UNIVERSITY OF LJUBLJANA
SCHOOL OF ECONOMICS AND BUSINESS

MASTER'S THESIS
THE DEVELOPMENT OF A BUSINESS MODEL:
THE CASE OF PROJECT LIGHT4LIFE

Ljubljana, November 23rd, 2020   AMRA PUPOVIĆ

AUTHORSHIP STATEMENT

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LIST OF ABBREVIATIONS

B2B – Business to Business

B2C – Business to Customer

B2G – Business to Government

BMC – Business Model Canvas

BMF – Business Model Framework

CBM – IBM's Component Business Model

CEO – Chief Executive Officer

CLD – Causal Loop Diagram

Evs – Electric Vehicles

GDP – Gross domestic product

GPS – Global Positioning Systems

ICT – Information and Communications Technology

iOT – Internet of Things

KPI – Key Performance Index

LED – Light Emitting Diode

liDAR – Light Detection And Ranging

MAUP – Modifiable areal unit problem

NGO – Non-governmental Organization

PIR – Passive Infrared Sensor

PLC – Power Line Communication

RFID – Radio Frequency Identification Devices

UN – United Nations

US – United States

WHO – World Health Organization

INTRODUCTION

In a fast-paced lifestyle that the population is living, safety - traffic safety is not a top priority. Especially while driving. Evident progress has been made in technology in general. Even though its aim is to help and ease a lifestyle, oftentimes it actually puts a person in a greater risk. The most obvious example are cellphones, tablets and other gadgets that people are inclined to use while driving. And even though they may be aware how dangerous use of gadgets while driving is and how one split of a second may change an entire life of more than one family, still, the use of gadgets while driving is very common among drivers. However, even when drivers are fully sober and are not using their cellphones while driving, they can be distracted and could cause road traffic accident. Distraction became so frequent in everyday life, not only while driving. Pedestrians could be distracted while crossing the road as well. Distraction cause many accidents. If distraction is not the cause of an accident that occurs on crosswalks, the cause could be the inability for driver to notice pedestrian in time.

According to the Global status report on road safety 2018 by World Health Organization (2018) (WHO) road crashes cost most countries over 3% of their Gross Domestic Product (GDP). The same report states that every year almost 1.35 million people die in road traffic crashes. More than half of those who die in all road traffic crashes are pedestrians, cyclists and motorcyclists. The eight-leading cause of death among all age groups are road traffic accidents, and it is a leading cause of death among young adults aged 5-29 (World Health Organization, 2018).

Preventive measures for reducing road traffic accidents exist, but still the statistics is the best monitoring tool of their success and the most recent WHO report demonstrated that governments of most countries have made certain progress in different regions in the world, but still not sufficient. Measures that affect all traffic participants- drivers, vehicles, road infrastructure need to be identified within the legislation and more importantly, implementation measures and monitoring indicators need to be specifically addressed (Gopalakrishnan, 2012).

Special attention is pointed on necessity of vehicles maintenance, removal of the old, unsafe vehicles from the traffic and continuous monitoring of the usage of seat belts. Road infrastructure should also be well maintained with visible road traffic signs. Municipalities should provide proper pedestrian crossings. One of the preventive measures (and threaths) governments need to tackle is the human factor in terms that the drivers need better regulated policy for issuing the driving license as it oftentimes appears that not all drivers can read the traffic signs accordingly. Legislation takes into account imposing strictly traffic rules by particular authorities of all countries. Regulations that impose wearing helmets need to be implemented in countries that do not have them or enforce them. Every member of society needs to be included toward reaching the goal of

safe road travel. Usually thee measures are designed by multidisciplinary team of psychologists, engineers, doctors and vehicle experts (Gopalakrishnan, 2012).

