ELECTRICIANS BY DESIGNING A MOBILE APPLICATION BASED ON THE SHARING ECONOMY MODEL

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AUTHORSHIP STATEMENT

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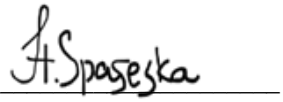
Ljubljana, _____ Author's signature: 

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LIST OF ABBREVIATIONS

API - Application Programming Interface

B2C - Business-to-customer

C2C - Customer-to-customer

CDO - Chief Digital Officer

CEO - Chief Executive Officer

CMA - Chamber and crafts

CRM - Customers Relationships Management

CTA - Click-through action

CUI - Character User Interface

DT - Digital transformation

DTM - Digital Transformation Manger

EEA - European Economic Area

ERP - Enterprise Resource Planning

EU - European Union

GDPR - General Data Protection

GPS - Global Positioning System

GUI - Graphical User Interface

ICT - Information and Communication Technologies

iOS - iPhone Operating System

IoT - Internet of Things

IT - Information technologies

NUI - Natural User Interface

OS - Operating System

P2P- Peer-to-peer

PM - Project Manager

PO - Product Owner

PX - Pixels

QR - Quick response code

SDLC - Software Development Life Cycle

SE - Sharing economy

SM - Scrum Master

UI - User Interface

UML - Unified Modelling Language

US - United States

UX - User experience

INTRODUCTION

Nowadays, companies are adopting technologies such as the Internet of things (IoT), Big Data, cloud computing, social media, etc., to manage their daily activities and as result, these technologies are transforming the ways companies operate, by creating value or new experiences (Morakanyan, Grace & O'Reilly, 2017). Technologies are affecting companies and customers at the same time. Furthermore, the customers are using different mobile and social interactions and companies, on the other hand, a range of innovative tools that enable them to transform the processes and the business models (Trkman & Tomat, 2019). These changes in the companies are the result of the process of digital transformation (Kokolakis, Karyda, Loukis & Charalabidis, 2016).

Likewise, in the last years, digital transformation is becoming more and more hyped term in various industries (Trkman & Tomat, 2019). Defined as a paradigm of transforming businesses, processes, activities, and models relying on information and communication technologies (Pihir, Tomičić-Pupek & Furjan, 2018), in literature is seen as a process of changes to improve customer experience and innovate business models by adopting digital technologies (Gerster, 2017). Consequently, digital transformation (DT) is also crucial for three main aspects of the company: the operational processes, customer experience, and business models (Westerman, Calméjane, Bonnet, Ferraris & McAfee, 2011). The business models that are enabling usage of assets rather than owning them is becoming trend. Peer-to-peer (P2P) markets are part of this trend, where users that own the assets, can use them whenever they need, or they can borrow the assets to users that are willing to pay for temporary usage (Abhishek, Guajardo & Zhang, 2021). In fact, this trend is the sharing economy. Technologies present the sharing economy concept as a disruptive innovation enabled by them. A greater societal cohesion as a path of exchange sees the term sharing (Ritter & Schanz, 2019). This act of sharing is a "collaborative consumption" or economy, a model of share usage (Kumar, Lahiri & Dogan, 2018).

Therefore, the characteristics of the companies in the sharing economy are that they connect customers with the suppliers of the service, they work via platforms such as mobile applications or website and their services are underutilized assets or labour (Apte & Davis, 2019). In the past years, many platforms appear that bring value to all the participants in the sharing process (Gerwe & Silva, 2020). These platforms known as service providers or enablers and helped to solve many social issues (Mittendorf, 2017). Several sectors like, on-demand services, hospitality, fashion and clothing, and food delivery, are already experiencing the benefits of this sharing concept, and other sectors are getting more attracted (Geissinger, Laurell & Sandström, 2020). One sector of the economy that is not well covered with the opportunities of the sharing economy is the service market. This sector consists of free construction workers that are working individually, and only a range of customers knows them. These workers are usually hardly reachable, just in case if someone recommends them or arranged by a construction

company. In addition, there is a shortage of this profile of workers (Kim, Chang & Castro-Lacouture, 2020). This market is under the service sector and closely aligned with the construction industry. Nowadays there is increased urbanization and industrialization, impacted by the technology this sector is slowly changing, smart housing, and smart cities are demanding for high skilled workers (Given-Wilson & Harmon, 2019). According to the U.S. Bureau of labour statistics, estimations are that this sector demand will grow by 9 percent from 2020 to 2030.

The motivation for my thesis is to research this service market and discover an answer to how to reach electricians quickly by designing and wireframing an application. The purpose of my thesis is to research the service market to identify the main customer needs, and to suggest solutions to these concerns. Based on the findings, the thesis aims to design and develop a comprehensive application that manages these needs and delivers an effective solution for users. The goals of my master thesis are:

1. To examine the influence of the sharing economy concept on the service market
2. Analyse the outcomes of the digital transformation on the service market.
3. Define the customer needs on the service market.
4. Improve the connection between the electricians and the customers and reduce the time needed to find electricians.
5. Analyse the service market and define the current state of digitalization on the market.
6. Design an application that will simplify the search for electricians.

The main research question would be how to simplify the process of searching for electricians by using the sharing economy concept, and what activities should be undertaken so the needs of all the participants are satisfied. Two interviews with electricians, one interview with a Chief Executive Officer (CEO) of a construction company, and an online survey will support the research question. The method of research contains two parts theoretical and practical. The theoretical part refers to the literature review of the thesis and summarizes the definitions, theories, concepts that are the path to the practical part designing of the application. For the practical part of the thesis different software for designing and prototyping, the application will be used.

Furthermore, in Chapter 1, the sharing economy concept, and its platform-based solutions are described. The process of evaluation of the term 'sharing' is explained, and the characteristics, roles, benefits, and constraints of the concept are well defined. Following, this concept is demonstrated with the help of already existing platforms for electricians, one web-platform, and one mobile. In Chapter 2, the focus is on the digitalization of the service market. Here, the definition of the digital transformation is clarified, and the different challenges, models, strategies, and processes are discussed. Moreover, in Chapter 3 an overview of the electrician's industry and its current state on the market is shown while defining the electricians, the types of electricians, following this, in Chapter 4, the process of mobile development is represented. First, the phases and the framework

of the process are clarified. Next, the wireframing, designing, and prototyping of the application and testing are explained. Following, in Chapter 5, the research methodology of the thesis is explained. Here, I will also present how the idea of the topic was examined, and for what purpose interviews, and a survey, were conducted. Subsequently, Chapter 6 demonstrates the results of the market research. In the following chapter, creative solution for the topic is developed. Next, in Chapter 7, the electrician's application model is described in detail. First, the application process is visualized with the Unified Modelling Language (UML) diagram and, next, with the wireframing design. The last two steps are determining the final design and prototyping the application. For this purpose, free online software is used. Lastly, in Chapter 8, improvements for the application are summarized to help bringing a better product to the customers.

1 SHARING ECONOMY CONCEPT

The exchange of products exists since the beginning of manhood. People first did barter for products, but when money was introduced as a form of payment, they exchange products for money. This period is the beginning of the first market known as traditional, where consumers buy the products and gain their ownership. Nevertheless, today, things on the market have changed. Many consumers are willing to pay for temporary usage of the product or the service rather than owning them. This phenomenon has named with many terms such as sharing economy, peer-to-peer or collaborative economy (Somers, Dewit & Baelus, 2018).

1.1 Defining the sharing economy concept

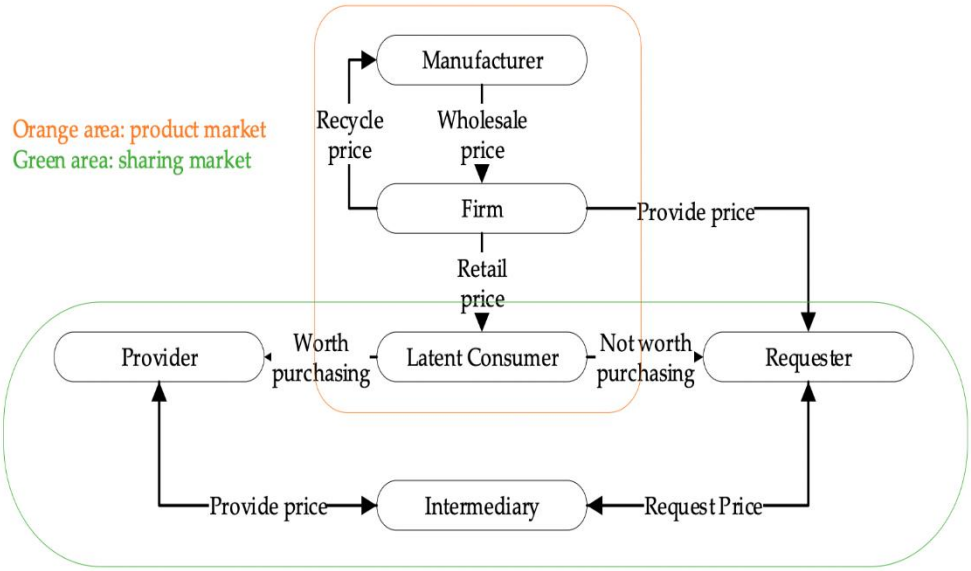
In the last decade, the sharing economy is being a disruptive approach to traditional businesses (Muñoz & Cohen, 2017). Many synonyms used to depict the SE concept: sharing economy, shared economy, peer-to-peer economy, P2P, gig economy, collaborative economy, collaborative consumption, and platform economy (Rojanakit, de Oliveira & Dulleck, 2022). Moreover, this range of different terms is used because of the difficulty of finding a concrete definition for the SE (Basselier, Langenus & Walravens, 2018). The European Parliament provides us with the following definition which says that: "The SE is a business model that allows individuals to share, exchange or buy - sell items or services on platforms running online" (Šimbelytė, Skujienė, Tumėnienė & Moščenkova, 2019). As players in the description, we meet a person as a service provider, an intermediary (platform owner), and a user. One question arises here how do platforms make a profit. The answer is that the platform owners earn from mediation. Then what are the benefits the players have it? The service providers benefit from sharing their resources or services, and the platform (legal entity- mediator) benefits from the mediation (Šimbelytė, Skujienė, Tumėnienė & Moščenkova, 2019). In general, the SE has become an interesting phenomenon, that pays a lot of public attention, and many

researchers are trying to discover what precisely means the term “sharing” by giving different explanations (Schlagwein, Schoder & Spindeldreher, 2020). However, this word “sharing” is not new in the literature and it is believed that it exists since humanity. The beginning of “sharing” was most common between familiar people such as friends and family when many goods and utilities were shared to help people do their work. In this kind of social relationship, the goods rented for a small sum of money or for free, but never rented to a stranger because of the lack of trust. The main change of this opinion was made while the Internet platforms started to provide public review systems and micro insurance, then the goods were shared with “strangers’ also (Frenken, 2017). The words “sharing “and “economy” are not related in between (Curtis & Lehner, 2019). To find a better definition of the concept of the sharing economy we should define the term “sharing” first and find a common phrase that will be both understandable for researchers and participants. The term “sharing” is simply understood as “divide” or “break up in little parts”. As this described, “sharing” is a simple distribution of the goods between people (Frenken, 2017). Later, many conflicts appear to generalize one definition for the term of the sharing economy. For some researchers, it is only rise of new business models, platforms that interrupt the traditional market, change the categories in the industries or the usage of rare resources, and for others sharing economy is the collaborative economy of on-demand resources where assets are used over online platforms (Russo & Stasi, 2016).

In literature, there is a division of two viewpoints describing the term “sharing economy.” The first view is regarding the legal aspects of the sharing economy and the second view is regarding the impact of the sharing economy on the traditional businesses (Grybaitė & Stankevičienė, 2016). Both viewpoints agreed upon the explanation given in the dictionaries where the sharing economy is presented as a system where the assets or the services are shared between the participants via a platform (Grybaitė & Stankevičienė, 2016). The vagueness of the sharing economy is mostly because of the following three trends: circular economy, access economy, and P2P economy. The circular economy describes a set of activities related to the usage of the existing products that are unutilized. Further, access economy stands for the switch from private ownership to temporary access to the product and services, and lastly, P2P that describes the usage of the online platform for sharing the goods (Guyader & Piscicelli, 2019). As an important element of the SE concept is the pricing. According to Yang and Xia's definition of the SE, they suggested three components of the concept i.e., IT-facilitated, peer-to-peer, and no transfer of ownership. The IT-facilitated part refers to the customer-to-customer (C2C) or business-to-customer (B2C) providers where the sharing is enabled via a platform without having ownership of the goods. In this structure, the sharing economy can be both models, B2B, where businesses are providers of goods, and C2C, where individuals are providers.

Figure 1 describes the pricing model in the SE concept. As displayed two main market areas, recreate the part: product market (orange colour) and sharing market (green colour). The product market includes the manufacturer, a firm, and a latent consumer. The process of the product market starts when the manufacturer produces the products and sells them to the firm at a wholesale price. Following this, the firm sells the products at a retail price to latent consumers, who first should decide if the product will bring them value and if worth purchasing it or not. Once the latent customer chooses a decision, he leaves the product market and enters the sharing market (Yang & Xia, 2021).

Figure 1: The extended sharing economy model



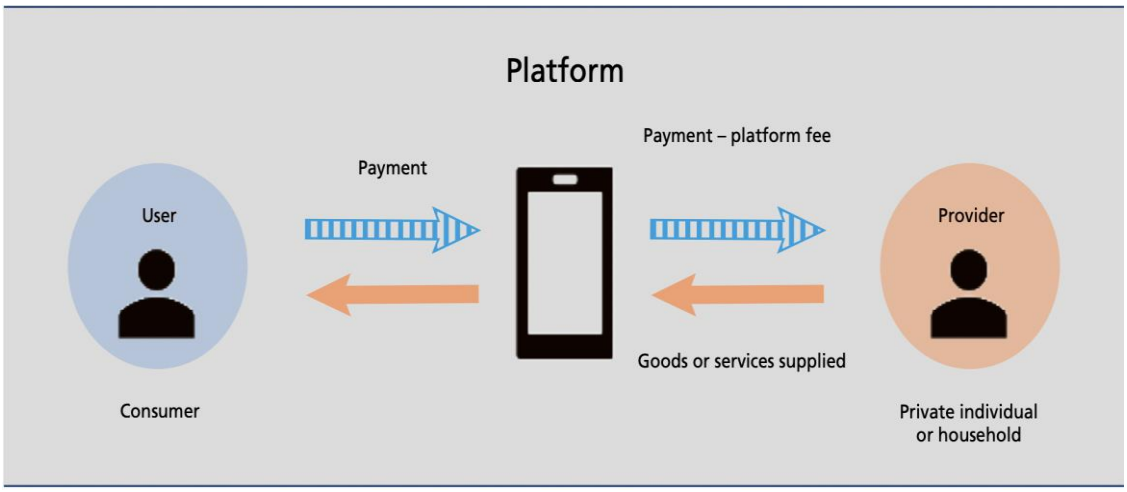
Source: Yang & Xia (2021).

On the other hand, the sharing market includes a provider, requester, and intermediary. If the latent consumer brings a decision to buy the product, he buys it at a retail price from the firm. With this action, he joins the sharing market, becomes a provider, and agrees to share the product over a platform (intermediary). This describes the C2C model, where a provider is an individual customer. If the latent consumer brings a decision not to buy the product, he becomes a requester, which means he decides to rent the product from some other provider (Yang & Xia, 2021). The figure explains that a provider can appear as the same firm that owns the product and share it via an online platform. Hence describes the B2C model where a provider is a company. The transactions between the providers and the requesters (end users) happen via an online platform (intermediary), where requesters pay the requested price to the intermediary and the intermediary pays the provided price (sharing price) to the providers and, charges a commission fee (Yang & Xia, 2021).

1.2 Characteristics and role of the sharing economy concept

The definitions that describe the SE concept have something in common, one mutual characteristic that is the digital platform that enables people to share goods, services, resources, or skills. As seen from Figure 2, SE is a model based on P2P interaction with easy access to goods and services via an app or an online platform. The image displays a user on one side, provider on the other side, and between a platform through which the payment, and the exchange are enabled. In other words, the SE meets the demand and supply of scarce assets or skills with the help of intermediates and digital technologies (Basselier, Langenus & Walravens, 2018). The platforms connect the suppliers and the buyers and create a community that motivates other members to join. As more people enter the platform, it grows, and more transactions happen, which leads to increased earnings for the platform owners (Šimbelytė, Skujienė, Tumėnienė & Moščenkova, 2019).

Figure 2: Peer- to- peer business model in the sharing economy



Source: Basselier, Langenus & Walravens (2018).

A characteristic of the SE is the following differences between the landing platforms, or leasing companies, and the sharing economy platforms. Sharing economy platforms are just intermediaries, they do not own resources, but on the other hand, the landing platforms possess resources, and they land them for a certain period (Šimbelytė, Skujienė, Tumėnienė & Moščenkova, 2019). The model of the sharing economy for many authors has consisted of the following seven dimensions: the existence of platform for collaboration between the participants, underutilized resources, and peer-to-peer interactions allowing shared access to participants, collaborative management, mission-driven element, alternative funding, and technology reliance (Muñoz & Cohen, 2017). If we want clearly to define the characteristics of the sharing economy concept, we should defer the terms sharing and exchange. As mentioned, "sharing" is a simple distribution of the goods between people and "exchange" is the distribution where goods change their ownership (Frenken, 2017).

Table 1 explains the characteristics of the sharing economy. The first characteristic is platform dependency, which refers to the process of information and service performance. It means that every activity that is required to deliver over an online platform. Various platforms demand various contributions and value propositions from the platform users. The second characteristic is that the products and the services that are purpose of exchange are underutilized resources. Meaning that the seller can decrease the cost of ownership by offering the surpluses of resources without actually selling those (Reinhold & Dolnicar, 2018).

Table 1: Characteristics of sharing economy

Characteristics	Description
Platform dependence	Use of digital of physical platforms as a primary means of exchange for communication and services
Underutilized resources	Access to resources owned by seller or facilitator with excess capacity sold off to mitigate cost of ownership
Peer to peer interactions	Interactions between non- institutionalized sellers and buyers of equal status
Collaborative governance	Buyers and sellers (co)-shape decision making, structures, and polices
Mission - driven	Emphasis of non-monetary rewards and alternative logics of value creation
Alternative funding	Non- institutionalized funding mechanisms (e.g. crowed founding)
Technology dependence	ICT enabled buyer-seller interaction at a scale of high speed and flexibility; technology as a core to facilitator value creation and capture

Source: Reinhold & Dolnicar (2018).

Moreover, the sharing economy concept is providing temporary access to the assets rather than ownership via an online platform. It means that underutilized goods are shared with participants without changing their owners. This temporary access can be viewed as a product-service system where products and services are privately owned and shared, redistricting systems where second-hand goods are shared, and collaborative lifestyle systems where skills and knowledge are shared. The cost of temporary access to the goods is less than the cost of owning them (Gregory & Halff, 2017). The third characteristics refers to that the sellers and the buyers should have the same status and be equal in the sharing process. For instance, the exchange between private tourists and private flat owners creates an equal peer-to-peer exchange. On the other hand, when a hotel uses this platform as a peer-to-peer accommodation network is not verified as equality between the participants. Next, the fourth characteristic is collaborative governance, meaning that all

the members in the process are involved in developing the policy, structure, and managing within the sharing platform. Furthermore, the fifth characteristic stands for that the primary mission of the sharing concept is not to make a profit maximization but other goals such as usage of surpluses and unused resources, meeting different people and cultures, and making the world a better place to live. Following the sixth characteristic is that the sharing economy can use alternative funds such as funds from crowdfunding (Reinhold & Dolnicar, 2018). Crowdfunding is defined as an alternative type of investment and by using the public; it obtains resources, for instance, entrepreneurship ideas, prototypes, different projects, etc. (Scholz, 2015). In addition, lastly is the dependence on technology in the sharing concept. The idea here is that the information and communication technology are enabling the whole process of exchange and interaction between the participants (Reinhold & Dolnicar, 2018).

The sharing economy has three important drivers: social, economic, and technological. The social refers to the concept of sharing goods, the economy refers to non-monetary payment, and the technological refers to the acquisition of new technology for a better connection between the participants (Somers, Dewit & Baelus, 2018). The main characteristics of the sharing economy are not new, and all the participants are aware of its advantages. The Internet and smartphones enable SE platforms to achieve the critical mass of users. The platforms act like intermediates for a small fee. In this process, platforms are building trust between the participants and they decrease the cost of transactions. For example, in sharing transport the provider platform matches the people with the drivers and takes a fee for that offer. Sharing platforms can be two-sided markets or multi-sided markets. The characteristics are the following: access over ownership, peer to peer, and allocation of idle resources (Constantiou, Marton & Tuunainen, 2017). The first characteristic access over ownership or on-demand economy is described as the ability users to have temporary access over underutilized assets (Maselli, Lenaerts & Beblavy, 2016). The second characteristic is a peer-to-peer or P2P market where peers or prosumers change the professionals on the market e.g., where people interact between themselves without any other third party (Ranchordas, 2017). Moreover, the third characteristic is the allocation of idle resources via a platform where these resources can be viewed as treasure e.g., they can be actively involved in the sharing process (Dazhou, 2019). The core functions of the sharing economy platform are to reduce the user's costs and bring additional profit to the person who shares the good or the service. For instance, to borrow something for a symbolic fee, such as clothes, knowledge, accommodation, etc. With the sharing economy, traditional consumption breaks, and it helps to save money. People share their surpluses to support someone else, and the resources are less strain due to their reuse (Bilderlings, 2019).