Light4Life was created in order to try to impact society and make a change. With a product such as Light4Life, the prevention of road crashes accidents can be tackled with reducing the number of road accidents that occur near pedestrian crossings. Also, with this solution it will be possible to increase safety of vulnerable road users such as pedestrians and cyclicts. Light4Life offers a solution to the problem of frequent traffic accidents that occur on pedestrian crossings. It is consisted of two segments: three types of motion sensors and a set of Light Emitting Diode (LED) lights. Light4Life is smart system that detects pedestrian in time and notifies the drivers that a pedestrian is crossing the road. This way, they have time to act accordingly, reduce the speed and stop if necessary. Visibility of pedestrians is improved with solution such as Light4Life. This also represents the biggest challenge for drivers.

One of the major challenges for newly established companies is how to monetize their idea or how to choose the right business model. By choosing right type of business model, start-ups are reassuring sustainable growth. It is important that they adapt to changes on the market which means they need to adapt business model accordingly. Business model design stands as a key challenge for anyone who wants to create a new business (Zott & Amit, 2010). Business models integrate basic insights of innovation, business processes and routines (Cavalcante, Kesting, & Ulhøi, 2011).

According to Magretta (2002) term business model was first used with the beginning of the personal computer and spreadsheet era. The reasoning to this lies within the fact that personal computers and spreadsheets provide a possibility of testing and modeling various components. It is considered that business model should be modeled in terms of the value chain. It should be consisted of two parts. Whereas the first part is about all the activities that are tightly connected with making something, the second part is connected with selling something (product or service). If established in a good manner, this business model shall demonstrate the unmet need for a new product or perhaps a process innovation (Magretta, 2002).

Innovation is often connected to a product or service, but also to developing business models that strengthen company's unique core competence (Anthony, 2012). In the beginning, it would be better for newly established companies to try multiple business models at the same time (Brown & Gioia, 2002).

Business models serve to identify two important things for a company: value creation and value capture. It explains the set of activities from procurement of raw materials to making such a product that satisfy the final customer needs. All with the idea to create the value or achieve the competitive advantage. Usually, they can show where innovation

can happen. They need to constantly be changed and adapted to current market changes or needs. That can be achieved through Business Model Framework (BMF). It is used so that companies evaluate their current business model in relation to its potential and where it would be and to define the necessary steps to achieving it (Chesbrough, 2007). A good business model articulates the value, which is created for users by the demand, identifies the market segment (target group/niche), clearly defines the structure of the value chain, taking into account company's suppliers and customers. It also specifies/identifies the revenue generation mechanism(s), shows a clear picture of where the company stands in the ecosystem (potential competitors) and defines the competitive strategy (Chesbrough, 2007).

In this master's thesis, the research will be conducted to understand how to establish a business model for a startup Light4Life using the Business Model Canvas (BMC) tool. Business Model Canvas is a strategic template that was proposed by Alexander Osterwalder in 2008 with the aim of improving existing and developing new business models. As a strategic management tool, Business Model Canvas is used for the development of a new companies or improving the situation of the existing ones. This template is composed of nine categories. Building blocks are key activities, key resources, partner network, value propositions, customer segments, channels, customer relationships, cost structure and revenue streams (Osterwalder & Pigneur, 2010).

Process of implementing this project will be easier once the Business Model Canvas is established. This will allow the team that is working on a project Light4Life to overcome potential problems of its type of business.

The purpose of this master thesis is to address the problem of road traffic accidents that occur on crosswalks and its added value is in an attempt to contribute to its prevention and/or reduction. Present solutions do not solve the problem of frequent traffic accidents that happen on crosswalks. With product Light4Life that is possible and at much less cost of precaution than the cost of harm occurred. Since Light4Life is an innovative product with a specific niche market, after designing a Business Model Canvas, Light4Life will know the right way to position itself on the market and determine the best way to approach its target buyers. Not only that, but this Master thesis, shall be of help to similar startups or companies to implement their innovative solutions to the market and to establish sustainable business models.