The rise of the sharing economy concept relates to the rise of the online platforms that provide temporary access to goods and services. Because of the usage of digital technologies people have changed the approach to product and services e.g., their attitude

for temporary access towards ownership. These platforms enable economic, social, and environmental benefits (Guyader & Piscicelli, 2019). The main role of the sharing economy platform is to interfere effectively and efficiently in the connection between the visitors on the platform. The good collaboration between the users in the process is a result of the quality of the service in the sharing economy platform (Akhmedova, Mas-Machuca & Marimon, 2020). In the last several years, the role of the SE is linked with environmental sustainability in various ways. One example is when people are becoming more aware of the usage of technologies to protect the environment. By using shared bike platforms instead of using petrol vehicles, which are causing air pollution. The usage of these shared bicycles results in energy efficiency (Lin & Zhai, 2023). It is important to mention that there are many different platforms and that each has its specific role. There is no equality between the platforms. They differ in the way they solve problems; in the way, they make interactions or create network effects. Nowadays many platforms exist but the common ones are technology platforms, computing platforms, utility, interaction, marketplace, content-crowding platforms, data-harvesting, content distribution, and on-demand service platforms. On-demand service platforms launched on the sharing economy concept (Platform Hunt, 2016).

1.3 Benefits of sharing economy

The purpose of the sharing economy is to have social, ecological, and economical values for the organizations (Wruk, Oberg, Klutt, & Maurer, 2019). The need for the sharing economy, from a sustainable perspective, emphasizes that it is a great opportunity for unemployed people to find temporary jobs, earn money, or interact socially (Schlagwein, Schoder & Spindeldreher, 2020). This perspective is a business potential that is still not well explored and used and offers many new job opportunities and better optimization of the asset's usage (Netter, Pedersen & Lüdeke-Freund, 2019).

Numerous advantages arise from the SE concept and affect all its participants such as:

- Participants save money (they use resources and services when they need them for a lower price rather than buying them)
- Easy and fast access to products and services
- Electronically payments via the platform
- Creating new jobs and flexible working hours
- Greater productivity because the platform facilitates mediation by decreasing costs
- More choices and quality (enabled by using filters on the platforms and helping participants choose service providers according to selected criteria)
- It promotes sustainability and socially responsible consumption.
- Existence of lower regulations for the participants (Šimbelytė, Skujienė, Tumėnienė & Moščenkova, 2019).

The sharing process can solve many problems in the economy such as overconsumption and income in-equity (Muñoz & Cohen, 2017). The sharing economy provides many social benefits such as the opportunity to earn and save money, changing customers' behaviour, use resources more sustainably, and social cohesion between people (Curtis & Lehner, 2019). The most important benefits of the sharing economy are the following: a unique experience for the participants, lower prices for the offer, and adapting to the needs of the customers than on the demand changes. P2P business will become a meaningful segment of the economy in the following years. That will have a positive impact on economic growth and will increase productivity. In addition, it will encourage other participants to enter the sector. Other benefits are that new networks within the societies will start and a room for innovations and new start-ups will be open.

The sharing economy also creates trust between the participant in the sector and its success bases on that trust. The repute of the participants that share their services and products is vital. If a user is not satisfied with the service provider, he can get low ratings and other users can decide not to use that service provider because of the lower rating compared to other providers on the Internet. Another benefit is the energy saving that is one of the biggest advantages that the sharing economy is characterized by. For instance, using shared transport leads to reducing costs and it saves energy (Grybaitė & Stankevičienė, 2016).

1.4 Constraints of sharing economy

There are several constrain of the sharing economy that are in conflict which arises with the existing traditional business sectors. The sharing economy models disrupt the existing companies and they believed that sharing economy platforms offer low- quality services and lower prices because of not loyal competence on the market (Kim, 2019). In many countries as an obstacle occurs the government with different regulations trying to control the innovations that sharing economy brings (Vith, Oberg, Höllerer & Meyer, 2019). In addition, as constrain is mentioned the willingness of the people to connect on the platform. The wider target brings success to the companies included in the sector of the sharing economy and the little segment is a disadvantage and leads to failure (Czakó, Szabó, Tóth & Fekete, 2019).

According to Šimbelytė, Skujienė, Tumėnienė & Moščenkova (2019), the main disadvantages of the SE are the following:

- SE does not guarantee safety and quality.
- Some platforms contain low data protection (participants must read the platform's policy and explore the security regulations)
- Boost the disappearance of traditional businesses because of unfair competition

- Lack of legal restrictions (having inspections, meeting safety standards, hygiene conditions)
- Irregular income (seen just as an opportunity for additional earnings)

Many constraints can be discussed as obstacles for participating in the sharing economy process such as availability, information access, informal access, discrimination, and privacy. Availability is the most common and it means that many countries have a specific law regulation that constrains the existence of the sharing economy platform. Next is the informal access meaning that many people are still sharing "goods" but without using any platform. They are doing the sharing process between already known and satisfied users. As in, every industry also here can be noticed a discrimination gap from the race or religious roots on both sides on the user and the provider side (Ranzini at el., 2017). Not many authors discuss the implementation of the sharing economy in different industry sectors because of the existence of a set of constraints that disable sharing economy platforms to operate. These constrain can be divided into few groups: economical barriers, such as lack of practicing sharing economy, stakeholders' barriers, like lack of rules and regulations, social barriers like lack of trust and technical barriers such as lack of technology to implement the sharing economy in different industries (Govindan, Shankar & Kannan, 2020).

2 MARKET DIGITALIZATION

2.1 Defining digital transformation

DT is involved in all sectors of society, and companies have the chance to transform their business models by using different digital technologies. Many definitions for DT are uncovered in the literature (Ziyadin, Suieubayeva & Utegenova, 2019). DT is the use of technology to radically improve the performance of an organization and in a digitally transformed business, it enables digital technologies to improve processes, engage talent, and new business models (Verina & Titko, 2019).

Another definition is that digital transformation is less of a digital problem than is a transformation problem (Westerman, 2018). Known as an improvement in the performance of companies, the DT is not just about customers, operations, and business models, but it is also about employees' experience (Westerman, 2018). According to Westerman, digital transformation directs more to leadership challenges then to technical once. Both leadership and technical challenges are important, but leadership capacity is essential because it turns technology into transformation. He pointed out that it is important how the company will manage the transformation by setting an exact vision, regularly investing and supporting to make this vision actual (Bonnet & Westerman, 2020).

Organizations are constantly implementing digital technologies for various goals like integrating and improving business processes, designing new market possibilities, innovations of products and services, decreasing costs, and making new business models (Kutnjak, Pihiri & Furjan, 2019). Here, the DT is discussed from two perspectives first, the digital technologies, done with the evolving of new technologies, and secondly by the user experience that correlates with the expectations consumers have linked with the consumption of the new trends (Henriette, Feki & Boughzala, 2016). Indeed, using technologies to improve productivity, creating value, and social prosperity affect the digital transformation. Estimated, digital transformation has speed growth and accelerated penetration in many industries, but many limitations are slowing its progress. Especially now, since industries were affected by the Covid-19 pandemic, many crucial changes developed in all industry areas (Reddy & Reinartz, 2017).

2.2 Digital business models, strategies and processes

When we say digital that does not only refer to something that we can buy and plug into the company. Digital transformation does not just include technology, but is an ongoing process that changes the way companies work. It involves combining people, machines, and processes, investments in skills, infrastructure, and making decisions about transforming those (Davenport & Westerman, 2018). As noted, digital transformation is not all about technology but needs multiple changes in organizations' strategy, processes, and structures (Štemberger, Erjavec, Manfreda & Jaklič, 2019).

2.2.1 Business model transformation

The business model is as a complex concept, framework, pattern, or statement that generates and, delivers value to customers. All companies are using their models based on three key things: how do organizations design, perform, and achieves the value (Li, 2020). The digital transformation of the business model is a valuable part for the development of all digital strategies. The business model is a main base of the company, and it can be adapted to the capabilities of the digital technologies. Companies face with many challenges that are happening while shifting the business models from analogue to platform-oriented (Bauriedel, 2020). The challenges that business models face are not only affected by companies and customers' needs. The business models are also affected by many sustainability changes and technological developments in digitalization and automation (De Man & Strandhagen, 2017).

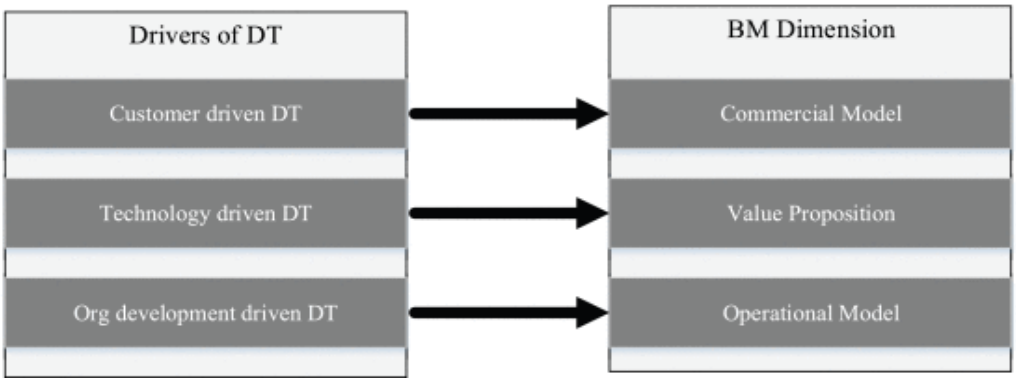
Furthermore, the business model explains how the elements of the organization work together thus; the model states how the company will convert its resources into economic value (Ritter & Schanz, 2019). The DT changes the functions in the business and how these functions interact within all activities in the company. The three building blocks in the changes are digital modifications to the business, creation of new digital businesses,

and digital globalization (Westerman, Bonnet & McAfee, 2014). When it comes to transformation, it is all about changing the way we do businesses, not the way we do technology. The first element is the digitally modified business, where companies are trying to connect the physical and the digital offerings. For instance, a grocery shop remains its traditional business being physical, but it uses the digital to improve its processes. This grocery uses an e-commerce platform and sells its products online. The next element is the new digital businesses. Here the company starts selling another digital product that complements their traditional product. An example would be selling sports shoes and a GPS device for tracking workout activities. Moreover, the last element is digital globalization, where companies shift operations from multinational to global. For example, a company can move its production elsewhere for a certain period (Westerman, Bonnet & McAfee, 2014).

According to Bonnet & Westerman times have changed, and now other three elements play bigger roles in the business model transformations in the companies. Those elements are digital enhancements, information-based service extensions, and multisided platforms. As mentioned before, the companies connect the physical and digital channels, but at this point they evolve more digital tools such as click-and-collect services. The next element is information-based service extensions, where businesses extend their product-based models with service-based models. For instance, selling car tires with sensors connected with a complete tire management service. The last element is the multisided platforms. These platforms have transformed many industries such as transport and accommodation (Bonnet & Westerman, 2020). A holistic framework model of business model consists of the following elements: value proposition, which reflects the vision and the strategy of the company, functional architecture that supports the production and the distribution, next financial sustainability, and stakeholder credibility that focuses on creating social and cultural values (Li, 2020). The question here is how these model changes after the DT begins in the companies. Digital technologies have a crucial role in the business models' disruptions and the changes in the models categorize as automation, extension, and transformation. This is how the technology changed the business models, with automation, extension, and transformation of the processes (Li, 2020). The DT in the business models affects partial elements or to the whole business models. At this point, technologies focus on experimenting with the business models and developing different trends that drive the interruption. These trends impact the company to start the DT are:

- The desire to implement new customer needs, and this one is customer driven
- The usage of new technologies, and this one is technology driven, and
- The aim to improve the way the work is done, this one is organizational driven

Figure 3: Influence of DT Drivers on Business Models Dimension



Source: Hrustek, Furjan & Pihir (2019).

Figure 3 presents the impact of the DT drivers on the companies' business (Hrustek, Furjan, & Pihir, 2019*).* For any Business model dimension, a particular method is used to recognize the different business model:

- First is the Commercial Model, which is customer-driven and that explains customer identification and experience. This model aims the customer in the centre of the attention.
- Next, the Value Proposition Model, which is technology driven and where the product or the service is defined by the technology that is used for their production.
- Lastly, The Operational Model, which is organizationally driven and that recognizes the advantages and disadvantages within the company that will enable the DT

The autonomous vacuum cleaner is as a good example of a customer-driven DT, while the old vacuum cleaner was just a solution to the increased customer's needs. As a technology-driven DT can mention the implementation of sensors that expanded the opportunities for products and services supported by the technology. In addition, the usage of robots instead of the human workforce is an organizationally- driven DT that improves the organizational advances for a more efficient work (Hrustek, Furjan & Pihir, 2019).

2.2.2 Digital transformation strategy

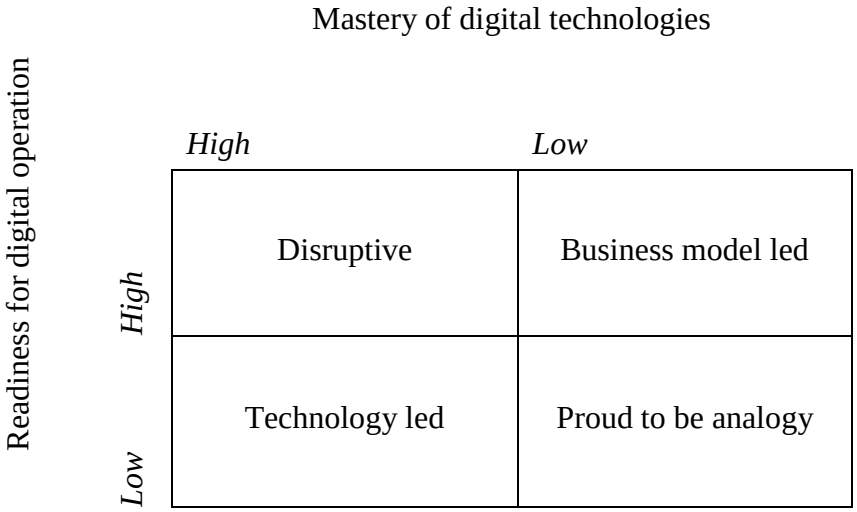
The strategy is defined as a package of measures that help for better company's decisions and actions. The development of digital strategies needs new ways of study and, different factors are considered. The goal of the digital strategies is to decrease costs by excluding operational activities and improving the value of the customers (Bauriedel, 2020). With the new digital technologies, companies are changing and improving their business models. To meet the transformation challenges, companies must implement a digital transformation strategy that will drive the changes (Korachi & Bounabat, 2020).

Therefore, the technology is not the one that provides value to the business. The value comes from doing the business in a different way, enabled by the new technologies. For instance, e-commerce is not about the Internet but about selling products or services differently (Westerman, 2018). According to Westerman, the company should focus not on creating a digital strategy but a better strategy enabled by the digital. A digital strategy is a business strategy, using digital resources to create a differential value (Korachi & Bounabat, 2020). It is a blueprint that helps companies to govern the transformation arrived from the new technologies. The digital strategies should align with the other business strategies in the company (Matt, Hess & Benlian, 2015). The digital transformation strategies have four elements in common. Those are the use of technologies, changes in value creation, structural changes, and financial aspects (Matt, Hess & Benlian, 2015). The first element is the usage of the new technologies. The company itself is the one that should decide if it desires to become a market leader in technology usage or if it wants to follow the other technology leaders on the market. The usage of the new technologies results in changes in value creation. New technologies give companies opportunities to enlarge their portfolio and digitize their products and services. The next element is the structural changes that refer to the way the new digital activities incorporate within the structures of the company. Lastly, the financial aspect is the element that aligns all previous elements, where the company supports the finance initiatives for transformation (Matt, Hess & Benlian, 2015).

Industries in general face not only with challenges of the DT but also with many obstacles such as issues, barriers, and problems that indirectly change the markets. While implementing the DT in the companies that are part of a particular industry, it is important to have a digital strategy that will enable managing all resources, and create value for the end-user. The digital transformation strategies have two dimensions, the usage of digital technologies, and the readiness of the business to accept the digital work, meaning that these strategies should be the focus rather than on the usage of digital technologies in the industry or on the improvement of the business model (Kutnjak, 2021). According to Tekic & Koroteev, there are four generic digital transformation strategies: disruptive, business model led, technology led, and proud to be analogue exist.

The disruptive strategy, as seen in Figure 4 represents a high level of business model predispositions for digital operations and high government of the digital technologies. The companies that follow this strategy are called “disruptors” or simply newer in the industry. Usually, they are start-ups. These companies have no employees or resources at the beginning and having zero is their advantage in doing business in a very new way with the usage of new digital technologies. Next, is business model led, a strategy that is characterized with low mastery of digital technologies and high level of business model readiness for digital operations.

Figure 4: Typology of digital transformation strategies



Source: Tekic & Koroteev (2019).

Here are the companies that are present on the market many years and they are under pressure to make changes and accept new technologies if they want to survive. Companies should react quickly on the changes to their products and services into digital once. For these purpose users need to be educated and their contribution to the formation of the new business model is essential. After changing, the model there will be more clear approach in transforming the business strategy. Following is technology led strategy that is characterised with a high level of technology changes the companies are willing to do and a low business model change, e.g., these companies want to keep their old model just to upgrade it with the novelties in the sector. Lastly, characterized with low usage of new technologies and low changes in the business model stands the proud to be analogue strategy. This strategy brings a historically specifications and characteristic with itself and it unique because with the current technology and business model the company developed a well-known brand (Tekic & Koroteev, 2019).

2.2.3 Transformation of business processes

The new digital technologies have a big impact on companies. Companies must combine these digital technologies to improve processes, employ better staff, and, develop new digital business models. Good digital transformation understands optimization of the company's business processes in accordance with the digital strategy. The transformation of the business process includes automation of all business processes in the company (Hartley & Sawaya, 2019). Operational transformation appears in the following elements of digital capability: core process automation, connected and dynamic operations, and data-driven decision-making (Bonnet & Westerman, 2020).

Some companies are still using the traditional ways of automating their processes like ERP (Enterprise Resource Planning) systems, but nowadays moreover, advanced

technologies like machine learning and robotics are used. For example using autonomous trucks in the mining industry. The next element in the digital capability, connected and dynamic operations, is the element where a digital connection exists between machines, models, and processes. For instance using drones to control a construction process. The last element is data-driven decision-making, wherewith the usage of machine learning and different algorithms, decisions, are brought more strongly (Bonnet & Westerman, 2020).

2.3 Digital transformation challenges in different industries

The digital transformation is happening around us, and by its challenges, every industry is affected. In common sense, digital transformation refers to the usage of computer and internet technology, and in a more general sense, it refers to the changes that new technology has on the company. It is noticeable that the digital transformation has its disruptive impact on the economic system and individuals' lives, presented with new or improved products and services, higher convenience, new experiences, lower cost, low prices, opportunities to create new values, and entering new markets (Reddy & Reinartz, 2017). The industries that were challenged the most by the DT are ICT (Information and Communication Technologies), manufacturing, education, human health and social work activities, electricity, gas, steam and air conditioning supply, wholesale and retail trade, repair of motor vehicles and motorcycles. The changes in the IC sector happened when companies required new digital leadership roles, such as DTM (Digital Transformation Manger) or CDO (Chief Digital Officer), in the manufacturing industry the main challenge was the acceptance of the "smart factory" while using lasers for cutting materials, digital printing and three-dimensional (3D) printing. Furthermore, in wholesale and retail challenge was increasing the number of online shopping and e-commerce. In education, many improvements happen such as bringing University classes remotely and development of e-learning platforms. Next, in the health industry challenge was the beginning of a new dimension of hospitals, where the health telemedicine took its place. The usage of different technologies and e-health platforms resulted as an improvement in the whole health system. Furthermore, oil and gas industry reflected on changes such as the digital application that helps connecting the producers with the end users' models (Kutnjak, Pihiri & Furjan, 2019).

Public administration, transportation, storage, and education were the industries influenced the most before the Covid -19 pandemic. The significant challenges that these industries face are the lack of skilled people, complex processes, and problems with data protection. Because digital changes occur every day, people have to repeat the learning process, become more educated and skilled. The next challenge is the additional work because of the complexity of the processes. Finally, the number of data increased in years, and companies needed to respond to its protection (Kutnjak, 2021). After the Covid-19 pandemic, new challenges arrived for many industries. Moreover, human health, social

work activities, and education were industries that are more impacted. The challenges doctors and medical staff faced were the digital tools that completely change the whole system in a short time. Additionally, technical problems in distance learning, staff, and students not prepared for working/studying remotely these all result in changing the homes into school classrooms and working environments (Kutnjak, 2021).

3 DIGITALIZATION OF THE SERVICE MARKET

3.1 Defining electricians

Electricians are merchants practicing electrical wiring of different constructing buildings with special equipment. They can work on the installation of new electrical components, or they can repair the existing ones. An electrician and an electrical contractor are often confused terms. An electrician is a person, and an electrical contractor is a businessperson or a company that hires electricians to perform their electrical construction projects and manage the electrical power system (Defined Electric, n.d.). In addition, another description says that an electrician can be anyone that has skills for installation and repairing the electrical wiring system and its components, including the lights, securing system, and the computer network system for industrial purposes and homes. Finally, a definition for an electrician underline as the following: a skilful person that operates in the construction industry and practices in the design, lighting, preservation, and improvement of electrical systems (ElectricianSchoolEdu, n.d.).

The general division of the electricians is on outside electricians or known as linemen and inside electricians, named as wiremen. Linemen are electricians that operate with higher voltages. Their work connects with the warrant transmission of electricity from the power plants to the electrical stations and lastly to the end-users. Linemen electricians work on households, commercial, and industrial constructions. On the other hand, the wiremen work with low voltage, usually located inside construction buildings. Wiremen fix, manage, and repair electrical systems in houses, commercial, and industrial buildings (ElectricianSchoolEdu, n.d.). Who can be an electrician relies on the regulations and requirements in different countries. In the US, the type of electricians is regarding their certification level and by their specialization. Here, concerning certification levels, the electricians divide into apprentices, journeymen, and masters. This certification level explains the steps to becoming an electrician. The first step is the apprentice level, meaning that everyone who wants to become an electrician must go through an apprenticeship program. For starting this program, a high school diploma from a relevant vocational department requires. In addition, long practical hours needed that last from three to 6 years before the apprentice enters an electrician group.

After completing the apprenticeship program, the candidate will satisfy the conditions to take the test for becoming a journeyman electrician. At this point, he gets a license from

the local licensing electrician group. With this certificate, the candidate can work individually without any supervision. The highest level in the process of becoming an electrician is the master level, and have 4.000 hours of work. After completing these working hours, the candidate can take the exam for becoming a master certificate electrician (EliteForceStaffing, n.d.). On the other hand, in Europe, there is no general division for the electricians. The grouping differs from country to country. There are also differences in the requirements for becoming an electrician. An electrician can be anyone that has a certificate of vocational aptitude, professional bachelor in electrical trades, or professional certificate. Furthermore, an electrician must have three years of working experience in the European Union (EU) or European Economic Area (EEA), to request a professional certificate to the chamber and crafts (CMA) (EliteForceStaffing, n.d.).

3.2 Service market overview

The electricians are part of the service market, that consists of many companies, that have the purpose of installing electrical systems, wiring lights or fitting electrical sockets, or repairing any, electrical issues in various object living or working buildings. Part of this market is different types of electricians, electrical engineers, management staff, and their employees that perform numerous types of electrical work (Fucci, Concas & Bailey, 2019). Electricians can be employed in many diverse industries such as construction, manufacturing, electrical engineering, government and all of them form the service market (BorderStates, 2022). Nowadays, in Europe in the majority of countries, the shortage of labour is seen in skilled workers such as electricians and mechanics (Astrov, Leitner, Grieveson, Hanzl-Weiss, Mara & Weinberger-Vidovic, 2021). Furthermore, in United States (US), there is a shortage of skilled labour employees. It states that electricians are in high demand. The gap of electrician's shortage appeared because the youth are not attracted that much to this industry, and on the other hand, the demand is higher, and the old skilled labour is going to retirement (Feinberg, n.d.).

Table 2: Number of electricians in different industries in the US

Industry	Number of electricians in 2020	Number of electricians in 2030 (predictions)
Construction	516.600	568.000
Manufacturing	49.000	51.800

Adapted from BorderStates (2022).

However, this shortage of electricians is not expected in all industries. As seen in Table 2, there are predictions that by 2030 there will be an increased demand for electricians in the construction and manufacturing industry (BorderStates, 2022).

3.3 Digitalization of the service market

For the past years, the service market has not been changed, but lately, with the impact of the new technologies, many transformations happened in the way electricians and contractors work. The digitalization on the market modified the whole system from manufacturing, distribution to electricians' handwork and to the end-user (Shakil, 2021). Many factors affect how this market is slowly changing, like the market concentration, the pricing transparency, and the new technologies and IoT. Customers are searching for better answers such as smart homes, faster distribution, smart and immediate repair of the issues etc. Furthermore, the trends mentioned before enable distributors and electricians to improve their business models and adapt to the changes in the market (Shakil, 2021). The usage of smart meters and renewable energy are changing future facilities. There always be a need for traditional electricians, but their role must change. They will need to upgrade their existing knowledge and skillset with the installation of solar panels, new heating systems, etc. Moreover, they will need to adapt on the changes in the industry (ECA, 2021).

The electricians are lately trying to increase their awareness on the market. At this point, electricians can be efficiently reachable by the customers. Creating a professional website, good content on the site, doing social media profiles, video marketing can help electricians boost their online reputation (Yelp, n.d.). In addition, electricians are improving their digital visibility with the usage of tools such as web sides, digital marketing, and mobile applications. Numerous mobile applications exist on the market that supports the work of electricians. For instance, the Service Titan app simplifies the electrician's work by helping them manage and organize their tasks efficiently, including scheduling calls from customers, booking the terms, and collecting data for an electrical issue. Next is the Route4Me app that transforms the process of planning the routes for the electricians per day. This application is usually used by construction companies that have many employed electricians (Persinger, 2022). Whether we talk about an electrician working, individually or as a part of a company, today, many business software help electricians organize their work. Such platform software is FieldPlus, which enables the company to use many customers relationships management (CRM) tools, like scheduling, writing notes, attaching files, and pictures, creating invoices and using GPS to track the location of their technicians. Next, another popular software platform is HauseCall Pro. Here, electricians can perform and have a picture of their entire work in one app. It includes the customer’s database, payment process, scheduling work, ordering equipment, materials, etc. (HomeStratosphere, n.d.). Very new chapter has opened with the introduction of the robotics in electrician's sector. Lately, different robots are used in the entire construction industry, such as 3D printing, robotic arms, vehicles, etc. This construction market affected by robotics is forecasted to reach $470.61 million by the end of 2026. For the construction workers in general, this indicates that their roles will be slowly replaced with machines by 2057. On the other hand, for the service market, it is

predicted that in the US, 42 % of electricians will be substituted with robotics (Kure, 2020).

3.4 Platform provider cases of sharing economy

Sharing economy defines a system where participants use platforms to match with the providers and exchange goods, services, and ideas. Afterwards, the sharing economy became phenomenon and term for widespread discussions (Belk, Eckhardt & Bardhi, 2019). The businesses in the sharing economy concept relate to the tangible goods such as housing and car rides, but also with many intangible assets such as knowledge and experience (Oh & Moon, 2016). The advantages of the Internet are the main drivers of the sharing economy concept. Nowadays we can find the sharing models in almost all sectors including learning, construction, telecommunications, fashion, finance, healthcare, transport, accommodation, etc. (Netter, Pedersen & Lüdeke-Freund, 2019). It that until the end of the 2025 sharing economy will grow from $15 billion in 2025 to $335 billion. It will rise in many sectors such as traveling, finance, music, and video streaming, knowledge, and others (Muñoz & Cohen 2017). The four sectors in which the sharing economy platforms are widely used are the sector of mobility, hospitality, on-demand sector, and clothing sector. Also, as leaders by the presence of their total reference per sector are Airbnb in the hospitality sector and Uber in the mobility sector. As representatives on the service market, there are many platform-based applications. Most of the platforms, do not have sharing concept, they are more applications like service management tools that organize the internal work for electricians, inventory, billing, contacts, etc. Others are platforms that help customers search for electricians. There are some web-based platforms like primerjam.si or mojmojster.net, and native-based such as the Housecall Pro software app, which is furthermore described (Muñoz & Cohen 2017).

Primerjam.si and mojmojster.net

In Slovenia, both web applications primerjam.si and mojmojster.net are functioning with the same approach. They search for workers from different profiles such as electricians, auto mechanics, repairperson, appliances, plumbers, carpenters, etc. The process of finding electricians in these apps is super easy. First, customers should specify they need electricians, and then they fill out personal data such as their real name, surname, email address, phone number, and location. Furthermore, customers are required to enter a more detailed explanation why they need the electricians, e.g., what electricity issue they have, when, is it an urgent situation, etc. The last step of the search is to leave credit card details, send a request, and wait for a response over an email or phone (Moj Mojster, n.d.).

Housecall Pro software application

On the other hand, Housecall is a native application. This application searches various workers in the US, for households that resolve problems with electricity, heating,

plumbing, painting, etc. The idea of this application is that users can register as workers or as customers. Both users must fill out the required data such as personal information, address, and payment details. The application supports Global Positioning System (GPS) location search, payment function, automatically receives, and gives invoices, chat capabilities between the users, email and phone options (Software Advice, n.d.).

Handy online platform

Another popular platform in the US for searching for different handymen's services is Handy, which enables an easy and effective way to arrange a home service. The idea is that a user registers a profile on the platform and fills out a form about what type of handymen he needs. On the other side, there are already registered repair people (individuals or companies) that offer their services. Once a fill-out form is sent over to the platform, all handymen that are potential problem solvers are offering their price and the earliest day they can fix the issue. When the user chooses one of the offers the problem, fixing can start (Handy, n.d.)

4 MOBILE APLICATION DEVELOPMENT

As stated in the chapter 2, the service market is still not digitalized enough. Different digital tools exist to simplify the work of electricians, like applications that organize the tasks and the equipment, but not many for searching electricians on the market (Flora & Chande, 2013). Here, mobile development is discussed for the purpose to develop an application that will simplify the process of searching for electricians. Mobile application development is defined as the process of developing applications for mobile phones and small screen devices that can be installed during production or downloaded by the end customer from an app store. Software development has emerged in the past few decades (Flora & Chande, 2013).

Mobile app development, like web app development, originates from traditional software development. The main difference is that these apps are written for mobile devices. Nowadays, there are two most known platforms for mobile apps, the iOS platform on Apple and the Android platform on Google (David, Novotny & Denman, 2021). No simple definition can explain mobile app development, but it can be concluded that it includes the process applied to create and release a mobile e.g., coding and deployment. While explaining this term, we come to describe what mobile and application stand for. In this point, mobile is for the device such as a mobile phone, watch, tablet, e-reader, or laptop, and application is for the software and the operating systems, platforms, and languages the device will support (David, Novotny & Denman, 2021). So, before starting the development process, a decision on what type of app will be developed should be brought. Different mobile applications are supporting the on-demand platforms. These applications can be native, web applications, and hybrid and so on. It depends on the

company to choose which application type will build. Native applications are specifically built for a typical device platform such as iPhone Operating System (iOS), or Android and installed from their application stores. Next, the web application is the one that has access via a web browser over the Internet, and lastly, the hybrid app, which can be a desktop and mobile at the same time (Saccomani, n.d.). Application development is understand as a process of common steps or stages. These stages include many people that work as a team within the company to deliver a final application product. The team involves experts from different fields, such as management, marketing, design, and engineering. The most typical steps in the process of developing n mobile application are strategy, planning, design, development, testing, and release (David, Novotny & Denman, 2021).

4.1 Software Development Life Cycle

Software Development Life Cycle (SDLC) is a framework for developing all software products. The purpose of the SDLC is to deliver excellent software products. This whole process includes a plan on how to proceed with designing, producing, and maintaining the software product (Shylesh, 2017). The steps in the traditional and the agile SDLC are the same, but the main difference is the sequence. In the traditional approach there is a linear sequence and in the agile iterative sequence (Team, kpi partners, n.d.). The distinction is that the unit of work for the traditional approach is the step itself named phase (Requirement Analysis, Design, Testing), and the unit of work for the agile approach is named sprint. In the traditional approach, each phase starts until the one before finishes, and they do not have a defined start and end date. On the other hand, in the agile approach the sprint has a defined start and end time, which is usually with a length of two weeks (Osbourn, 2020). One proposed mobile application development process consists of the following stages: strategy, planning, design, app development, testing, and deployment.

4.1.1 Strategy and Planning

The first step is forming the strategy. This phase should give us an answer to many questions, such as what are the objectives of the application, what problems this application solves, what team will work on the development, and how long the process of developing the application will last (Matthew, Novothy & Denman, n.d.).In this stage, companies should receive an answer on how the mobile application is a solution to their concerns (Matthew, Novothy & Denman, n.d.).The following step is planning, where companies decide whether the development will be their solution or they will hire a digital agency. Whether a decision on a no-code or low-code platform will be the right solution for their app development, positioning the teams, the tools, the technology, and the deadlines they will use during the development (Tobin, 2020).

4.1.2 Design

Following is developing the design. In this phase, the team is doing brainstorming and sketching ideas. This step results in a prototype of our application. Here the UI and UX decisions are made, and a mock-up prototyping of the app with minimal client requirements is created (Matthew, Novothy & Denman, n.d.). The process of designing the mobile application is probably the most important one that combines all the ideas for a creative solution in one place. It all starts with the goal of the application. Setting a clear goal and documenting it makes explicit what we like to achieve with the application and how we will satisfy the already discovered customers' needs. Next is creating a wireframe or a blueprint of the design, meaning a clear specification outline for the application related to how many pages the app will have and all the functionalities that should be included. Lastly is the final design and prototyping of the application (Paish, n.d.)

The prototyping of an application explains in detail the process of designing and presenting the final product for testing. Several steps are followed in the process, which help companies create and bring the right designed application to customers. These steps include understanding the problem, identifying main functionality requirements, creating sketches of the primary screens, turning the sketches into wireframes, turning the wireframes into a prototype, and translating wireframes into the final design. First, we must identify the problem, for example, to discover why we want to design the application. The next step is to define the functionality requirements and prioritize them. For instance, our application will run on an Android platform, have three pages, and include a feed with stories, a possibility for liking pictures, and more. After prioritizing the main functionalities of our future design, we should focus on making sketches of the preliminary screens of the application. Turning these sketches into wireframes is the next step, where we determine the skeleton of how our design should look (Hall, n.d.).

A beautiful, functional, and professional design skeleton is the one that will make our application successful. Choosing the right colours, fonts, pictures, and all design elements are decisions that should be presented here. Both the user experience (UX) and user interface (UI) are important, meaning the designer should design the product in the shoes of the customers and make functionalities that will make the app easy to navigate (Hall, n.d.). The UI creates visual interfaces for different digital products. It guides the visual product interface of an app, like the app screens. The UI design includes techniques of visual and interactive effects that will be evident to the user and help him navigate easily with the app. Moreover, it means the design of everything visual on the digital product, i.e., the product's display (Hannah, 2021). This design directs to a system, and the user interacts with this app via controls and data inputting. Following the UI refers to the general perception and behaviour users receive while interacting with the app (Joo, 2017).

In this app designing process, the designers have an important role in creating an interface that is beautiful, compelling, and connected with the company's goals. Designers are

responsible for creating a suite of UI elements, like buttons, icons, menus, colour palettes, etc. Once they decide on the needed elements, they can proceed with the app designing (Hannah, 2021). It is important to note that there are two ways an application can be designed. If we do not have a big team, we can use software to design the application ourselves. The second way is by hiring a professional designer. Using an application builder will be a cheaper option than hiring a full-time designer but still depends on the complexity of our plan for the application (Paish, n.d.). The next step is when the wireframes become prototypes. In this phase, the product is brought closer to a specific group of people who should test the pre-designed application. Finally, the prototypes are turned into the final design. Here, the final design of our app is done, depending on the scenario we have chosen, whether to design the application ourselves using a software solution, hire a freelance designer, or a designing agency (Hall, n.d.).

4.1.3 Development, testing and deployment

The actual process of building the app as a final product happens in this stage of development. This stage refers to the real creation and release of the mobile application. Here the technical architecture of the app is completed, including the backend, frontend, and APIs (Application Programming Interface). In addition, the application is tested. This is the phase where the quality of the app is secured. Here the testing team is doing different types of testing that will help discover all the issues that occurred in the previous steps of development. Software testing is the method of checking if a current software product matches the expected requirements and checking whether the software is bug-free. With software testing, the bugs, issues, and defects in the software can be discovered in the early stages of software development (Kimsbruner, 2022).Once the application passes all the mentioned steps above, it is ready to deploy and is available for the end-users (Matthew, Novothy & Denman, n.d.).

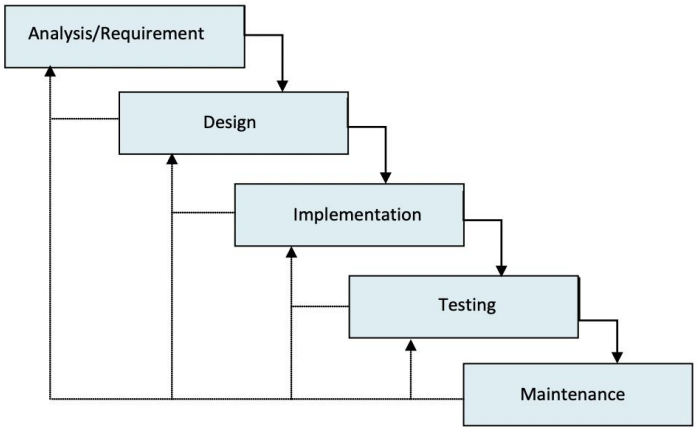
4.2 Software development methodologies

The software development process is long and time-consuming and needs financial and human help to build an excellent plan and produce quality software. Several methodologies have been embraced to improve the software development process. The traditional methodology was presented first, which was widely accepted by businesses and developers, but in time, a new, improved methodology evolved - named agile methodology (Lawal & Ogbu, 2021). The two primary software development methodologies in the IT sector are the Waterfall and the Agile. These methodologies have numerous characteristics and benefits for both the clients and the businesses. The methodologies differ in their approaches and the involvement of team members.

The traditional method follows a defined step-by-step process, while the agile approach allows each step to be completed individually. Additionally, collaboration between teams

is emphasized in the agile methodology, while it is not as prominent in the traditional model. In the traditional method, documentation is often neglected, leading to important details being missed, whereas the agile approach prioritizes documentation. Finally, while the traditional approach focuses on meeting all requirements at once, the agile method values daily collaboration between teams and clients, resulting in a more successful end product (Dima & Maassen, 2018). The Waterfall model is a methodology where one-step must finish for the development to go to the next step. These steps are seen on the Figure 5: Analysis, Design, Implementation, Testing and Maintenance, and will be discussed in the following paragraph (Lawal & Ogbu, 2021).

Figure 5: Waterfall development model



Source: Lawal & Ogbu (2021).

This five-step methodology was unique at the beginning, but in time, it caused many issues during the development of the software. The process, as mentioned, must follow each step one by one, so the software testing in the early stages was excluded, which caused not a qualitative product. There has been instability during the process, many delays with codes, high costs, and unsynchronised teams (Lawal & Ogbu, 2021).

Table 3: Differences between the Traditional and Agile model

Characteristics	Traditional development	Agile development
Fundamental hypothesis	It is specific, can be predicted and developed using extended and detailed planning	Small team, software that is of high quality with the use of continuous improvement in design and testing is developed

(table continues)

Table 3: Differences between the Traditional and Agile model (Continued)

Style by the management	Control and command	Collaboration and leadership
Communication method	Formal	Informal
Development direction	Fixed	Can be changed
Requirement	Well known and stable	Rapid to changes and emergent
Size	Project teams are large	Project teams are small

Adapted from Lawal & Ogbu (2021).

Following to these, new methodology was presented. The Agile methodology which is defined by many different methods: Kanban, Dynamic Software Development Mode, Crystal, Lean Development, SCRUM, and others (Lawal & Ogbu, 2021). In the Agile methodology development the work is divided into small cycles, there is iterative delivery, a client feedback, smaller teams, and increased collaboration between the teams. This agile approach is more accurate and customer close, the issues are adaptable, and can be modified anytime during the development (Team, kpi partners, n.d.). An example of the agile methodology is the SCRUM method, is where the company organizes cross-functional teams with several roles Scrum Master, Product Owner, and a development team. The requirements from the client are placed in the Product Backlog and divided into several User Stories, and these tasks are organized in a unit of works named Sprints. Each Sprint consists of the user stories that are planned to achieve in the time unit. Many visible differences between the two methodologies exist that arise from their characteristics and their approach to work (Table 3). As we mentioned above in the table, they differ by the unit of work which traditionally is called phase, and in the agile approach is named sprint. The teams in the traditional model are big, and the communication between them and the client is formal. On the other hand, in the agile environment, the teams are small, adaptable to rapid changes, and the communication is informal (Lawal & Ogbu, 2021).

5 RESEARCH METHODOLOGY

Since the research question of my thesis is to examine if a mobile application for electricians will simplify the search for them, at this point, I focused on the electricians and their opinion. I did two online interviews with electricians and one interview with a CEO of a construction company. The goal of having the interviews with the electricians is to see how easy they find a job, to examine their opinion about the electrician's needs on the market and their views on the transformations happening in the market. On the other hand, the purpose of the interview with the CEO was to get more information about the current state of the service market, how they, as a company, search for electricians,

and the usage of tools for simplifying the work, and the impact of digitalization on their domain.