The main aim of this Master thesis is to design a business model for a project Light4Life. Supporting aims are the following:
1. To present the theoretical background of the problem of road traffic accidents and business models;
2. To present the current state in road traffic safety;

3. To conduct the research that will confirm the need for this product and inform the development of its business model.
4. To examine the challenges and contingencies related to such a process of business model development and thus inform both theory and practice.

Research methodology is conducted in this Master thesis is based on qualitative methods of gathering the necessary data. In-depth interviews are conducted with relevant experts from this field of interest. Six interviews with experts included questions that covered topics of road safety, road crushes and prevention of it as well as possibility ofcooperation with Municipalities when it comes to implementation of Light4Life. Experts that were interviewed were from Police Administration of Montenegro, a company that is perceived in Montenegro as socially responsible company, a leading partner organization for the implementation of international development projects, from the Ministry of Traffic of Montenegro and from Municipality of Podgorica (capital of Montenegro).

In order to get insight into the end users' perceptions of road safety while crossing the road, all participants in traffic (both pedestrians and drivers) are interviewed. Twelve interviews were conducted with pedestrians and drivers. Prior to conducting in-depth interviews, an integrative review of the literature was performed in order to explore the theoretical, practical, contextual, and evolving nature of research synthesis. Websites of key organizations are reviewed, scientific articles or papers from relevant authors are read and examined from the provided reference list. The research findings are interpreted to provide an input for the establishment of the business model through Business Model Canvas and its elements. Every element of the Canvas was explored in detail in order to identify what is the best way to approach the market. Obtained answers were analyzed and connected to each component of the Business Model Canvas and further used to develop the business model for a startup Light4Life.

The master thesis is consisted of five parts. The introduction identifies and presents the problem along with the arguments of the relevance of this topic and issues to be discussed. The first chapter elaborates road safety from the perspective of general trends in its promotion and improvement, regulations and challenges. The second chapter focuses on the analysis of a business model with a special focus on Canvas business model. The third chapter sublimes previous two chapters on a practical level – through a presentation of the project Light4Life, its mission, goal, characteristics and it is analyzed from the perspective of a business model. The fourth chapter focuses on a project Light4Life from the Business Model Canvas perspective. Finally, the conclusion shall summarize main points of this master thesis and the research conducted.

1   ROAD SAFETY

For more than a century, road safety has been studied, analysed and improved. A result of such researches are theories, accident and road accident models. The field of road safety is an interdisciplinary field because it requires knowledge of multiple base sciences (techniques, medicine, social behaviour) and scientific disciplines (mathematics, physics, road traffic engineering, highway engineering, safety, transport, education, psychology, sociology, ergonomics, medicine, law, urban planning).

Theory, by the Oxford Dictionary definition, is a formal statement consisted of the rules on which a particular field of interest is based ("Theory", n.d.). With that in mind, there are four types of theories on road safety: stochastic, causal, systemic and behavioural. Every theory marked one of the periods in the last 100 years of the development to explaining why road traffic accidents happen (Jamroz, 2008).

1.1   Stochastic theories

Stochastic theories were developed from the beginning of the last century until 60s. During their development, road traffic accidents were analysed as random events and from the point of statistical accident theories (Jamroz, 2008). Its beginning dates from period when Bortkiewicz published a book "The Law of Small Numbers". He has conducted research on the frequency of death cases from horse kicks in the Prussian army using Poisson model. The finding was that the number of deaths per army corps per year was almost perfectly random. His finding was wide accepted which meant that accidents were happening without human control over them, so they happened randomly. Other researches state that accidents are occurring accidentally, while on the other hand, they are caused by people who have personal disorders.

Road safety could be explained in detail with other stochastic models such as regression, negative binomial model time series, stochastic processes, spatial, econometric, etc. whereas the most popular model is regression model. That is because the data that describe independent variable are easily available. Other stochastic models resulted in a conclusion that there are many different factors that could cause road accident so that ordinary drivers are not the only factor (Jamroz, 2008).