The interview questions are open, short, and based on the literature review of my thesis. I have formulated them to examine the views and approaches of electricians regarding the service market, the digitalization of the market, the shortage of electricians, and the designing of an application for electrician searches. The aim is to determine, based on existing literature, whether it is difficult to find an electrician and if designing an application will help electricians connect with customers faster. Furthermore, I conducted an online survey which included questions based on the interviews. After analysing the results of both the interviews and the online survey, I started developing the idea of creating an app for electricians which should answer the research question. Based on the results of the interviews and online surveys, I would present an overall analysis, and the transcripts of the complete interviews are included in the and Appendix 1 and Appendix 2.

5.1 In-depth interviews

Electricians

The interviews with the electricians were conducted over the WhatsApp platform on the same day in late October 2021. All the questions were close-ended and semi-structured, and I asked the electricians 12 questions, which were collaborative to share their opinions and experiences. Firstly, I asked if they hold any recognized certificates for electricians. Then, I inquired about their employment status, whether they work for a company or on individual projects. Next, I was interested in knowing whether they work on other projects, such as in their neighbourhood, and how people usually contact them. Additionally, I asked about their views on the shortage of electricians on the market, based on the literature. To examine their use of technology, I asked whether they typically use mobile devices, how many applications they have installed, and whether they use an electrician's app that helps them while working. I also asked for their thoughts on having an application that uses GPS to locate them and help nearby customers. Lastly, I questioned whether they would be prepared to accept any innovation on the market, such as a mobile application for searching for electricians. The detailed answers to the interviews can be found in the following chapter.

CEO of Construction Company

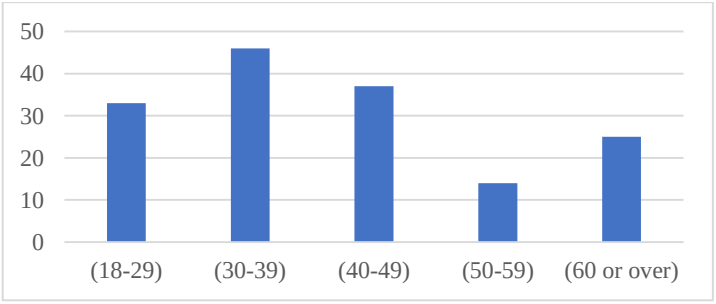
The interview with the CEO was held over the WhatsApp application in September 2021. The interview has 10 questions, semi-structured and they were sent to the interviewee one day before the actual interview. The first question refers to how many electricians they work with and whether they are all employees at the company or they are contractors. The CEO was asked how they search for electricians when they need them and how easily

they find them. Following were the questions about the digitalization of the electrician's market, and whether they as a company use any tool that simplifies their process of work or way of searching for electricians. Also, I asked the CEO about their opinion if there is a shortage of electricians on the market and how would they feel if they will have an app that will help them in the process of searching for electricians. CEO's answers are additionally explained in the following chapter.

5.2 Online survey

To create the online survey, I formulated questions based on the literature review, interviews with electricians, and an interview with the CEO of a construction company. I conducted the survey using Google Forms and titled it Digitalization in the service market. I posted the survey in several Facebook groups related to household issues, which were the best target to collect viewpoints connected to home electrical issues. The groups were from several regions: Slovenia, Croatia, Germany, North Macedonia, and the US. The questionnaire is short, well defined, and consists of 14 questions. I used a Likert scale to rate the level of agreement of the interviewees (strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree), frequency (never, rarely, sometimes, often, and always), importance (very important, important, neutral, unimportant, and very unimportant), and satisfaction (never, rarely, sometimes, often, and always). The questionnaire consisted of two sections. The first section comprised demographic data of the respondents, while the second section focused on the frequency of electrical problems and the technical knowledge of the respondents. Figure 6 represents the respondents by their ages.

Figure 6: Respondents ages groups



Source: Own work.

In the upcoming chapter, I present the analysis of the survey results in mean values, conducted using Excel, including various charts and pivot tables. A total of 155 respondents participated in the online survey, and all of them completed the required 14 questions. The demographic data shows that 105 respondents (69 %) were female, 46 (29 %) were male and four (2 %) preferred not to disclose their gender. As illustrated in Figure 6 the majority of the respondents are women that live in an urban area and belong in the

second age group (30 -39) .The research indicates that all the respondents are individuals who are members of household Facebook groups related to electricity topics. This suggests that they likely joined these groups after experiencing electricity-related problems at home. Furthermore, 42 % of the respondents are from an urban area, 33 % from a suburban area, and 15 % are from a rural area.

5.3 Application development

After obtaining the results from the questionnaires and interviews, the actual application development process began. I opted to use the SDLC methodology with the Waterfall approach. I choose this model because it is simple, and the application itself is not complex. During the planning and analysis phase, I fulfilled the roles of planner, analyst, designer, developer, and tester, as there was no dedicated team for the app's development. Following the SDLC framework, I progressed to the wireframing phase, where I created blueprints for the app's design. These blueprints acted as placeholders for the final design and prototype of the application, highlighting the essential design prerequisites. I did wireframing of the electrician's app on ten screens, by using the Mock Flow Wireframe Pro software. However, not all application functionalities were entirely defined and showed at this stage. Attaching to the SDLC methodology, I utilized the UML case diagram to illustrate and visualize the app flows, using the Visual Paradigm software to create the diagrams. Finally, I ran the Adalo software builder to incorporate the design and prototype of the final version of the electrician's app. To do so, I used a free trial of the software, resulting in a final design consisting of sixteen screens.

6 ANALYSES OF THE CUSTOMER'S NEEDS AND ELECTRICIAN'S PREPAREDNESS FOR DIGITALIZING THE SERVICE MARKET

6.1 Analysing customer needs

To start, I analysed the demographic structure of the respondents by combining the data related to their gender, age range, and residential region. To answer the first group of questions related to the demographic structure of the respondents, I summarized the results concerning their gender, age range, and residential region.

The data shows that a higher percentage of respondents are women, indicating that women are more responsible for household and related households issues. Additionally, it was found that the highest percentage of women are subscribers to Facebook groups that help solve electricity issues. This percentage of respondents falls within the 30-39 age range, and the majority of respondents are from rural areas, which in my opinion, points out that the woman from this particular area of living moreover is responsible for

their household in general. In the **Error! Not a valid bookmark self-reference.**, I have provided a summary of the data for all 155 respondents.

Table 4: The demographic structure of the respondents

		f	f %
Gender	Male	46	29,7
	Female	105	67,7
	Prefer not to say	4	2,6
Area of living	Urban	39	25,2
	Sub-urban	51	32,9
	Rural	61	41,9

Source: Own work

Table 5 summarizes the questions connected to searching for electricians and presents the total means of the percentage of people facing these issues. The results indicate that respondents frequently experience issues with their electricity, and the percentage of people who have difficulties searching for electricians is higher than the average. Regardless, a higher percentage of respondents agree that it is difficult to find an electrician at any time. In addition, to gain insight into how respondents search for electricians, I summarized their answers whether they primarily searched for electricians online (e.g. by using a search engine like Google) or through personal recommendations from friends. The percentages of respondents who reported searching for electricians online and through personal recommendations from friends were close, indicating that people are equally likely to pursue both options.

Table 5: Mean values of the attitudes towards electrical maters

	Mean
I am often facing electricity issues at home	2,9
I find it difficult to search for electrician when I immediately need one	3,4
I usually search for electricians googling online	3,4
I usually search for electricians as a suggestion by a friend	3,3
I this there is a shortage of electricians on the market	3,4
I think there should be a simpler way to search for electricians	3,7

Source: Own work

The respondents expressed a desire for a more efficient way of searching for electricians on the market, one that would enable them to solve their electrical issues promptly when they happen. Moreover, the percentage of people who indicated satisfaction with a mobile application that simplifies the process of searching for electricians was higher than the

overall average. Following, I examined the occurrence of electrical issues per area. Based on the Table 6, a significant number of respondents who reported experiencing electrical issues in their households agreed with the statement that finding an electrician immediately when needed is difficult regardless the area where they are living. This table, represents the mean values of the different statements the respondents were asked upon different electrical maters in their households. The results suggest that the percentage of people facing electrician issues is similar across all areas, but it is more challenging to find an electrician in rural areas.

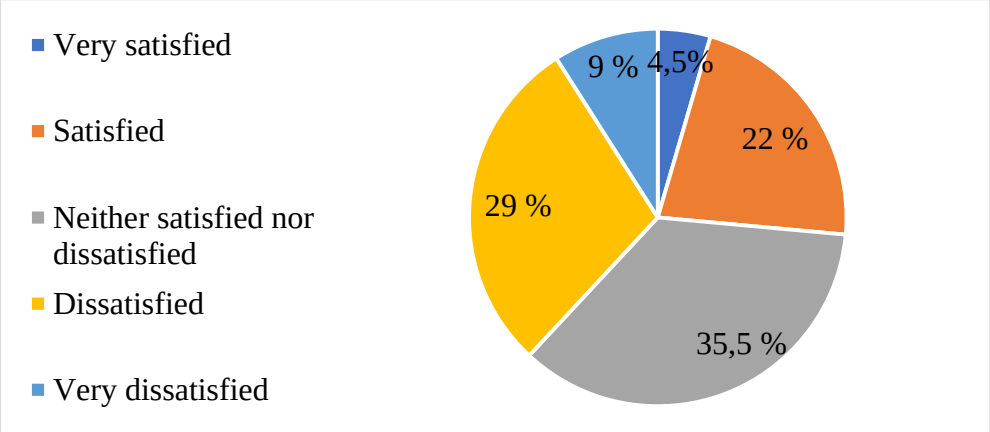
Table 6: Mean values of the attitudes of searching for electricians per the living area

	Area of living		
	Rural	Sub-rural	Urban
I am often facing electricity issues at home	2,8	3	3
I find it difficult to search for electrician when I immediately need one	3,8	3,1	3, 4

Source: Own work

Additionally, I examined the satisfaction of the current process for finding electricians. Half of the respondents reported are neither satisfied nor dissatisfied with the process, suggesting that those experiencing electrical issues are determined to find a solution regardless of the challenges involved (Figure 7).

Figure 7: Satisfaction of the process for searching for an electrician



Source: Own work

Next, I examined the technical habits of respondents, specifically how often they used mobile devices and various mobile applications. To summarize the data, I analysed the frequency of mobile device usage and the age range of respondents who reported using these devices. As seen from Table 7, the results indicate that younger people are more

likely to use mobile devices than older people are. The survey results indicate that a majority of respondents, regardless of their area of residence, age-range, or mobile device usage, support the idea of simplifying the process of finding electricians and providing customers with a quick and easy way to connect with them.

Table 7: How often respondents use mobile devices according to their ages

		Age range of respondents				
		(18-29)	(30-39)	(40-49)	(50-59)	(60 or over)
Frequency of using mobile devices	Always	78,8 %	39,2 %	35,2 %	50 %	28 %
	Often	21,2 %	50 %	29,7 %	35,8 %	16 %
	Sometimes	/	6,5 %	29,7 %	7,1 %	12 %
	Rarely	/	4,3 %	2,7 %	7,1%	/
	Never	/	/	2,7 %	/	44 %

Source: Own work

6.2 Analysing electrician's preparedness for digitalizing the market

6.2.1 Electricians interview analyses

In this section, an analysis of the interviews with two electricians from different regions, E1 from North Macedonia and E2 from Croatia, is presented. The electricians perform different types of electrical work, and their answers in the interviews were found to be quite distinct. The objective of the analysis is to evaluate the preparedness of electricians for digitalization in the market by aligning their responses with the literature review of the thesis. The process of becoming an electrician varies by country, with some countries requiring only a diploma from a vocational high school and several years of apprenticeship, while others demand passing an exam and earning an electrician certification. In this case, E1 does not possess a certification, while E2 holds a certificate. Thus, it can be inferred that the need for certification to work as an electrician depends on the region of practice. To further analyse the electricians' preparedness for digitalization, I asked them about their use of technology in their work. E1 stated that he mostly uses his smartphone to communicate with his colleagues and to access technical information when needed. On the other hand, E2 uses a variety of tools, including specialized software for designing electrical systems and 3D modelling tools for visualizing installations. This indicates that while some electricians may rely on basic technology, others may be more advanced in their use of digital tools and software. In addition, I inquired about their awareness of digital platforms for finding work and advertising their services. E1 was not aware of any such platforms, while E2 mentioned that he has used online platforms to advertise his services and find new clients. This

suggests that there may be a lack of awareness and understanding among some electricians regarding the potential benefits of digital platforms for their work.

Finally, I asked both electricians about their views on the future of their profession and how they see technology affecting it. E1 expressed concern that increasing automation and digitalization may lead to a reduction in the need for manual labour, including electricians. E2, on the other hand, was more optimistic, stating that while technology may change the nature of the work, there will always be a need for skilled electricians to install, maintain, and repair electrical systems. Overall, the interviews with the electricians highlight the diversity of experiences and perspectives within the profession. While some may be more advanced in their use of technology and aware of digital platforms for finding work, others may be less familiar with these tools. As the industry continues to evolve, it will be essential for electricians to stay up-to-date with technological advancements and adapt to changing market conditions. Next, I analysed the electricians' opinions regarding whether they agree that there is a shortage of electricians on the market and how customers approach them. Both electricians concurred that there is a shortage of skilled electricians on the market. This aligns with the literature that indicates that the electrician job market has been experiencing a loss of skilled workers in recent years, and the younger generation is not attracted to this profession.

Additionally, both E1 and E2 agreed that word-of-mouth recommendations continue to play a significant role in the service market, and clients usually approach them after hearing about their well-performed jobs. I also examined whether the electricians use any software to simplify their work and their opinions on software usage. While E1 was unaware of any such software, E2 used a time tracker while working. As highlighted in the thesis, there are various software and applications available on the market, indicating that the service market is slowly adapting to digitalization. However, electricians must be more educated and trained to use them effectively. Furthermore, I analysed whether the electricians would be satisfied with an application that facilitates the search for electricians and whether they think electricians, in general, would be prepared to use such an application. Both E1 and E2 welcomed any changes in the market that would simplify their job. They added that older electricians might face challenges using the new technological advancements in the market.

6.2.2 CEO analyses of the interview

The CEO represents a small construction company based in North Macedonia that typically works on short-term projects. While the company has six employed electricians, the number of workers fluctuates depending on the project, and additional electricians are often contracted to meet tight deadlines. The CEO acknowledges the challenge of finding licensed and experienced electricians in today's market. The most significant finding is

summarized in the Table 8 below, and the complete interview transcript is included in the Appendix.

Table 8: Main interview findings

Statements of the respondents toward different electrician maters in the households	Answers of the respondents of the different electrician maters in their households
Shortage of electricians on the service market	- It is hard to find electricians nowadays - There is a problem of finding skilled workers on the market
Ways of searching for electricians	- Online advertisements - By suggestion from contractors or employees
Digitalization on the service market	- All-new smart connected devices of housing required installation and repair with new digital equipment, and electricians must train to use it
Mobile application for simplifying the process of searching for electricians	- Bigger markets are using different web and mobile applications on the service market We urgently need an app that will simplify this process of searching
Digitalization on the service market	- Using technology in every market is moving the markets from their edges - In the last five years, the service market is more digitalized

Source: Own work

The choice of an electrician is influenced by various factors, including their experience, speed, accuracy, and track record of successful projects. That is why the CEO would be extremely pleased to have access to an application that would allow her company to engage the services of a licensed electrician precisely when needed.

7 DEVELOPING AN APPLICATION FOR DIGITALIZING THE PROCESS OF SEARCHING FOR ELECTRICIANS

Based on the opinions from the survey and the interviews, I created the solution for simplifying the process of searching for electricians on the market. I followed the traditional methodology for the software development, which passed all the phases of the SDLC. Additionally, I started with the strategy and planning where I decided what will be the purpose of the electrician's app, what tools I will be using for designing and development, what teams will be included in the process, when and how will the deployment of the app happen. In addition, I proposed a name for the app – Electrician's click. After this strategy and planning decisions, I moved to the further step, which is designing the application. Moreover, I formed a case UML diagram, which describes the process of the mobile application. In addition, visualization of the design of the app will be given, and finally, the app will be tested. At this point, I followed the SDLC framework for creating and designing the application for electricians. Software or designing the application will be necessary and, its screenshots will illustrate the application design. Before the final design, a UML diagram in the software Visual Paradigm will demonstrate the whole process of searching for electricians, following a wireframing software or blueprints in Wireframe Pro will depict the pre-design, and lastly, the software Adalo will illustrate the designing and the prototyping of the application's final design. Next, upon the development I have decided that there is no need for developer to build the app from scratch, because the electrician's app will be no-code based and will be built with the Adalo tool. Moreover, regarding the deployment I have decided that the app first will be realised only on Google Play Store. Finally, the product was created, which has a simple flow. It begins with the process of registration. Here both users, the electricians, and the customers complete their profiles according to the specification requirements. After successful registration, the customer can report an electricity issue, locate himself, and request help from the nearest electrician. If the nearby electrician is available, he accepts the request and arrives at the customer's address. Once the electrician starts repairing the electrical issue, he changes his working status - from available to busy. Lastly, the entire flow completes with the payment, which also proceeded via the app.

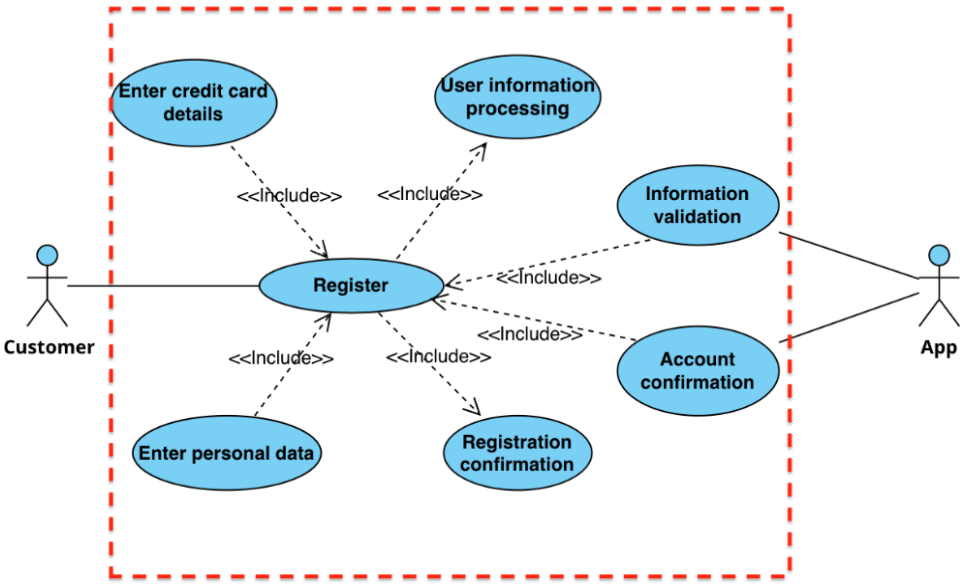
7.1 Procedure of the application for electricians

The framework begins with an illustration of the concept for creating the mobile app. The shortage of electricians on the market and the place for further digitalization on this market supported the idea of having an app for searching for electricians. Therefore, the first approach is to create the flows with all the apps elements and their relationships, within an UML case diagram, and following to explain each flow.

7.1.1 UML case diagram

In Figure 8 and *Figure 9* the process of creating the actor's profiles and logging into the app are depicted with a UML case diagram, which is modelled with the help of Visual Paradigm Software. The case diagram displays the process flows for registration and login by using different diagram elements, which furthermore are explained.

Figure 8: UML case diagram for registering as a customer

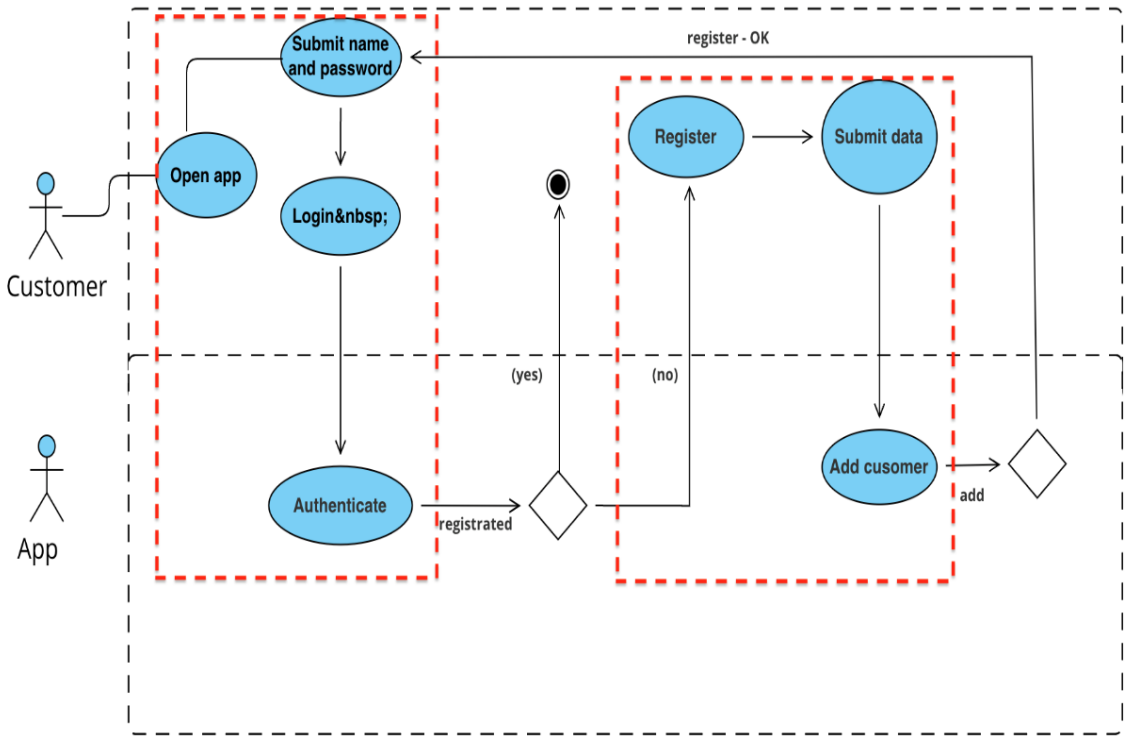


Source: Own work.