1.2   Causal theories

These theories based its findings on knowing the real factors that cause road accidents and that only with acquiring that knowledge their prevention is possible. Causal theories are divided into deterministic and probabilistic. Deterministic are the sequence of events that led to accident while probabilistic look at the set of factors that led to it. A father of deterministic theory that looked at sequence of events was Herbert William Heinrich. His

"domino theory" is based on assumption that accident is composed of a single event with a cause. According to domino theory, to achieve better safety, source of the accident should be identified and eliminated (Heinrich, 1950).

Accidents that happen on the road are very often. They present a foist to the country. The costs that are associated with these accidents are both indirect and direct and they affect both individuals and government. Costs are human costs (e.g. grief, suffering, willingness to pay), direct economic costs of lost output. There are medical costs for people who were injured in the accident, costs of damage for vehicles and the place where the accident occurred, then costs for police and administrative costs of accident insurance (Department for Transport, 2011).

Road traffic accidents are very hard to predict due to their nature of randomness manifestation (Elvik, 2004). Fridstrøm & Ingebrigtsen, (1991) argued that road traffic accidents are totally random because of its effect of regression toward the mean. When doing analysis in statistics, this effect arises when a random variable is extreme on its first measurement but on its second measurement is closer to the mean or average. Or when in its first measurement it is closer to the average but in the second is the extreme. On the other hand, Davis (2004) argues that in the road traffic accidents there is no involvement of randomness.

According to Elvik (2004) there are two road safety theories. One is connected to engineering and human behavioral effects. Elvik (2004), states that road safety measures could influence road safety by affecting relevant factors with engineering effect and behavioral adaptation. This means that human behavior and engineering are two sources of risk. An example of engineering effect is road lightning which improves visibility. Even though it improves visibility road users are less alert – which is an example of behavioral effect (Elvik, 2004). Another factor which is connected to engineering effect is vehicle related factors. For example, electronic stability control, high gross weight or poor stopping distance are associated with vehicle features and could have an effect on road safety and they are connected with different level of risk (Chang & Mannering, 1999).

Majority of researches since the 1960s suggested that human factors had a strong contribution to the road accidents. Human factors are analyzed in two ways: causal and systematic (Jamroz, 2008).

Errors cost too much. As stated earlier, they represent the cost for the country but more important, for people involved in the road accident. Factors that cause human errors are countless. They are divided into categories by the time of their occurence. With that in mind, there are two categories of errors: untrained behavior (erros as unintentional activities) and trained behavior (performance errors) (Rasmussen & Svedung, 2000).

According to Jamroz (2008), the most frequent factors include environmental factors, personal features (e.g. gender, age, practice and training), factors that modify driver behavior (alcohol, drugs, weather), vehicle equipment, supervised behavior and many others.

Analysis of the cause of road accidents is a process which consists of factor identification, lateral chain of events (trees model) and sometimes sequential or network models. Causes could be discovered or identified and eliminated by using causal theories, especially sequential, network and tree models by running analysis of a number of causes of road accidents. By doing so, cause will be either discovered and eliminated or reduced (Jamroz, 2008).

Causal approach to analyzing accidents is focused on assumption that in order to identify the real cause of the accident, detail investigation of each accident and event that happened prior to it should be conducted. In various of studies on the influence of human factor on road safety and behavior in traffic that led to accident, four types of driver behavior were identified. These types are distraction, carelessness and misperception; drowsiness and risky; competitive and aggressive behavior.

As technology advances and car industry develops, there are many other types of problems that occur due to new vehicles and new elements of transport infrastructure that affect road traffic participants' behavior. All these types of new problems need to be studied. New areas that require research are drugs used by road participants, dynamic space of visibility, telematic devices, etc. (Jamroz, 2008).

1.3   Systemic theories

With increased number of cars in the United States during 1940s and 50s, number of road accidents arise. That showed that road accidents could be caused by anyone, not only people who have personal disorders. During this period when the number of cars in the United States increased, the focus on why road accidents happen was on causal theories and human error. Road safety policy had been changing only in terms of human behavior. This approach showed as ineffective. However, it was realized that in order to affect the number of road accidents, the reason why people cause accidents need to be understood and that it is not enough to declare that people make mistakes. In addition, this realization helped to develop systemic theory (Jamroz, 2008).