First, for the registration flow, we have the customer as an actor, who starts interacting with the app, once he installs it. He is redirected to the Welcome screen with an association relationship with the app, from where he starts the registration process. The first relationship is with the Registration use case. This use case has dependency relationships with other use cases: Entering credit card details, Entering personal data, User information processing, Information validation, Account confirmation, and Registration confirmation. The app or the system in general has also an association relationship while Information validation and Account confirmation.

The UML diagram in Figure 9, displays the relationship when the customer opens the app and submits his email and password. Next, the communication between the cases proceeds with a direct association, which means that after the login case, an authentication from the app system is required. Subsequent is the decision from the system, meaning that if the user is already registered, he finished the flow with the end state, and if he is not registered, he goes further with the registration process.

Figure 9: UML use case for logging into the app as a customer



Source: Own work.

Elements that are used in the UML diagrams:

- Actors: We have 2 users that are interacting with the application Users (Customers and Electricians) and the system (electrician's app)
- Use cases: Each functionality in the app will be represented with a use case (register, log in, enter data)
- Objects:

- End state: The end state shows a process ending, such as login process completed, and is shown as a circle with a small black dot inside (Athuraliya, 2022).
- Choice: The choice object which is shown with a diamond square represents choice that is made which path the further process will have, for instance yes or no decision (Athuraliya, 2022).

- Relationships:

- Association: The primary relationship, which indicates any connection between the cases, for instance transport and train transport (Penn State, n.d).
- Direct association: Represents a powerful relationship between the cases thus, there is a direct connection, where one case is subsequently by default related to the other, for instance like glass and water (Penn State, n.d).

7.1.2 Mobile application flows

The app itself is not complex and includes several flows with simple steps that are clarified in this paragraph:

- Electrician/Log in Registration flow and Customer/Log in Registration flow
- Reporting an issue flow and Request acceptance flow
- User's chat flow, Payment and Rating flow

Two main actors (users or customers) play a role in the application, first is the user, who can be anyone that might have a problem with electricity in the household, and the second is an electrician, who offers professionalism to repair the electricity issues. There are a few requirements like preconditions that the actors should complete before downloading the app from the store. Table 9 presents the preconditions of the mobile app users. The main flow in the app is the user's registration flow, which contains two sub flows: registering an electrician and registering a customer.

Table 9: Preconditions for the actors in the app

Electrician's preconditions for registration into the app	User's Preconditions for registration into the app
Mobile device	Mobile device
Electrician's app installed	Electrician's app installed
Registered as an electrician	Registered as a customer
User name	User name
Email address	Email address
Bank account number	Bank credit card
Valid certificate/ proof for performing electrical work	Using locator
Work equipment	

Source: Own work.

Customer registration/Log in flow

After apps installation the user is landed on a screen (Welcome screen) where he can choose how to register. In addition, I will describe the customer's registration flow. By clicking the button Register as a customer, the user is presented with a screen where he is asked to fill-out the following data: First Name, Last Name, Email address, Password, Password confirmation, and credit card details. Once all needed details are filled out, the data will be under a process of reviewing data validation and accuracy. If all information

is correct, subsequently, the profile is successfully created, otherwise the user is asked to submit the additional missing information.

A successfully created user profile receives an email message with a confirmation link for a completed registration. By clicking the link from the email, the user redirects to the main Welcome screen app screen. Here, only by tapping on the login as a customer button, the user should be able to log into the app by entering the already created credentials while registering (email and password).

Reporting an issue flow

Already registered customer can easily report an electrical issue and ask for a nearby electrician for help. This process flow has several steps. The customer first logs into the app, he turns on the GPS locator and enters its home address. After entering the housing address, he lands on a screen with listed different type of issues such as installation of power and signal cable, mounting of power sockets, switches, data sockets, distribution boards, installation of cable trays, etc. The customer chooses the electrical issue he has and he is redirected to a screen with nearby electricians. On this screen, the user can see short info about the nearby available electricians: First name, Last Name, distance and ratings. The user chooses (clicks) one electrician and sends a request. A huge impact in this choice of an electrician can have the reviews and recommendation history (comments) for the electricians, which are visible on electrician's profiles. Next step of the flow is when this issue request from the customer is added to a list issues. This screen with issue's list is visible only to electricians.

Electrician/Log in Registration flow

On the other hand, a successfully created electrician's profile is the one with a unique First Name, Last Name, Email address, Password, Password confirmation, and Working certificate e.g., a proof that he is an eligible electrician. Same as in the registration flow for the customer, also here the fill- out data, once entered is under a process of reviewing for validation and accuracy. Right after the data is approved, the user can create his profile. The registration process finishes once the user receives an email with a confirmation link. By clicking on this link, the user is redirected to the Welcome screen. From this screen by tapping on the Log in as an electrician, the user can log into the app.

Request acceptance flow

From the Welcome screen, the electrician can log into the application with his credentials (email and password). Once he lands on his profile screen, he can access the customer’s issues that are sent to him. Next, he chooses one customer, and he accepts his request.

User’s chat flow

Behind accepting the customer, there is an opportunity for a discussion room between the electrician and the customer. At this point, the electrician usually announces how long it will take him to come to the requested location, or the customer may be asked to describe the issue he is facing in more detail.

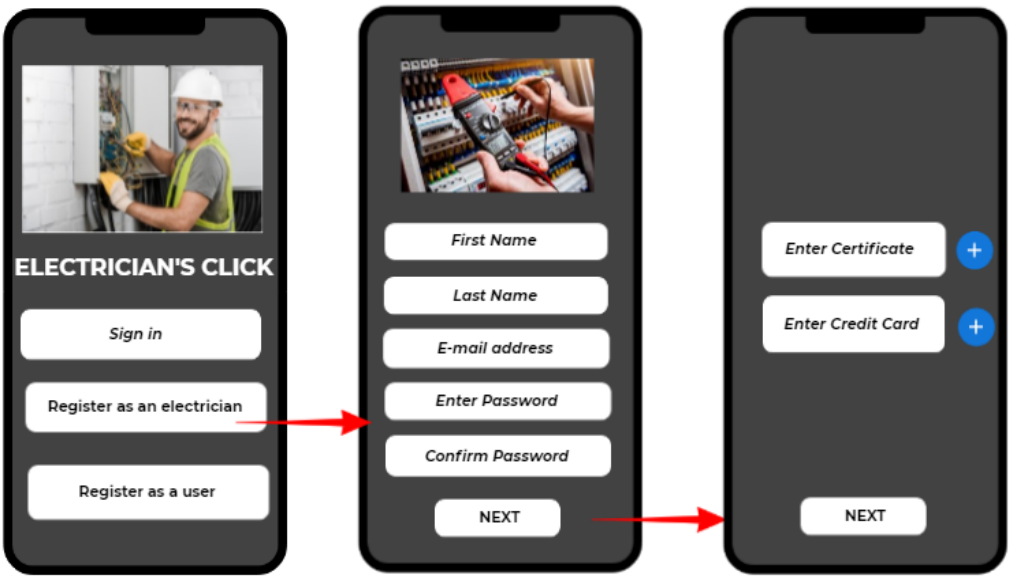
Payment and rating flow

The electrician arrives prepared with all equipment and tools needed for solving the electricity problem at the willing address. Once he starts working, he sets his status as busy and returns it to available after completing the work. Lastly, the customer pays for the service via the app, usually, if he is satisfied, he writes comments and ratings on the electrician's profile.

7.2 Wireframing the application for electricians

Once the app framework is created, where all the flows and elements of the app are defined, the process of wireframing the application can start. Here a preliminary design will be done which will be a base for the app prototyping. In Figure 10, can be seen the registration process for an electrician. All other screenshots from the process are placed in Appendix.

Figure 10: Registration process- electrician's profile wireframe design



Source: Own work.

First, the Sign in as an electrician flow will be observed. On the main page, the Welcome screen of the application, we have three button options: Sign in, Register as an electrician and Register as a user. All of these buttons are clickable and by clicking on them they

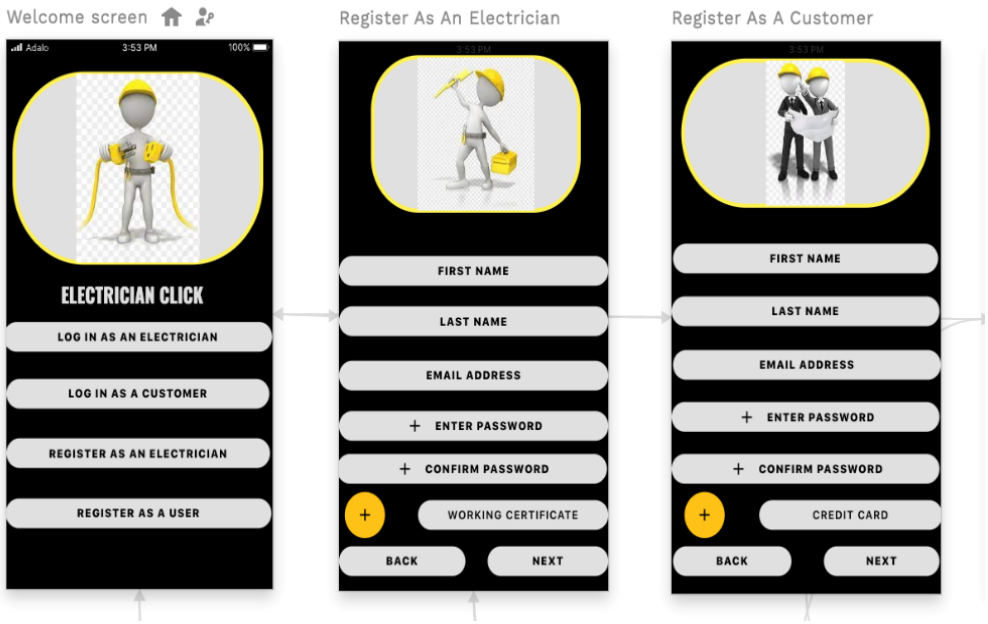
trigger some action moreover they redirect the user to another screen. Once the electrician receives an email that the profile is approved, he has successfully registered, and he is redirected to the Welcome screen of the electrician's app. Next, by clicking on the Sign in button, he is logged into the app and lands on the Electrician's profile screen, where he starts creating his profile. From the Profile screen, the electrician has a functionality to set his status: busy or available, by switching the toggle button. He can update the data from his profile screen, his name, and surname and also, he can change his profile picture by uploading one from his device.

Furthermore, on the profile screen the ratings and comments, which customers are leaving for the electrician's work according to their satisfaction, are visible. In addition, there is an Issue list button, which by clicking it the electrician is redirected to the list with customer's issues by customers that have already requested his help. This list is constantly updating, or it can be empty if the electrician does not have any request from a user. The items of this issue list are consisting of the avatar photo, the name, the address of the user, and a short message explaining the problem. Here, the electrician chooses one user, usually the one nearest one (by location), with clicking the arrow button next to the issue. At this point, the electrician brings the decision for accepting or denying the request from the user. This action is followed by a new screen, which has a possibility to chat with the user in a private room. In addition, I will explain the user's main flows. From the Welcome application screen, the user clicks the button register as a user and follows the procedure by entering the personal data, first name, last name, email address, password, and credit card detail. Once filling out the required data, the user waits on profile's approval. When the user receives an email confirmation, that his data is confirmed, he starts creating his profile by clicking the sign in button. Once the user logs into the app he, lands on the User's profile screen. From his profile screen, the user can upload profile picture, change his personal data, and set location by using the GPS locator. If the user has any electricity issue, by clicking the issue button, he can see a list with different issues and he selects the one he thinks is the most relevant to the problem he is having. After selecting the issue, the user lands to a new screen, which is showing a list of nearby, available electricians. The user requests one electrician from the list by clicking the request button, and followed, he waits for acceptance. After a confirmation from the electrician, that he is available to fix the electricity problem, green checkmark as a notification, occurs on the screen. Above this announcement, there is a button, by which the user can initiate a chat with the electrician. Finally, the work starts when the electrician arrives at the user's address. Meanwhile, work is in progress the electrician sets his status into busy. After work finishes, the user pays the electrician for the fixed issue and chooses whether he wants to leave a comment or review. With the payment, the entire process completes, and the electrician changes its status from busy to available.

7.3 Using software for designing and prototyping the application

The electrician's design application shows 16 active functional pages (screens) that summarize the process of searching for electrician. Those are: Home page, Register as an electrician, Register as a user, Waiting for approval, Electrician's profile, Enter Certificate, Credit card details, Issue list, User's profile, Issue list for users, Request an electrician, Chat now, Request page progress, User acceptance and Job in progress. Few of those screens are depict in *Figure 11* below. On the Home screen, the main flows of the application are displayed, and the proposed name of the application is Electricians Click. The most important flow in the application is the registration process, where users can register as either an electrician or a regular user.

Figure 11: Final design of the application



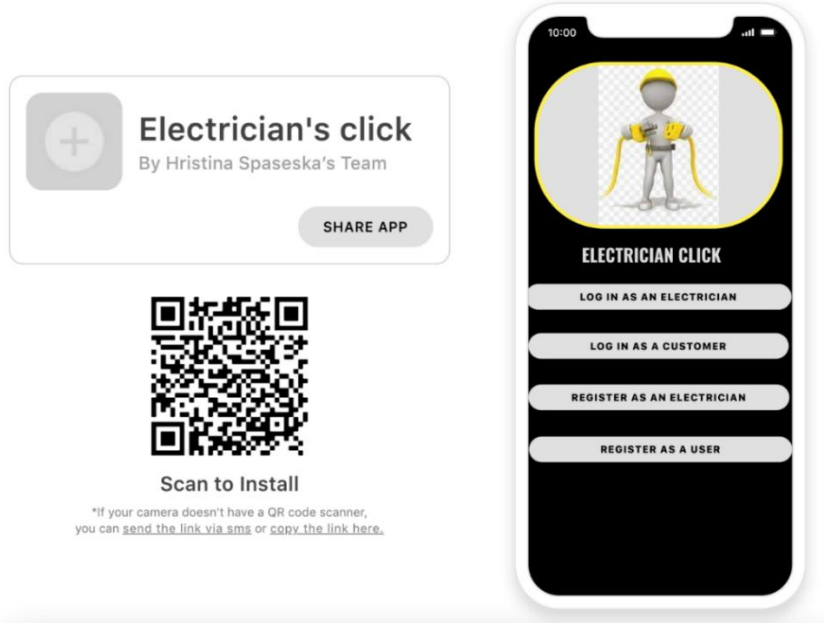
Source: Own work

The second most important flow is the login process, which is available only after the user has successfully registered. In the second screenshot, all the necessary fields required for an electrician to register are shown. These fields include the first name, last name, email address, password, and proof that the user is an electrician. The third screenshot displays the registration process for a regular user or customer. Here, users must enter their first name, last name, email address, password, and credit card information.

Once all required fields are completed, users can submit their registration, and upon approval, they will receive an email granting them access to the application. All the necessary steps for registering as either an electrician or a regular user have been defined in the previous chapter. To enhance the user experience, improvements can be made to

improve the visual depiction of the flows and make them more user-friendly, which will be discussed in the improvement part. The prototyped version of the application is seen in the Figure 12 below. With scanning, the Quick Response (QR) code an access to the prototyped application is enabled.

Figure 12: Application prototype



Source: Own work

Several functionalities of the proposed application are not functioning as intended. This is because I have been utilizing a trial version that restricts the display of various elements.

7.4 Testing the application

To test the usability of the application prototype, I conducted a representative user test. A colleague of mine was responsible for administering the test, which involved scanning the mobile application's QR code (Quick response code), and following the test cases outlined on paper. Each test case consisted of a series of steps designed to assess the application's functionalities. The results of the manual execution of the tests from the paper is presented in one test case document, which can be seen in Appendix 8**:**

In Table 10, are summarized the common mistakes that are repeating on several places in the application. Furthermore, the tester gave me a general opinion for the application and all her suggestion are considered as improvements in the following chapter.

Table 10: Application's errors

Number	Errors noticed in the application
1	Text overlapping
2	Button not clickable
3	Button is loading and not opening a new page
4	GPS location is unlabelled
5	Once user is on Google maps it cannot turn back to the application
6	Chat option is unavailable
7	Payment process is not functioning

Source: Own work.

The tester agrees upon that the idea for the electrician's application is achieved. The process of searching for the electricians is simple to understand. The design of the application is user-friendly, it is easy to navigate, and all features are well delivered to the end user.

8 FINDINGS AND FUTURE IMPROVEMENTS

8.1 Research Findings

In the following paragraph, I have summarized my findings from the interviews and literature review. The concept of the sharing economy (SE) has proven to be influential, with many positive marks on the way industries operate. According to the literature, the SE's characteristics, such as platform dependencies, technological advances, and peer-to-peer interactions, are leading to incremental improvements in the service market and the industry as a whole. Based on my research into the service market, the statistical data indicates a shortage of skilled workers in the industry (Feinberg, n.d.). This claim was also confirmed during the interview, with the CEO, who mentioned that their company is currently facing difficulties in finding electricians. The literature suggests that the process of searching for electricians has been influenced by the digitalization of the market, leading to the development of many new applications (Shakil, 2021). In Slovenia, one such application is Moj Mojster, which is currently the best way to find an electrician when someone is needed. In addition to the information obtained from the CEO, I learned that many electricians use various applications to assist them with their day-to-day activities. The CEO acknowledged that digital transformation is happening in the market, which also was emphasized by the theory (Bonnet & Westerman, 2020). Following, the CEO pointed out that with the development of new smart cities and smart homes, electricians will need to update their knowledge and expertise, and all of this will result in an increased demand for electricians soon.

Regarding the process of finding electricians, the CEO mentioned that they typically search for them online or rely on recommendations from contractors and employees. However, they believe that this process should be simplified and made more user-friendly. During our conversation, the CEO expressed appreciation for the concept of an application similar to mine, which could simplify the process of finding electricians. They expressed hope that such an application would become available on the market soon. However, the CEO also acknowledged that signify cant improvements would be necessary to ensure the successful delivery of this product.
Neither one software can be 100 presents bug-free. Continuous testing of the application is required, and the application should be tested during the process of development and after launching it. Once testing the application for electricians, a conclusion is that many improvements should be done. At this point, the application will be more eye-catchy and will have better performance. These modifications are related to the visual appearance of the elements of the application, and to some parts of the process in general.

The following improvements were determined during a pair-testing session that I conducted with a friend for the prototype application. All the improvements that might help our application to become more user-friendly, that will increase the number of users, and will make the overall application better, are placed into the following groups:

- Application planning improvement
- Application flows improvements
- Application regulation improvements
- Development and design improvements

8.2 App planning improvements

Before starting with the idea for development, additional in-debt research is needed on the market. A new survey with customers and more interviews with electricians should be done, to a narrow market. The background is to discover more information that was not included in the initial research, such as which OS (Operating System) devices are most in use next, if electricians are already employed or in retirement, would they have time for additional work. Following whether electricians will find it acceptable to submit the form to the competent institutions for the additional earnings they will have and whether they have at home the necessary equipment for repairing the electrical issues. In addition, this research should include the prices of common electrical issues in households that will be a base for setting the initial prices for the issues on the customer's issue list.

Above all, when results from this research will arrive, a decision for additional improvements arises. First, is bringing a decision for narrowing the target market. We can assume that launching the application to a smaller geographical region will be more beneficial. As for a start, I will suggest Slovenia. Second, since the Android and the iOS

are the most popular OS platforms for mobile applications, the application can be also built for iOS devices. Third, a good decision will be to move from the no-code platform, and implement build the app from scratch solution. In this case, a good suggestion choice will be using Flutter as a frontend and .NET as a backend. In this scenario because we will be using Flutter, which is open-source software that allows cross-platform mobile app development we will need only one developer for both Android and iOS (Appify, 2022).

In the process of planning also, the methodology approach should be defined. While developing the electrician's app I used the traditional method, because there was no team included in the process and each phase was done after one was completed. However, as an improvement can be implemented an Agile methodology, moreover the SCRUM method. The important parts of this method are the Product Backlog, the Sprints and the Scrum team. The teams are usually small from 3 – 9 members with different roles: Product Owner, Scrum Master (SM), and team members, which can include developers, testers, designers and other profiles (Mundra, Misra & Dhawale, 2013). The PO (Product Owner) is usually the PM (Project Manager) on the project and the SM (Scrum Master) the one who is responsible that everyone understands the project purpose and usually he is the sponsor of the project (Fowler, 2019). Moreover, the Product Backlog consists of all the requirements, named User stories. These User Stories are committed by the Product Owner and are divided into Sprint Backlogs which define how one Sprint will be planned and executed. Following, the Sprint Backlog can be explained as documentation of all the prerequisites for the recent sprint. Lastly, Sprint is the smallest unit of work, and usually, it lasts from 1 to 3 weeks, where the team works on assigned tasks. The tasks that the team will work on are chosen and selected from the Sprint Backlog (Srivastava, Bhardwaj & Saraswat, 2017).

The purpose of these small work units is to produce a good product. During the development process, several meetings are organized by the PM so that he can track the progress and the success of the work. Usually, if the application is complex, then there can be daily scrum meetings with the team, while at the beginning of each sprint, there is a sprint planning and retrospective meeting, and after every sprint, there are sprint retrospective meetings (Mundra, Misra & Dhawale, 2013). Hence, we can proceed with forming the team for electrician’s app, which will be consisted of a PM, which is the PO and SC simultaneously, a designer, 2 developers (backend and frontend), and one tester. Next, the sprint will last 2 weeks and there will be two times scrum meetings per week on Tuesday and Thursday at 11 a.m.

8.3 Application flows improvements

As mentioned, before, five main flows were defined in the app: Registering/Log in electrician, Registering/Log in Customer, Reporting an issue, Request acceptance flow,

User’s chat flow and Payment and rating. Several improvements can be made by adding some elements to these flows:

- In the Register an electrician flow, the process of submitting a certificate can be changed, with uploading any other proof according to the country’s requirements.
- In the Reporting issue flow, while the customer is choosing a problem from the issue list, he might find it difficult to select the right one, so an improvement here can be an option of describing the problem with his own words before sending the request.
- In the Reporting issue flow, next to every issue it will be good if there is the lowest price that can be paid for repairing the issue. That is the reason why additional research should be done to determine the prices of the most common electricians' issues.
- Electricians' can add working hours on their profile which will be visible for the customers e.g., Electrician X is working from 6 p.m. until 11 p.m.
- After a customer sends a request to the electrician, the electrician should receive a notification that he has been requested, and a time limit for acceptance this request should be defined, for instance half an hour, so that the customer can go further with the search and request another electrician.
- If the electrician receives several requests from customers at the same time, or in time length of 15-20 minutes, he can choose which customer to accept, and also there should be an optioned where he can reject the others customers.
- It is important to secure your data online, especially when you have sensitive information such as a bank account or credit card, as in the electrician's application. When the user uses the 'Username/Password' form, there are various techniques to protect his password, and the 2FA (Two-Factor- authentication) is one of those (Saini, 2021). During the registration process, whether is for an electrician or customer, the 2FA authentication flow can be implemented, where the user can secure his app with a biometrical identification, for instance Face recognition or Fingerprint.
- Companies in different industries, for example the construction industry that are searching for electricians to work on a current project should be enabled to create a profile as a company.

The most valuable feedback for improving the application will come from end-users once the application is in production. Their experience and feedback will provide valuable insights into what aspects of the application need improvement. Therefore, while improvements can be made during the development phase, it is important to prioritize collecting and incorporating user feedback once the application is launched.

8.4 Application legal regulations improvements

Data privacy has been one of the very often matters in the last several years. Every user that interacts with a digital product must be aware of the data regulations, which are unique for different regions and countries (Appify, 2022).

As an improvement, electrician's app will have:

- Privacy Policy and Cookie Policy
- Terms and Conditions
- Consent

As a decision for market narrowing was brought, and Slovenia is the country in which the app will be released first, here the GDPR (General Data Protection) will go above the existing law in requiring higher standards for the company to process data (Voigt & Von dem Bussche, 2017). Furthermore, the additional earnings of the electricians should be taxed. These taxes apply to the different laws in each country. Moreover, in Slovenia, there is a progressive tax rate that increases if the additional income grows. For instance, if the additional yearly income for the electricians will be around 25.000 EUR, they will have to pay a tax rate of 26 %, following, if the electricians earn 50.000 EUR, they will have to pay a tax rate of 33%, and so on (Slovenia, n.d.).

8.5 Development and design improvements

The existing app design is done with the free trial version of the Adalo tool and that is the reason why many action buttons are not triggering any action. This causes the explanation of why several buttons are not clickable or editable. Upgrading the version of this tool might deal with these issues, but as mentioned before, the app will be built from scratch. An overall new design for the app is required, and for redesigning purposes, another tool can be used, for instance, the Figma tool. This tool is functional to any OS, works with every Browser, and can include the entire team to work and comment for improvements directly on the design screens (Kopf, n.d.).

Implementation of notifications can be included. For instance, when the electrician is requested by the customer, it will be nice if he receives a pop-up notification immediately, so he can make a decision faster whether to accept the request or not. In addition, on the other hand, once the customer is accepted or rejected, he should receive a notification promptly. Next, adding additional screens in the app, which will better depict the app flows:

- On the Welcome screen, simplify the buttons, only two buttons can exist: Sign in and Register. By clicking the Register button, the user should be redirected to a screen where he can choose whether he wants to register as a customer or electrician.

- On the Register as an electrician screen there should be a new button Bank account details, which by clicking will land the user to a new screen for editing the Bank account details

Furthermore, some buttons can be improved and added:

- Make the buttons CTA, that by clicking them will trigger an action and a new window screen or a link will be open.
- On the Welcome, screen a button where the user can change his language. Due to the decision the app will be for Slovenia, the app should be both in the Slovene and the English language. By clicking this button, the user should be redirected to a screen where he can choose the wanted language.
- Add “i” info button, on the Electrician's account screen, where by clicking it, a new modal screen will be opened.

  The Welcome screen will be updated to include links to the Privacy Policy, Cookie Policy, Terms and Conditions, and Consent. Additionally, users will have the option to sign up using their Google, Apple ID, or Facebook accounts.

CONCLUSION

The DT is rapidly influencing every industry, hence the service market. Defined as the industry changer that uses the technology to bring new and improved experience to the companies, the DT is essential for their future development especially, in the segment of processes, customer experience, and business models. Thus, the DT is not just about the technology but it is about the right combination of all the assets in the companies, such as people, machines, skills, processes, strategies.

Moreover, all industries are adapting to the new changes triggered by the digitalization, and so is the service market. As inspiration for my thesis was to research the service market and develop a solution that will bring the customers closer to the electricians. This market consists of all electricians that are people who have skills in installing and repairing the electrical wiring system for industries and homes. In the last years, it was determined that there is a shortage of electricians on the market. The shortage of electricians has usually related to the reason that this service market is not more attractive to young people. However, never the less, this market is slowly changing, most impacted by the DT. Thus, there are predictions that by 2030 there will be an increased demand for electricians in the construction and manufacturing industry. Due to the changes on the service market, mostly influenced by the DT, currently, many apps support and help electricians to organize their work. Some solutions connect the electricians with the end users, but none is in real-time promptly.

In addition, I dive into this market research to arise the idea of designing this app based on the SE concept. The SE is defined as the sharing process of goods and services via an online platform. The SE has been interesting topic the past several years even though people have been familiar with it since ever. The concept here enables people to have temporary access to any goods and services instead of buying them. The focus of the research question of this topic is whether digitalization and the SE concept will simplify the process of searching for electricians. Together two interviews with the electricians and with CEO of the construction company contributed in the exploration and defining the current state of the service market. Additionally, the survey with the customers enabled me to see how hard is for them to reach the electricians right away. The general opinion from the research was that designing an application would be beneficial from both sides for the customers and for the electricians. The research has found that an application for searching for electrician will be from a huge importance and that this solution can just increase and improve the current service market state. In the past years, there is a deficit of electrician's workers on the market because many of the younger people decide to take a feature career in different industries. Nevertheless, this market will always will be of an essential importance especially in the construction industry. In the following years with the usage of the new technologies and the DT of all industries in general, the need of this type of workers will increase.

Furthermore, the researched topic starts realized by following the SDLC of software development and creating the basics of this researched idea into a prototyped app. First, I approached planning the flows and the functionalities the app for electricians has, next I designed the UML diagrams with the help of the Visual Paradigm tool, following I created the wireframe blueprints for the design in the Wireframe Pro tool, then did the design prototype with the help of the Adalo tool, and lastly manually test the application.

The electrician's app aims to identify customer needs and pain points in the market. This was achieved by analysing the outcomes of digital transformation in the service market. Based on these findings, a prototype was designed as a comprehensive solution to search the electricians in simpler way. Therefore, as mentioned, the DT is influencing this industry, and lately, many modifications are visible. The conclusion is that there always will be a need for electricians, but their role will be transforming, as the industries will, so the electricians will need to upgrade their knowledge and align it with the experience they have it. Related to this topic and to the SE in general it will be advisable if additional researches are done, because this phenomenon can be crucial for many worldwide economies and face with the issue of unemployment.

REFERENCE LIST

1. Abhishek, V., Guajardo, J. A., & Zhang, Z. (2021). Business models in the sharing economy: Manufacturing durable goods in the presence of peer-to-peer rental markets. *Information Systems Research, 32*(4), 1450–1469.
2. Akhmedova, A., Mas-Machuca, M., & Marimon, F. (2020). Value co-creation in the sharing economy: The role of quality of service provided by Peer. *Journal of Cleaner Production, 266*, 121736.
3. Appify. (2022, February 21). *Flutter app development - why you should choose flutter*. Appify. Retrieved December 2, 2022 from https://www.appify.digital/post/flutter-app-development
4. Apte, U. M., & Davis, M. M. (2019). Sharing Economy Services: Business Model Generation. *California Management Review, 61*(2), 104–131.
5. Astrov, V., Leitner, S., Grieveson, R., Hanzl-Weiss, D., Mara, I., & Weinberger-Vidovic, H. (2021). *How do economies in EU-CEE cope with labour shortages?* (No. 452). Wiiw Research Report.
6. Athuraliya, A. (2022, June 2). *UML diagram objects and their usage*. Creately Blog. Retrieved December 5, 2022 from https://creately.com/blog/diagrams/uml-diagram-objects/
7. Defined Electric (n.d.). *Basic definitions – electricians.* Retrieved December 10, 2022 from http://definedelectric.com/basic-definitions-electricians/
8. Basselier, R., Langenus, G., & Walravens, L. (2018). The rise of the sharing economy. *Economic Review*, 3, 57-78.
9. Bauriedel, S. (2020). Procedure model for the development of Digital Strategies. *16th International Bata Conference for Ph.D. Students and Young Researchers*. (p. 49).
10. Belk, R. W., Eckhardt, G. M., & Bardhi, F. (2019). *Introduction to the Handbook of the Sharing Economy: The paradox of the sharing economy*. In Handbook of the sharing economy (pp. 1-8). Northampton: Edward Elgar Publishing.
11. Bilderlings. (2019, March 1). *How the sharing economy concept works.* Builderlings. Retrieved December 10, 2022 from https://bilderlings.com/blog/how-the-sharing-economy-concept
12. Bonnet, D., & Westerman, G. (2020). The New Elements of Digital Transformation. *MIT Sloan Management Review, 62*(2)
13. BorderStates (2022, January 4). *The state of electrician shortage in 2022: New data on the impact of Covid – 19*. BorderStates. Retrieved January 20, 2022 from https://solutions.borderstates.com/the-electrician-shortage/
14. Constantiou, I., Marton, A., & Tuunainen, V. K. (2017). Four models of sharing economy platforms. *MIS Quarterly Executive, 16*(4).
15. Curtis, S. K., & Lehner, M. (2019). Defining the sharing economy for sustainability. *Sustainability, 11*(3), 567.

16. Czakó, K., Szabó, K., Tóth, M., & Fekete, D. (2019). Differences, constraints and key elements of providing local sharing economy services in different-sized cities: A Hungarian case. *Resources, 8*(3), 147.
17. Davenport, T. H., & Westerman, G. (2018). Why so many high-profile digital transformations fail. *Harvard Business Review, 9*(4), 15.
18. David, M., Novotny, A., & Denman, J. (2021, March 15). *What is mobile application development? Summary and app development process*. App Architecture. Retrieved November 25, 2022 from https://www.techtarget.com/searchapparchitecture/definition/mobile-application-development
19. Dazhou, T. (2019). Analysis of the present situation and prospects of development of sharing economy. *Open Access Library Journal, 6*, e5640.
20. De Man, J. C., & Strandhagen, J. O. (2017). An Industry 4.0 research agenda for sustainable business models. *Procedia Cirp, 63*, 721-726.
21. Dima, A. M., & Maassen, M. A. (2018). From waterfall to agile software: Development models in the IT sector, 2006 to 2018. Impacts on company management. *Journal of International Studies, 11*(2), 315-326.
22. ECA, U. (2021, June 3). *Vision: The future of the electrical constructing industry*. Retrieved January 19, 2022 from https://www.niceic.com/Niceic.com/media/Press-Photos/NICEIC-and-ECA-2021-Vision-Report.pdf
23. ElectricianSchoolEdu. (n.d.). *What is an electrician?* ElectricianSchoolEdu. Retrieved June 10, 2022 from https://www.electricianschooledu.org/what-is-an-electrician/
24. Penn State (n.d). Retrieved December 11, 2022, from https://www.e-education.psu.edu/geog468/l8_p4.html
25. EliteForceStaffing. (n.d.). *What types of electricians are there?* EliteForceStaffing. Retrieved June 10, 2022 from https://eliteforcestaffing.com/types-of-electricians/
26. Feinberg. A, E. (n.d). *The severe Electrician Shortage in America of 2021: Is there an end in sight?* Qmerit. Retrieved 19 January 2022, from: https://qmerit.com/currenttrendsblog/the-severe-electrician-shortage-in-america-of-2021-is-there-an-end-in-sight/
27. Flora, H. K., & Chande, S. V. (2013). A review and analysis on mobile application development processes using agile methodologies. *International Journal of Research in Computer Science, 3*(4), 9.
28. Fowler, F. M. (2019). *Scrum Team Roles.* In Navigating Hybrid Scrum Environments (pp. 31-38). Berkeley, CA: Apress
29. Frenken, K. (2017). Political economies and environmental futures for the sharing economy. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 375*(2095), 20160367.
30. Fucci, F., Concas, G. & Bailey, M., (2019). *A snapshot of the electrical contracting sector in Europe.* [online] Brussels: European Electrical Construction Association, p.18. Retrieved January 20, 2022 from https://europe-on.org/wp-content/uploads/2019/12/EuropeOn-sector-report-3_compressed-2.pdf

31. Geissinger, A., Laurell, C., & Sandström, C. (2020). Digital Disruption beyond Uber and Airbnb—tracking the long tail of the sharing economy. *Technological Forecasting and Social Change, 155*, 119323.
32. Gerster, D. (2017). *Digital Transformation and IT: Current State of Research*. In Pacific Asia Conference on International Systems (p. 133). Langkawi: PACIS
33. Gerwe, O., & Silva, R. (2020). Clarifying the sharing economy: Conceptualization, typology, antecedents, and effects. *Academy of Management Perspectives, 34*(1), 65-96.
34. Given-Wilson, R., & Harmon, D. E. (2019). *Your Future as an Electrician.* The Rosen Publishing Group, Inc.
35. Govindan, K., Shankar, K. M., & Kannan, D. (2020). Achieving sustainable development goals through identifying and analyzing barriers to industrial sharing economy: A framework development. *International Journal of Production Economics*, *227*, 107575.
36. Gregory, A., & Halff, G. (2017). Understanding public relations in the 'sharing economy'. *Public Relations Review, 43*(1), 4-13.
37. Grybaitė, V., & Stankevičienė, J. (2016). Motives for participation in the sharing economy–evidence from Lithuania. *Ekonomia i Zarządzanie, 8*(4).
38. Guyader, H., & Piscicelli, L. (2019). Business model diversification in the sharing economy: The case of GoMore. *Journal of cleaner production, 215*, 1059-1069.
39. Hall, R. (n.d). *How to prototype a mobile application and leave a lasting impression on investors.* Mind Sea. Retrieved January 20, 2022 from https://mindsea.com/how-to-prototype-a-mobile-app/
40. Handy. (n.d.) *About Us*. Retrieved November 26, 2022 from https://www.handy.com/about
41. Hannah, J. (2021, April 24). *What is a user interface & what are the key elements?* Career Foundry. Retrieved December 4, 2022 from https://careerfoundry.com/en/blog/ui-design/what-is-a-user-interface/
42. Hartley, J. L., & Sawaya, W. J. (2019). Tortoise, not the hare: Digital transformation of supply chain business processes. *Business Horizons, 62*(6), 707-715.
43. Henriette, E., Feki, M., & Boughzala, I. (2016). Digital Transformation Challenges. In *MCIS* (p. 33).
44. HomeStratosphere (n.d.). *17 top electrician business software programs and platforms.* Home Stratosphere. Retrieved from December 11, 2022 from https://www.homestratosphere.com/electrician-business-software/#3_Tradify
45. Hrustek, L., Furjan, M. T., & Pihir, I. (2019). *Influence of digital transformation drivers on business model creation.* In 2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics *(MIPRO)* (pp. 1304-1308). IEEE.
46. 0Indihar Štemberger, M., Erjavec, J., Manfreda, A., & Jaklič, J. (2019). Patterns of approaches to digital transformation: An institutional arrangements perspective. *Economic and Business Review, 21*(3), 7.

47. Joo, H. (2017). A study on understanding of UI and UX, and understanding of design according to user interface change. *International Journal of Applied Engineering Research, 12*(20), 9931-9935.
48. Team, kpi partners (n.d.). *Traditional vs. Agile Software Development Methodologies.* https://www.kpipartners.com/blog/traditional-vs-agile-software-development-methodologies
49. Kim, M. J. (2019). Benefits and concerns of the sharing economy: economic analysis and policy implications. *KDI Journal of Economic Policy, 41*(1), 15-41.
50. Kim, S., Chang, S., & Castro-Lacouture, D. (2020). Dynamic modelling for analysing impacts of skilled labour shortage on construction project management. *Journal of Management in Engineering, 36*(1), 04019035.
51. Kimsbruner, K. (2022, December 13). *Manual Testing vs Automated Testing.* Perfecto. Retrieved January 19, 2022 from https://www.perfecto.io/blog/automated-testing-vs-manual-testing-vs-continuous-testing
52. Kokolakis, S., Karyda, M., Loukis, E. N., & Charalabidis, Y. (2016). Information Systems in a Changing Economy and Society: MCIS2015 Proceedings.
53. Kopf, B. (n.d.). *The power of Figma as a design tool, Toptal Design Blog.* Toptal. Retrieved December 2, 2022 from https://www.toptal.com/designers/ui/figma-design-tool
54. Korachi, Z., & Bounabat, B. (2020). General Approach for Formulating a Digital Transformation Strategy. *Journal of Computational Science 16*, 493-507.
55. Kumar, V., Lahiri, A., & Dogan, O. B. (2018). A strategic framework for a profitable business model in the sharing economy. *Industrial Marketing Management, 69*, 147-160.
56. Kure, S. (2020, October 7). *Could 42% of Electricians Really Be Replaced by Robots?* EC&M. Retrieved November 12, 2022 from https://www.ecmweb.com/neca-show-coverage/article/21144122/could-42-of-electricians-really-be-replaced-by-robots
57. Kutnjak, A. (2021). Covid-19 accelerates digital transformation in industries: Challenges, issues, barriers and problems in transformation. *IEEE access*, *9*, 79373-79388.
58. Kutnjak, A., Pihiri, I., & Furjan, M. T. (2019). *Digital Transformation Case Studies across Industries–Literature Review.* In 2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO*)* (pp. 1293-1298). IEEE.
59. Lawal, A., & Ogbu, R. C. (2021). A Comparative Analysis of Agile and Waterfall Software Development Methodologies. *Bakolori Journal of General Studies, 11*(2), 1-2.
60. Li, F. (2020). The digital transformation of business models in the creative industries: A holistic framework and emerging trends. *Technovation, 92*, 102012.
61. Lin, H., & Zhai, X. (2023). Energy efficiency through user adoption of the sharing economy leading to environmentally sustainable development. *Journal of Innovation & Knowledge, 8*(1), 100315.