Various studies compared systemic theories with non-systemic theories. According to Leveson, many researches are conducted from cause-effect point of view. Which is not enough because the core of the problem is not investigated because the analysis stops prematurely (Underwood & Waterson, 2013). Systemic theories allow better development of safety measures.

According to systemic theories, accidents happen due to an unsuccessful attempt to adjust when the safety system components interact whereas neither one of the elements is considered to be more important than the other (Jamroz, 2008). However, they are used to recognize the relation and dependencies that affect accidents, known as factors, transferred in time and space and factors that occur at the time and place of the road accident. Once recognized, these factors are used to build a system of road safety measures which monitor and control dependencies and relations (Jamroz, 2008).

1.4   Other theories and models

Risk factors are high for road traffic and every participant in traffic is exposed to it. This is the main reason why road traffic is merit of science attention. In order to achieve in Sustainable Development, United Nations in its global environmental policy contemplation recognized road safety to be an important part of it (Bezerra, 2018). Exposure to risk is high and various theories and models are applied and developed to prevent it or at least to reduce it.

In terms of modelling accidents *theory of reliability* is developed, *behavioral theories* are about how people evaluate and asses risk as a prime factor of accidents. Besides these, there are models of the *theory of disasters* that forecast road accidents in conditions of high congestion, similar *theory of alertness* used in military and *theory of distraction* which explores accidents that occurred in workplace (Jamroz, 2008). Road safety is a complex topic that requires various fields of study in order to be examined. There is no general model that explains occurrence of road accidents.

1.5   Future research direction

In order to improve road safety successfully, it is necessary to understand both the factors that affect road safety and how do they affect it. Thus, focus of existing researches is in identifying key factors and their effect on road safety. These factors are usually related to traffic and road characteristics. Even though many researches are conducted, there are areas that have to be examined further.

A significant contribution to this point are studies that found the positive relationship between speed and accident frequency whereas other studies found the opposite (Wang, Quddus & Isson, 2013). The reason to that could be that properties related to speed, such as speed variance, affect road accident occurrence rather than speed itself. Another issue could be the data quality.

To understand better how speed or speed variance affect safety, individual vehicle-level high frequency speed data should be used. Data issues that are occurring could be

overcame by matching sampling data of crash and non-crush cases so that can give a perception of accident occurrence (Pande & Abdel-Aty, 2009). New ways of data acquisition such as radars, video image processing and kinematic sensors allow collection of detailed naturalistic driving event data (Jovanis, Valverde, Wu & Shankar, 2011), which consequently enriches future research. In traditional researches either aggregate data is used, such as accident frequency or the data about the accident after its occurrence. However, there is not enough information on the sequence of events prior to accident. These driving data would made understanding of the cause of accidents easier (Jovanis, Valverde, Wu & Shankar, 2011).

Furthermore, as a proactive approach and measure to accident prevention, it would be helpful if data of "near crash" events could be tracked and collected. Effect of speed on road accidents is one of the areas that need to be scrutinized.

Mixed effects on road safety in existing literature appear to be between traffic congestion and road horizontal curvatures. The reason could to this could be the, similarly, the data quality. More precisely, the use of appropriate measurements. Curvatures are not easy to measure. The curvature measurements are consisted of the number of sharp horizontal curves, sharpe curve indicator, bend density, detour ratio, straightness index, cumulative angle, and angle (Milton & Mannering, 1998; Miaou, Song & Mallick, 2003; Haynes, Jones, Kennedy, Harvey & Jewell, 2007). Haynes, Jones, Kennedy, Harvey & Jewell (2007) stated that the single measurement of road curvature could not tackle entire all properties of interest.

Similar approach applies to traffic congestion. In existing researches, direct measurement of traffic congestion is rarely used while use of proxy variables is more common. The aim of future research should be the improvement of measurements for different factors and what their effects on road safety are through different measures`. Consequence of this could be an overview of how various factors affect safety in different conditions (Wang, Quddus & Isson, 2013). Usually, the research is conducted in developed countries. For example, if the hypothesis is that the speed variance will have a negative effect on road safety it is expected that it is for both developed and developing countries.

Basically, implications of such geographically limited research are generalized to all contexts. It is important to understand that the road conditions such as traffic management and road configurations are different in developing and developed countries. Therefore, the effects of some factors might be differing for developing countries (Altwaijri, Quddus & Bristow, 2011). Developed countries face the same challenge, some factors have mixed effects on road safety.

In Global Status Report on Road Safety, WHO (2018) pointed out that even though low-income countries and middle-income countries have in total 48% of the world's registered

vehicles, 90% of deaths on the roads occur in these low- or middle-income countries (World Health Organzation, 2018). It is more than clear that the future research effort should be focused in developing countries. Obstacle that can arrise is insufficient amount of data due to that majority of developing countries do not have a good database for road accidents. The way to overcome this obstacle is to employ inferential statistical techniques. If the research is conducted based on high speed roads such as highway, then the focus of future research may be the safety effects of those factors in areas where the roads are minor, so rural areas should be of interest (Wang, Quddus & Isson, 2013).

More sophisticated statistical techniques could provide better insight into effects that factors have on road safety. Highway Safety Manual reffered NB statistical model to be as one of the safety performance functions (AASHTO, 2010). Nowadays, road safety researches apply more advance statistical models. (Lord & Mannering, 2010; Savolainen, Mannering, Lord & Quddus, 2011). If used, advanced statistical models could relieve the obstacle of omited variable bias and unobserved effects, such as spatial models that account for spatial correlation, random parameter models and multilevel models (Lord & Mannering, 2010). Hence, it is known that other methodological issues could result in biased or misleading estimations of effects of factors (Wang, Quddus & Isson, 2013). According to Hauer (2010), before-after studies have better consistence rate across different studies than cross-sectional regressions whereas regression model hardly truly apprehend real effects.

In addition to regression models, there is one more problem. Modifiable areal unit problem (MAUP) arise. MAUP refers to the situation where the boundary of zones that are used in a spatial analysis change, consequently the statistical inference and interpretations that are obtained from the zones will change (Openshaw, 1984); (Wang, Quddus, Ryley, Enoch & Davison, 2012). This can lead to the conclusion that the problem with mixed effects of factors (in terms of both direction and magnitude of such effects), as the one with road curvature, could be caused by these methodological issues or by different study context and designs.

In sequence of reviewing and combining results from various studies, researcher can use meta-analysis. It is "analysis of analysis" or as Glass (1976) defined it "a statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings".

This kind of analysis is used in road safety research, mainly to asses bicycle helmet efficacy in road safety (Attewell, Glase & Mcfadden, 2001) and in driver improvement intervention (Masten & Peck, 2004). Publications bias could arise with this approach due to the tendency not to publish findings of a study if they are unwanted, difficult to explain or statistically insignificant (Høye & Elvik, 2010; Elvik, 2011).

Beside every mentioned aspect of road safety, important cause of why transport systems are not as economically efficient, or environmentally friendly is 'human element'. Furthermore, more and more studies are being conducted to prevent human error in transport system. Studies such as automated transport system (e.g. autonomous driving) or reducing environmental pollution (reduce emissions and impact climate change). All in the aim of reducing the damage humans made.

As autonomous systems have the technology (such as radar, Light Detection And Ranging (liDAR), video cameras, laser scanner) which is well founded and is becoming so by time, the future research should focus on the issues that will arise with the development of new driving environment (for example, how these autonomous systems interact with vehicles without this feature) (Wang, Quddus & Isson, 2013).