62. Maselli, I., Lenaerts, K., & Beblavý, M. (2016). *Five things we need to know about the on-demand economy*. Centre for European Policy Studies - CEPS, Brussels Essay No. 21/8 January 2016.
63. Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & information systems engineering, 57*(5), 339-343.
64. Matthew, D., Novothy, A., & Denman. J. (n.d.). *Mobile Application Development.* TechTarget. Retrieved December 13, 2022 https://searchapparchitecture.techtarget.com/definition/mobile-application-development\
65. Mittendorf, C. (2017). Create an Uber account? An investigation of trust and perceived risk in the sharing economy. *Journal of Customer Behavior, 16*(3), 281-307.
66. Moj Mojster. (n.d.). *Kako deluje?* Moj Mojster. Retrieved December 11, 2022 from https://www.mojmojster.net/o_storitvi
67. Morakanyan, R., A. Grace, A., & O'Reilly, P. (2017). Conceptualizing Digital Transformation in Business Organizations: A Systematic Review of Literature.
68. Mundra, A., Misra, S., & Dhawale, C. A. (2013). *Practical scrum-scrum team: Way to produce successful and quality software*. In 2013 13th International Conference on Computational Science and Its Applications (pp. 119-123. IEEE.
69. Muñoz, P., & Cohen, B. (2017). Mapping out the sharing economy: A configurational approach to sharing business modelling. *Technological Forecasting and Social Change, 125*, 21-37.
70. Netter, S., Pedersen, E. R. G., & Lüdeke-Freund, F. (2019). Sharing economy revisited: Towards a new framework for understanding sharing models. *Journal of cleaner production, 221*, 224-233.
71. Oh, S., & Moon, J. Y. (2016). *Calling for a shared understanding of the" sharing economy"*. In Proceedings of the 18th Annual International Conference on Electronic Commerce: e-Commerce in Smart connected World (pp. 1-5). New York: ACM
72. Osbourn, T. (2020, April 14) *Traditional SDLC vs agile SDLC: The 4 differences that matter most.* TextExpander. Retrieved November 29, 2022 from https://textexpander.com/blog/traditional-sdlc-vs-agile-sdlc
73. Paish, C. (n.d.). *How to design an app: the ultimate guide*. 99designs. Retrieved January 19, 2022 from https://99designs.com/blog/web-digital/how-to-design-an-app/#design
74. Persinger, M. (2022, May 15). *15 Essential Electrician Apps for Electrical Businesses.* ServiceTitan. Retrieved December 10, 2022 from https://www.servicetitan.com/blog/best-electrician-apps
75. Pihir, I., Tomičić-Pupek, K., & Furjan, M. T. (2018). *Digital Transformation Insights and Trends.* In Central European Conference on Information and Intelligent Systems (pp. 141-149). Varazdin :Faculty of Organization and Informatics
76. Platform Hunt. (2016, June 12). *The 9 types of Software Platforms*. Platform Hunt. Retrieved December 10, 2022 from https://medium.com/platform-hunt/the-8-types-of-software-platforms-473c74f4536a

77. Ranchordás, S. (2017). Peers or Professionals: The P2P-Economy and Competition Law. *European Competition and Regulatory Law Review 1*, 320.
78. Ranzini, G., Newlands, G., Anselmi, G., Andreotti, A., Eichhorn, T., Etter, M., Hoffmann, C. P., JJrss, S., & Lutz, C. (2017). Millennials and the sharing economy: European perspectives. *SSRN Electronic Journal*.
79. Reddy, S. K., & Reinartz, W. (2017). Digital transformation and value creation: Sea change ahead. *GfK Marketing Intelligence Review, 9*(1), 10.
80. Reinhold, S., & Dolnicar, S. (2018). The sharing economy. Peer-to-Peer Accommodation Networks, 15.
81. Ritter, M., & Schanz, H. (2019). The sharing economy: A comprehensive business model framework. *Journal of cleaner production, 213*, 320-331
82. Rojanakit, P., de Oliveira, R. T., & Dulleck, U. (2022). The sharing economy: A critical review and research agenda. *Journal of Business Research*, *139*, 1317-1334.
83. Russo, F., & Stasi, M. L. (2016). Defining the relevant market in the sharing economy. *Internet policy review, 5*(2), 1-13.
84. Saccomani, P. (n.d.). *Native Apps, Web Apps or Hybrid Apps? What is the difference?* MobiLoud. Retrieved June 10, 2022 from https://www.mobiloud.com/blog/native-web-or-hybrid-apps#1
85. Saini, M. S. (2021). Comparative Analysis of Top 5, 2-Factor Authentication Solutions.
86. Schlagwein, D., Schoder, D., & Spindeldreher, K. (2020). Consolidated, systemic conceptualization and definition of the "sharing economy". *Journal of the Association for Information Science and Technology*, *71*(7), 817-838.
87. Scholz, N. (2015). *The relevance of Crowdfunding: The impact on the innovation process of small entrepreneurial firms.* Springer.
88. Shakil, S. (2021, May 11). *Why must electricians adapt to a new digital world?* Mechanical Electrical & Plumbing. Retrieved January 19, 2022 from https://www.mepmiddleeast.com/business/77948-why-must-electricians-adapt-to-a-new-digital-world
89. Shylesh, S. (2017). *A study of software development life cycle process models*. In National Conference on Reinventing Opportunities in Management, IT, and Social Sciences (pp. 534-541).Mangalore, India: SIMS
90. Šimbelytė, S., Skujienė, A., Tumėnienė, V., & Moščenkova, E. (2019). Sharing economy: Characteristics and Challenges. Studijos Kitančioje,13
91. Slovenia (n.d.) *Individual - Taxes on personal income.* Retrieved December 3, 2022 from https://taxsummaries.pwc.com/slovenia/individual/taxes-on-personal-income#:~:text=In%202022%2C%20the%20following%20tax,amendments%20of%20the%20PIT%20Act.&text=Note%20that%20capital%20gains%2C%20interest,length%20of%20the%20holding%20period
92. Software Advice. (n.d.). *Housecall Pro Software. Software Advice.* Retrieved December 10, 2022 from https://www.softwareadvice.com/construction/housecall-profile/

93. Somers, L., Dewit, I., & Baelus, C. (2018). Understanding product-service systems in a sharing economy context–A literature review. *Procedia Cirp*, *73*, 173-178.
94. Srivastava, A., Bhardwaj, S., & Saraswat, S. (2017). *SCRUM model for agile methodology*. In 2017 International Conference on Computing, Communication and Automation (ICCCA) (pp. 864-869). IEEE.
95. Tekic, Z., & Koroteev, D. (2019). From disruptively digital to proudly analogy: A holistic typology of digital transformation strategies. *Business Horizons*, *62*(6), 683-693.
96. Tobin, D. (2020, February 2). *What is no-code?* Integrate.io. Retrieved November 29, 2022 from https://www.integrate.io/blog/what-is-no-code/
97. Trkman, P., & Tomat, L. (2019). Digital transformation- The hype and conceptual changes. *Economic and Business review, vol. 21*(3), 351-370.
98. Verina, N., & Titko, J. (2019). *Digital transformation: conceptual framework.* In Proc. of the Int. Scientific Conference "Contemporary Issues in Business, Management and Economics Engineering (pp. 9-10). Vilnius, Lithuania: Vilnius Gediminas Technical University
99. Vith, S., Oberg, A., Höllerer, M. A., & Meyer, R. E. (2019). Envisioning the 'sharing city': Governance strategies for the sharing economy. *Journal of Business Ethics, 159*(4), 1023-1046.
100. Voigt, P., & Von dem Bussche, A. (2017). The EU general data protection regulation (GDPR). A Practical Guide, first Ed., Cham: *Springer International Publishing, 10*(3152676), 10-5555.
101. Westerman, G. (2018). Your company does not need a digital strategy. *MIT Sloan Management Review, 59*(3), 1-5.
102. Westerman, G., Bonnet, D., & McAfee, A. (2014). The nine elements of digital transformation. *MIT Sloan Management Review, 55*(3), 1-6.
103. Westerman, G., Calméjane, C., Bonnet, D., Ferraris, P., & McAfee, A. (2011). Digital Transformation: A roadmap for billion-dollar organizations. *MIT Centre for Digital Business and Capgemini Consulting*, *1*, 1-68
104. Wruk, D., Oberg, A., Klutt, J., & Maurer, I. (2019). The presentation of self as good and right: How value propositions and business model features are linked in the sharing economy. *Journal of Business Ethics, 159*(4), 997-1021.
105. Yang, M., & Xia, E. (2021). A systematic literature review on pricing strategies in the sharing economy. *Sustainability*, *13*(17), 9762.
106. Yelp. (n.d.). *Seven electrician-advertising ideas to boost sales*. Retrieved June 10, 2022 from https://business.yelp.com/advertise/electrician-advertising-ideas/
107. Ziyadin, S., Suieubayeva, S., & Utegenova, A. (2020). *Digital transformation in business.* In Digital Age: Chances, Challenges and Future *7* (pp. 408-415). Switzerland: Springer International Publishing.

APPENDICES

Appendix 1: Povzetek (Summary in Slovene language)

Digitalna transformacija (DT) hitro vpliva na vse panoge, torej tudi na trg storitev. Definirana je kot spreminjevalka panoga, ki uporablja tehnologijo za prinašanje novih in izboljšanih izkušenj podjetjem. DT je tako bistvena za njihov nadaljnji razvoj, zlasti v segmentu procesov, uporabniške izkušnje in poslovnih modelov. Pri DT torej ne gre le za tehnologijo, temveč za pravo kombinacijo vseh sredstev v podjetjih, kot so ljudje, stroji, spretnosti, procesi in strategije.

Poleg tega se vse panoge prilagajajo novim spremembam, ki jih je sprožila digitalizacija, in tako tudi trg storitev. Če govorimo o trgu električarskih storitev, sestavljajo ta trg vsi električarji, ki so usposobljeni za namestitev in popravilo sistemov električnih napeljav in naprav za industrijo in domove. Analize zadnjih letih kažejo, da na trgu primanjkuje električarjev. Pomanjkanje električarjev je običajno povezano z razlogom, da ta trg ni bolj privlačen za mlade, kljub temu pa se tudi ta počasi spreminja, na kar najbolj vpliva DT.

Cilj magistrske naloge je bil raziskati trg storitev in razviti rešitev, ki bi kupce bolj približala temu tržnemu segmentu. Raziskava je pokazala, da bi bila aplikacija za iskanje električarja zelo pomembna in da lahko taka rešitev bistveno poveča in izboljša trenutno stanje na trgu storitev. Glavni namen razvite aplikacije je povezovanje strank in električarjev v realnem času. Po raziskavi trga sem izdelala prototipno zasnovo, ki kaže na predlagani izgled same aplikacije ter opredelila njene funkcionalnosti in tokove. S pomočjo več programskih orodij sem za dostavo končnega izdelka sledila SDLC protokolu za razvoj programske opreme.

Appendix 2: Interviews with the electricians

Electrician 1 (E1): Interview with E1 from Skopje, North Macedonia

Electrician 2 (E2): Interview with E2 from Zagreb, Croatia

1. Are you a licensed electrician?

E1: In our country, becoming a certified electrician is a little bit unaware. I have some friends working as an electrician in Germany, Denmark, and other countries, and they have explained to me what that means. I finished the vocational school: "Mihajlo Pupin" in Skopje, and I earned the diploma for a qualified electrician about commercial installation and housing. I did my training in one Construction Company for around two years during my studies. After the training, the company offered me a good salary, and I am still working for them.

E2: At my time, no license for an electrician was needed. I finished technical high school and earned a diploma for electricity technician in Rijeka. Nevertheless, when I worked in Sweden, I needed to pass an exam, and I took a certificate A for electrical installation.

2. Are you working in a company or, are you hired only for projects?

E1: Yes, I am working in a small construction company, and we, electricians in the company, have many projects that we are working on so, I do not have time for additional work. Sometimes I work twelve hours on an object and still cannot finish what I have to do for the particular day.

E2: I am currently unemployed. I recently came back from Sweden. I am searching for a job, and I sent my documents to the Employment office but cannot exclude the option to found my own company**.**

3. Do you work on self-projects such as repairing electrical issues in your neighbourhood?

E1: I do not have that time, and if it is urgent, I am there for help.

When I was not overwhelmed with work in the company when I had fewer objects to work, I did have time, and I was repairing some issues in households. People called me for boilers, stoves, changing some panels, preparing pumps, for many problems. Clean money we say!

E2: Yes, especially this time until I am searching for a job I am working as an individual electrician, and yes, usually I am doing my job in one region.

4. How often do people call for some issue, but you are not available now?

E1: Aww, especially in my neighbourhood, friends, family. All the time. I changed my phone number last year because of that. They are calling me all the time. I do not know if in EU is like this, but here, if they know you are an electrician, they recommend you to other people. They did not even ask for permission to give you your number. This annoys me.

E2: It happens very often. I have left my phone number in an advertisement, and I am getting calls very frequently, but cannot be present everywhere, therefore, I am cancelling many offers.

5. What kind of work do you do the most? Did you specialize in any particular area or field?

E1: Usually, I am responsible for the wiring system on the working objects. Connect the sockets with the cables to the source box. My major in school was low voltage electricity.

E2: I specialized in electrical installation for commercial installations, but I also worked in residential installations. So now, when I am back in Zagreb, I am working only in housing.

6. How do customers give you a reference? Do they share a good word of mouth and share your contact with others?

E1: Here, in our country, that thing is still functioning. You do only once a good job, and the day after, you will have 100 missed calls from unknown people.

E2: For me, it is a little difficult, since I came back three months ago. However, yes word of mouth is the best marketing here in these regions.

7. Do you think there is a shortage of electricians on the market? How do people find you if they need your service?

E1: I am not reading any statistics, but I can see what is happening on the market. Our electricians are going to the EU, UK in the US, and no one left here. I am sure they go away from the country for better conditions and a higher salary, but they also work more. They work more because there is a shortage of this profession everywhere.

E2: I am sure that there is a shortage. I guarantee you 100 %. I was satisfied with my job in Sweden because everything was more organized. I see that things these past ten years are better. Therefore, I have an advertisement on one page for skillset work, and that is how people reach me if they need me.

8. Do you use any software solution for simplifying your job?

E1: I do not. I am not using any software solutions, but our electro engineer in the company is using Auto- cad for her projects if this satisfies your question.

E2: I am aware that there are many applications, web, and mobile once. In Sweden, we used just a time tracker while working.

9. How would you feel about having an application that will organize your work?

E1: If that exists, I would be happy to have it. I would be satisfied with having such an application because I assume e that will also shorten my working hours. It is difficult, I am telling you. Sometimes staying more than 12 hours. It can happen you have forgotten some equipment, so you must order it immediately, or I do not know working on 2000 m 2 and have a deadline in two days, but you are the only electrician overall object and have 300 sockets to install.

E2: I will be happy! What to say, anything that can easier the job is welcomed.

10. How would you feel about having a mobile application that will use GPS and that will locate you to help any customer near you having an issue?

E1: That will be a great idea! If that kind of application exists here in our country, maybe I will not work for the company anymore. I am just joking. Yes, it will be wonderful to have such an application.

E2: I am also aware of one similar application, or a web page not sure, how you are classifying them as "EMajstor," in Slovenia you have it by a different name. That interesting solution also works with maps and finding nearby electricians. However, I have not tried it yet. In addition, yes, I will be very satisfied if that kind of mobile application exists on the market. It will be very easy for me to connect with the customers.

11. How would you feel if this application has many options, such as creating a profile, with possibility for comments and ratings after finishing a job, and enabling payment directly via the app on your bank account?

E1: I like to have that mobile application specifically if you are working individually, will easier your work.

E2: That is an interesting idea. If I decide to establish the company, then I will install that application.

12. Do you think that the electricians are prepared to accept any novelty on the market, for instance, a mobile application as we mentioned above?

E1: Novelties? I am not sure what else can be changed we have our equipment we go on an object, do our job and go home J I think that this application is a good start for some

things to change on our market. In addition, are we prepared? I cannot generalize. I am 38 years old, and I am using my mobile phone most of the time during my day, so I think that the younger electricians will not have any problems using such an application. However, our market is consisted of many old electricians due younger avoid to become electricians, and I think that they will have difficulties using mobile applications.

E2: In my opinion, I am 55, but I am good with mobile phones. I do not think that today people from many different professions are having problems navigating phones. However, let us exclude that it might be difficult for those who are nearly going to retirement. In general, I think that the electricians are prepared.

Appendix 3: Transcript of the interview with the CEO of the construction company

Interview with the CEO of Mobil-EL Skopje.

1. How many electricians do you have in your company?

The number of our electricians varies from project to project. Currently, we have six electricians that are full-time employed in our company. In addition, we have added four electricians that are helping us with finalizing the activities on one project. With them, we sign contracts only for finishing the ongoing projects.

2. Are all electrician's employee in your company, or do you hire electricians only for projects?

I have already started answering this question in the previous one. Not all electricians are with permanent contact we, also, hire additional electricians, according to our project requirements.

3. When you need electricians for a certain project, how easy is it to find them. Do you think there is a shortage of electricians on the market?

Moreover, in the past two years, we collaborated with the same electricians, and if we need them, we directly contact them. However, yes, it is hard to find an electrician nowadays, especially when all skilled workers are willing to leave the country. If there is a shortage? My answer is yes. I am reading a lot, and I can see that this problem with finding skilled workers is not just in our country, but it is globally.

4. How do you search for electricians? How do you find them?

We usually find electricians on online advertisements or by a suggestion from our collaborators and employees. For the choice of the electrician, relevant are many aspects like the electrician's experience, his/her speed, accuracy, and the background of excellent performed projects.

5. What do you understand by digitalizing the service market?

Oh, we have a lot to talk about on this question. For instance, I am an electrical engineer, and I know about digitalization in the electrical-engineering market. In addition, because I am working in construction, I have noticed many changes in this market. At this point, as an example, I will mention smart homes. All-new smart connected devices in this type of housing required installation and repairing with new digital equipment, and electricians must train to use it.

6. At what level do you think the service market is digitalized?

I do not know from which aspect to explain it. Nevertheless, using technology on every market is moving the markets from their edges. In my opinion, in the last five years, the market for electricians is being more digitalized. Anyways, I am a great supporter of the digitalization.

7. Are you aware of any mobile application that simplifies the process of searching for electricians?

No, I am not aware not here on our market in Macedonia. However, I know that in other countries the markets are bigger and that they use different web and mobile applications, not just for electrician's search.

8. Do you use any software solution for organizing electricians' work?

I am not happy saying this, but no, currently we are not using any software, even though I am aware of a few, but still did not plan of changing our way of working, not for now, maybe in the future.

9. What do you think of existence of a mobile application for searching electricians?

Honestly, that would be something we urgently need it. However, I have read the explanation for the functionalities of your application, and I think that you must make one improvement, where companies can register themselves as users.

Appendix 4: Online survey

Dear participants,

Thank you for your time and for answering the questions of this questionnaire. Your contribution is very important for the research on the digitalization of the service market.

It will take you around 5 minutes.

The answers of the survey would be used in the framework of the Master Thesis's entitled: “Digitalizing the process of searching electricians by designing a mobile application based on the sharing economy model ".

Thank you very much!

Hristina

** Required*

1. Which option describes you best? *
- Female
- Male
- Prefer not to say
2. Which age group describes you? *
- 18-29
- 30-39
- 40-49
- 50-59
- 60 or over
3. Which best describes where you live? *
- Urban area
- Suburban area
- Rural area
4. I am often facing with electricity problem at home. *
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
5. I find it difficult to search for electrician when I immediately need one. *
- Strongly agree
- Agree

- Neither agree nor disagree
- Disagree
- Strongly disagree

6. I am satisfied of the process of searching for electricians. *
- Very satisfied
- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Very dissatisfied

7. I usually search for electricians on Yellow Pages, googling for them online *
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

8. I usually search for electricians as a suggestion from a friend. *
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

9. I think there is a shortage of electricians on the market. *
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

10. In my opinion, there should be a simpler way of searching for electricians. *
- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

11. How frequently do you use a mobile phone? *
- Never
- Rarely
- Sometimes
- Often
- Always

12. How frequently do you install/use mobile applications? *
- Never

- Rarely
- Sometimes
- Often
- Always

13. I am aware of some mobile applications for searching electricians. *

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

14. It will be important to me to have an app for searching for electricians. *

- Very important
- Important
- Neutral
- Unimportant
- Very unimportant

Appendix 5: Analysis of respondent's opinion

Table: Respondents by gender

Gender	Respondents
Female	105
Male	46
Prefer not to say	4
Total	155

Table: Respondents area of living

Area	Respondents
Rural	39
Suburban	51
Urban	65
Total	155

Table: Respondents by age- ranges

Age range	Respondents
(18-29)	33
(30-39)	46
(40-49)	37
(50-59)	14
(60 or over)	25
Total	155

Table: Respondents opinion on frequency of electrical problems

Agreement (x)	Respondents (f)	f *x
5	24	120
4	21	84
3	33	99
2	75	150
1	0	0
Total	155	453

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x} = 453 / 155 = 2.9$

Table: Difficulty to find electrician

Agreement (x)	Respondents(f)	f * x
5	13	65
4	77	308
3	33	99
2	29	58
1	3	3
Total	155	533

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x}$ = 533 / 155= 3.4

Table: Attitudes towards occurrence of electricity issues per area of living

	Area of living					
Agreement(x)	Rural(y)	Sub-rural(y1)	Urban(y2)	x*y	x*y1	x*y2
5	6	11	7	30	55	35
4	4	5	12	16	20	48
3	6	8	20	18	24	60
2	23	27	26	46	54	52
1	0	0	0	0	0	0
Total	39	51	65	110	153	195

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x}1$ (rural) = 110/39 = 2, 8

$\bar{x}2$ (sub-rural) = 153/51 = 3

$\bar{x}3$ (urban) =195/65 = 3

Table: Attitudes towards difficulty to find an electrician per area

	Area of living					
Agreement(x)	Rural(y)	Sub-rural(y1)	Urban(y2)	x*y	x*y1	x*y2
5	3	3	7	15	15	35
4	29	20	28	116	80	112
3	6	11	16	18	33	48
2	1	16	12	2	32	24
1	0	1	2	0	0	2

Total	39	51	65	151	160	221

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x}1$ (rural) = 151/39 = 3, 8

$\bar{x}2$ (sub-rural) = 160/51 = 3, 1

$\bar{x}3$ (urban) =221/65 = 3, 4

Table: Satisfaction of the process for searching electricians

Satisfaction	Respondents
Very satisfied	7
Satisfied	34
Neither satisfied nor dissatisfied	55
Dissatisfied	45
Very dissatisfied	14
Total	155

Table: Searching for electricians, online, Yellow Pages

Agreement	Respondents
Strongly agree	15
Agree	72
Neither agree nor disagree	31
Disagree	36
Strongly disagree	2
Total	155

Table: Calculating mean of searching for electricians, online, Yellow Pages

Agreement (x)	Respondents (f)	x*f
5	14	70
4	72	288
3	31	93
2	36	72
1	2	2
Total	155	525

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x} = 525/155 = 3, 4$

Table: Searching for electricians by a suggestion from a friend

Agreement	Respondents
Strongly agree	5
Agree	86
Neither agree nor disagree	19
Disagree	34
Strongly disagree	11
Total	155

Table: Calculating the mean of searching for electricians by a suggestion from a friend

Agreement (x)	Respondents (f)	x*f
5	5	25
4	86	344
3	19	57
2	34	68
1	11	11
Total	155	505

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x} = 505/155 = 3, 3$

Table: Opinion upon the shortage of electricians on the market

Agreement	Respondents
Strongly agree	16
Agree	78
Neither agree nor disagree	19
Disagree	39
Strongly disagree	3
Total	155

Table: Calculating the mean of the respondents opinion upon the shortage of electricians on the market

Agreement (x)	Respondents (f)	x*f
5	16	80
4	78	312
3	19	57
2	39	78
1	3	3
Total	155	530

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x} = 530/155 = 3, 4$

Table: Respondents response whether there should be a simpler way of searching for electricians

Agreement	Respondents
Strongly agree	9
Agree	111
Neither agree nor disagree	20
Disagree	14
Strongly disagree	1
Total	155

Table: Calculating the mean of respondents whether there should be simpler way of searching for electricians

Agreement (x)	Respondents (f)	x*f
5	9	45
4	111	444
3	20	60
2	14	23
1	1	1
Total	155	578

(5-strongly agree, 4- agree, 3- nor agree nor disagree, 2- disagree and 1 – strongly disagree)

$\bar{x}$ = 578/155 = 3, 7

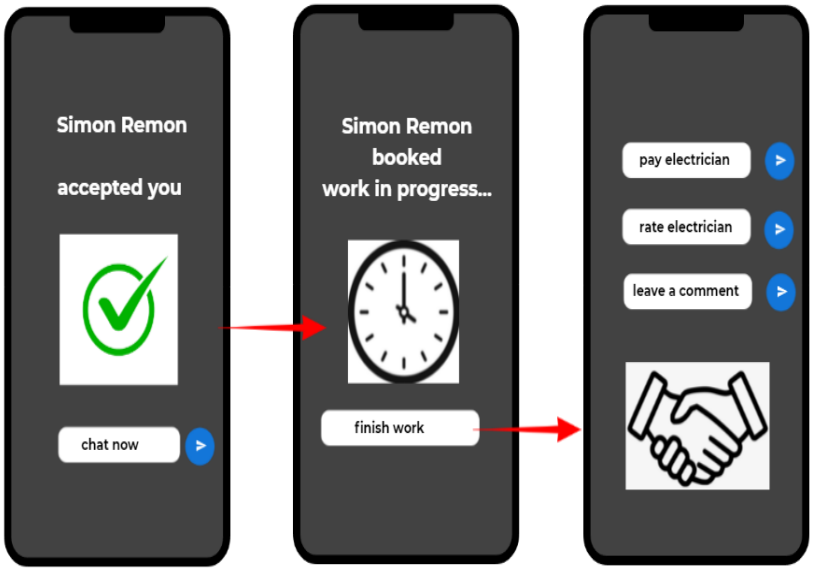
Table: Frequency of using mobile phone

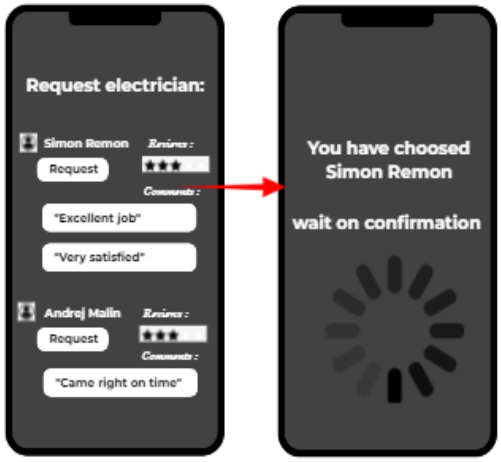
Frequency	Respondents
Always	71
Often	50
Sometimes	18
Rarely	4
Never	12
Total	155

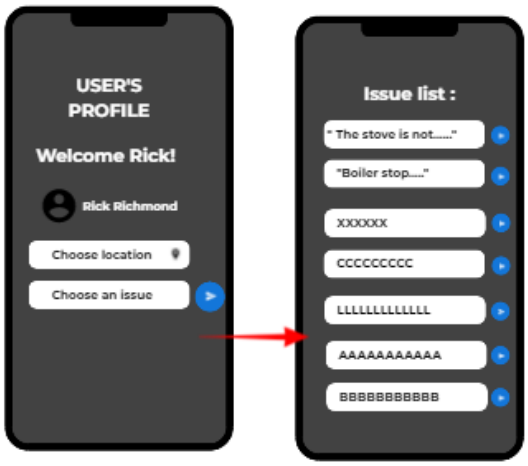
Table: Importance of having an app for searching for electricians

Level of importance	Respondents
Very important	62
Important	67
Neutral	21
Unimportant	5
Very unimportant	0
Total	155

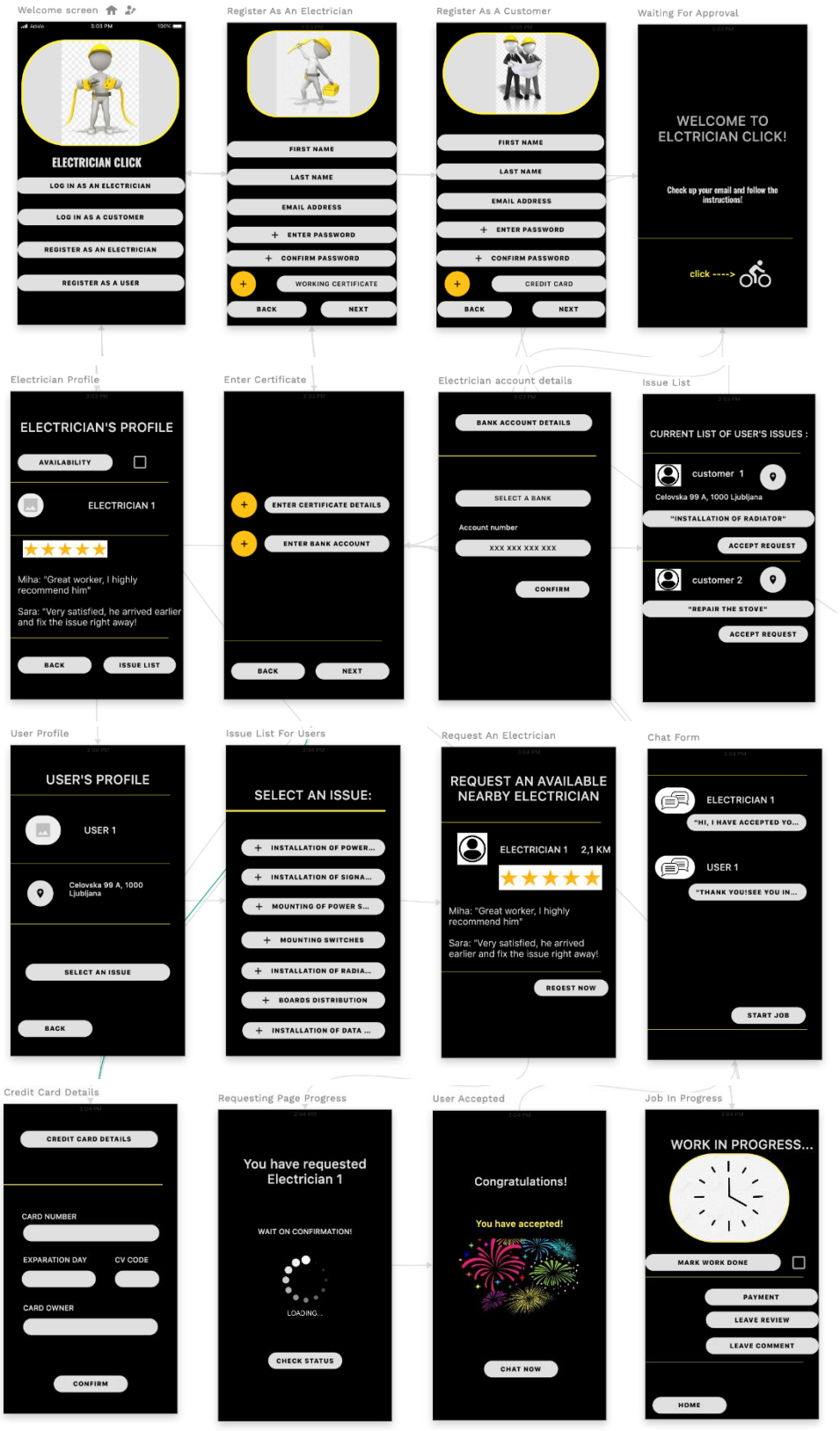
Appendix 6: Wireframing application's design







Appendix 7: Designing and prototyping the final design of the application



Appendix 8: Test case document example

Step	Name	Test steps	Expected results	Actual results	Status
1	Open electrician's app	Scan the QR code	App should open	App opened	Passed ✓□
2	Open electrician's profile page	Click on the button "electrician"	Electrician's profile page should open	Page opened	Passed ✓
2/1	Check availability option	Click on button "availability"	Status should change available/ busy	Button is not clickable	Failed ✗
2/2	Check checkboxes functionality	Click on the checkboxes next to the availability status	Boxes should be clickable and showing "thumb up" and thumb down"	While clicking boxes are changing the thumb	Passed ✓
2/3	Check picture placeholder functionality	Click on the picture placeholder	Choose an action message that should appear (Upload a photo from files or take a picture with the cam)	Options to upload a photo are available by clicking the picture placeholder	Passed ✓
2/4	Enter stars as rating (Rate the electrician)	Click on the button "stars"	User should be available to rate the electrician by entering stars	While clicking on "stars", the button starts loading	Failed ✗
2/4	Enter a comment (Leave electrician a comment)	Click on the button "comments"	The user should be available to leave a comment	While clicking on "comment", the button starts loading	Failed ✗
2/5	Check the functionality of the "back" button	Click on the button "back"	"Back" button should be clickable and to lead us to the home app page	By clicking "back" button we are back on the home page	Passed ✓
2/6	Check the functionality of the "issue list" button	Click on the "issue list" button	The "Issue list" button should lead the user to the list of electricity issues	By clicking "issue list" button, issue list page opens	Passed ✓

2/7	Check the location option	Click on the location icon	Google maps with the listed address should be available	Google maps are opening but not on the marked address by the user	Failed ✗
2/8	Check the "accept request" button	Click on the "accept request" button	The "Accept request" button should be clickable and lead us to the acceptance page	"Accept request" button by clicking opens the acceptance congratulations page	Passed ✓
2/9	Check the functionality of the "chat now" button	Click on the "chat now" button	The "chat now" button should open the chat room between the user and the electrician	By clicking the "chat now" button, the chat room opens	Passed ✓
2/10	Start chatting as an electrician or a user	Click on the text placeholder under every user	By clicking the text placeholder, users should be able to start chatting and add text	The chatting option is unavailable, and by clicking the text placeholder, a loading option appears	Failed ✗
2/11	Check the functionality of the "start job" button	Click on the "start job" button	"Start job" button should be clickable and to lead us on the next page, "work in progress"	By clicking the "start job" button, the work in progress page is open	Passed ✓
2/12	Check the "mark work down" checkmark	Click on the checkmark box next to the" mark work done"	Checkmark box, should be clickable	By clicking the box checkmarks appears and with clicking it again the checkmark disappears	Passed ✓
2/13	Check payment process	Click on the "payment" button	The button should be clickable, and the credit	The "payment" button is not	Failed ✗

			card options should be available	clickable, and it is loading	
2/14	Check option to leave a review	Click on the "leave review" button	The button should be clickable and should enable user to leave a rating and a comment	The "leave a review" button is not clickable	Failed ✗
2/15	Check the functionality of the "home" button	Click the "home" button	The button should be clickable and should turn us back on the home apps page	The "home" button leads us on the home page	Passed ✓
3	Open the user profile	Click on the "user" button	The button should be clickable and the "user's profile" should open	The "user" button is clickable and it initiates opening the user's profile	Passed ✓
3/1	Check picture placeholder functionality	Click on the picture placeholder	Choose an action message that should appear (Upload a photo from files or take a picture with the cam)	Options to upload a photo are available by clicking the picture placeholder	Passed ✓
3/2	Check location	Click on the location icon	By clicking the location icon the user should be able to change the location	By clicking the icon, the user is unable to change the location	Failed ✗
3/3	Check the functionality of the button "select an issue"	Click on the button "select an issue"	The button should be clickable and lead us to the list with issues	By clicking the "select an issue" button, the list of issues opens	Passed ✓
3/4	Check the functionality of the "back" button	Click on the button "back"	"Back" button should be clickable and to lead us to the home app page	By clicking "back" button we are back on the home page	Passed ✓
3/5	Check the functionality of all listed issues	Click on all the issues from the list	Issues should be clickable and should lead us to the "request an electrician" page	All issues from the list are clickable	Passed ✓

3/6	Check the "request now" electrician's option	Click on the "request now" button	A page with information that an electrician is requested should appear	By clicking the "request now" button the checking status page is open	Passed ✓
3/7	"Check status" button functionality	Click on the "check status "button	After the loading finishes, by clicking on the "check status," user should be able to see acceptance or denial from the electrician	Clicking the "check status" lead us to the acceptance page	Passed ✓
3/8	Check the functionality of the "chat now" button	Click on the "chat now" button	The "chat now" button should open the chat room between the user and the electrician	By clicking the "chat now" button, the chat room opens	Passed ✓
3/9	Start chatting as an electrician or a user	Click on the text placeholder under every user	By clicking the text placeholder, users should be able to start chatting and add text	The chatting option is unavailable, and by clicking the text placeholder, a loading option appears	Failed ✗
3/10	Check the functionality of the "start job" button	Click on the "start job" button	"Start job" button should be clickable and to lead us on the next page, "work in progress"	By clicking the "start job" button, the work in progress page is open	Passed ✓
3/11	Check the "mark work down" checkmark	Click on the checkmark box next to the" mark work done"	Checkmark box, should be clickable	By clicking the box checkmarks appears and with clicking it again the checkmark disappears	Passed ✓
3/12	Check payment process	Click on the "payment" button	The button should be clickable, and the credit card options should be available	The "payment" button is not clickable, and it is loading	Failed ✗

3/13	Check option to leave a review	Click on the "leave review" button	The button should be clickable and should enable user to leave a rating and a comment	The "leave a review" button is not clickable	Failed ✗
3/14	Check the functionality of the "home" button	Click the "home" button	The button should be clickable and should turn us back on the home apps page	The "home" button leads us on the home page	Passed ✓
4	Register as an electrician	Click on the "register as an electrician" button	Option to sign up data as an electrician should open on the next page	By clicking the "register as an electrician" button, fill in data for the electricians to appear	Passed ✓
4/1	Add first name	Click on the button "first name"	"First name" should be clickable and give electrician's an option to enter the name	"First name" button not working properly, loading sign appears while clicking the button	Failed ✗
4/2	Add last name	Click on the button "last name"	"Last name" should be clickable and give electrician's an option to enter the last name	"Last name" button not working properly, loading sign appears while clicking the button	Failed ✗
4/3	Add an email address	Click on the button "email address"	"Email address" should be clickable and give electrician's an option to enter the email address	"Email address" button not working properly, loading sign appears while clicking the button	Failed ✗

4/4	Enter password	Click on the button “password”	“Password” should be clickable and give electrician’s an option to enter a password	“Password” button not working properly, loading sign appears while clicking the button	Failed ✗
4/5	Confirm password	Click on the button “confirm password”	“Confirm password” should be clickable and give electrician’s an option to confirm email password	“Confirm password” button not working properly, loading sign appears while clicking the button	Failed ✗
4/6	Check the functionality of the “back” button	Click on the button “back”	“Back” button should be clickable and to lead us to the home app page	By clicking “back” button we are back on the home page	Passed ✓
4/7	Check the “next” button	Click on the “next button”	“Next” button should open the page for editing the certificate and the credit card details of the electrician	By clicking the “next” button, the page for more electrician’s details is open	Passed ✓
4/8	Check the functionality of adding certificate details	Click on the button” enter certificate details”	By clicking the button” enter certificate details”, the electrician should be able to enter the data of the electrician's certification	Clicking the button only the loading option appears	Failed ✗
4/9	Check the “enter card details “feature	Click on the “enter card details” button	Page with the possibility to enter the card details should be displayed	By clicking the “enter card details”, user is led to the credit card details page	Passed ✓
4/10	Check the functionality	Click on the button “back”	“Back” button should be clickable and to lead us to the fill-in page data	By clicking the “back” button, we are back on	Passed ✓

	of the “back” button			fill-in electrician’s data page	
4/11	Enter card number	Click on the “card number” text holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
4/12	Enter expiration day	Click on the “expiration day” number holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
4/13	Enter Cv code	Click on the “Cv code” number holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
4/14	Enter card owner	Click on the “enter card owner” text holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
4/15	Check the functionality of the “confirm” button	Click the “confirm” button	By clicking the button, the electrician is back on the entering data page	The button leads the electrician to the required page	Passed ✓
4/16	Check “next” button	Click the “next” button	This button should give the electrician the possibility to create the profile and wait for an email confirmation	By clicking the button, the electrician’s profile is created and it is waiting on email confirmation	Passed ✓
4/17	Check if the bike is clickable	Click the bike	Clicking the bike we should be back on the home page	By clicking the bike, electrician is back on the home page	Passed ✓
5	Register as a user	Click on the button “register as a user”	A page to fill out users' data should be open	Page with user’s details appears while	Passed ✓

				clicking the button	
5/1	Add first name	Click on the button "first name"	"First name" should be clickable and give electrician's an option to enter the name	"First name" button not working properly, loading sign appears while clicking the button	Failed ✗
5/2	Add last name	Click on the button "last name"	"Last name" should be clickable and give electrician's an option to enter the last name	"Last name" button not working properly, loading sign appears while clicking the button	Failed ✗
5/3	Add an email address	Click on the button "email address"	"Email address" should be clickable and give electrician's an option to enter the email address	"Email address" button not working properly, loading sign appears while clicking the button	Failed ✗
5/4	Enter password	Click on the button "password"	"Password" should be clickable and give electrician's an option to enter a password	"Password" button not working properly, loading sign appears while clicking the button	Failed ✗
5/5	Confirm password	Click on the button "confirm password"	"Confirm password" should be clickable and give electrician's an option to confirm email password	"Confirm password" button not working properly, loading sign appears while	Failed ✗

				clicking the button	
5/6	Check the functionality of the "back" button	Click on the button "back"	"Back" button should be clickable and to lead us to the home app page	By clicking "back" button we are back on the home page	Passed ✓
5/7	Check the "next" button	Click on the "next button"	"Next" button should open the page for editing the credit card details of the user	By clicking the "next" button, the page for entering the user's credit card should open	Passed ✓
5/8	Enter card number	Click on the "card number" text holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
5/9	Enter expiration day	Click on the "expiration day" number holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
5/10	Enter Cv code	Click on the "Cv code" number holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
5/11	Enter card owner	Click on the "enter card owner" text holder	User should be able to add data	By clicking the button, the loading option occurs	Failed ✗
5/12	Check the functionality of the "confirm" button	Click the "confirm" button	By clicking the button, the user is back on the entering data page	The button leads the user to the required page	Passed ✓
5/13	Check "next" button	Click the "next" button	This button should give the user the possibility to create the profile and wait for an email confirmation	By clicking the button, the user's profile is created and it is waiting on email confirmation	Passed ✓

5/14	Check if the bike is clickable	Click the bike	Clicking the bike, we should be back on the home page	By clicking the bike, user is back on the home page	Passed ✓