1.6   Smart City

With the expansion of the digital technologies, the cities are becoming smarter. Fast and constant pace of urbanization requires innovative methods to manage challenges of the urban life such as overpopulation, energy consumption, resources managemend and environment protection (Eremia, Toma & Sanduleac, 2017). By 2050 it is forcasted that the urban population in the European Union will be 80%, which is 8% higher than it was in 2015. It is important to mention that cities take only 2% of planet's surface but the impact on the world they have is strong. Furthermore, cities take about 50% of the world population, major role in total energy generation – 75% and cities are one of the most responsible for the greenhouse effect – 80% (United Nations Environment Programme, 2011).

Characteristics of the cities of the future are amended and more characteristics have been added into the dictionary in order to better understand what exactly fall under the cities of the future concept - a concept promoted by stakeholders and interest groups. This lexicon is expanded over the last decades and various specific terms were popular in the time due to the ideas that were promoted by business environment, political entities, universities and civil community (Eremia, Toma & Sanduleac, 2017).

Smart city was defined by many experts, and some definitions were:
- "A 'smart city' uses Information and Communications Technology (ICT) to enhance its livability, workability and sustainability" (Smart Cities Council, 2014).

- US Office Technical and Scientific Information defined it as a city that monitors and integrates conditions of all its critical infrastructures in order to efficiently optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens (Sperling, Young, Garikapati, Duvall & Beck, 2019).

- Smart city could be defined by a geographical space and is able to command resources (human, natural, equipment, buildings and infrastructure) and waste that is collected by lifestyle that it is lived in that particular city; should be sustainable and environment friendly (Guerrero-Perez, Huerta, Gonzalez & Lopez, 2013).

Table 1 shows which expressions which were used for "future cities" in last decade by interested groups in specific fields (Eremia, Toma & Sanduleac, 2017).

Table 1: "Future cities" - conceptions of success

Domain	Social	Economic	Governing
Garden cities	Participative cities	Entrepreneurial cities	Managed cities
Sustainable cities	Walkable cities	Competitive cities	Intelligent cities
Eco-cities	Integrated cities	Productive cities	Productive cities
Green cities	Inclusive cities	Innovative cities	Efficient cities
Compact cities	Just cities	Business-friendly cities	Well-run, well-led cities
Smart cities	Open cities	Global cities	Smart cities
Resilient cities	Livable cities	Resilient cities	Future cities

Source: Eremia, Toma & Sanduleac (2017).

- Sustainable city - main influence on the popularity that this term associated with future urban development got after 1950 had United Nations Brundtland Commission report (1987) knowledge domain of sustainable development (Eremia, Toma & Sanduleac, 2017).
- Digital cities is the term that was used in 90s and the concept was to show strong relation between fast growing information and telecommunication technology and significant amount of information (Aurigi, 2005).

As the technology were developing, in 2009 the term »digital cities« got replaced with »smart cities«. The term unites elements of sustainability and social inclusion combining it with latest internet technologies (Moi, Moonen & Clark, 2014; RPA World Cities Planning Committee, 2014).

- Eco-cities term was popular in the mid-90s. It suggests that the city should be developed in equilibrium with nature. Whereas the elimination of all carbon waste should be done, and the energy production should go through clean resources. This term was suggested by a group Urban Ecology. This group was founded by Richard Register in California. The term eco-cities got more infamy in 2011 due to the rapid growth of interest in smart city concept (Aurigi, 2005).

In order for a city to transform into a smart one, it has to follow set of phsycal infrastructure as well as legislation with aim of economic development. They have to assure social inclusion and allow environment protection (Eremia, Toma & Sanduleac, 2017). On Figure 1 are shown characteristics of a smart city that are available to Municipality and citizens to use them to define a smart city (Eremia, Toma & Sanduleac, 2017).

Figure 1: Characteristics and tools used to define Smart Cities

Source: Smart Cities Council (2014).

The features of the smart city are shown in Figure 2.

Figure 2: The key aspects of smart cities
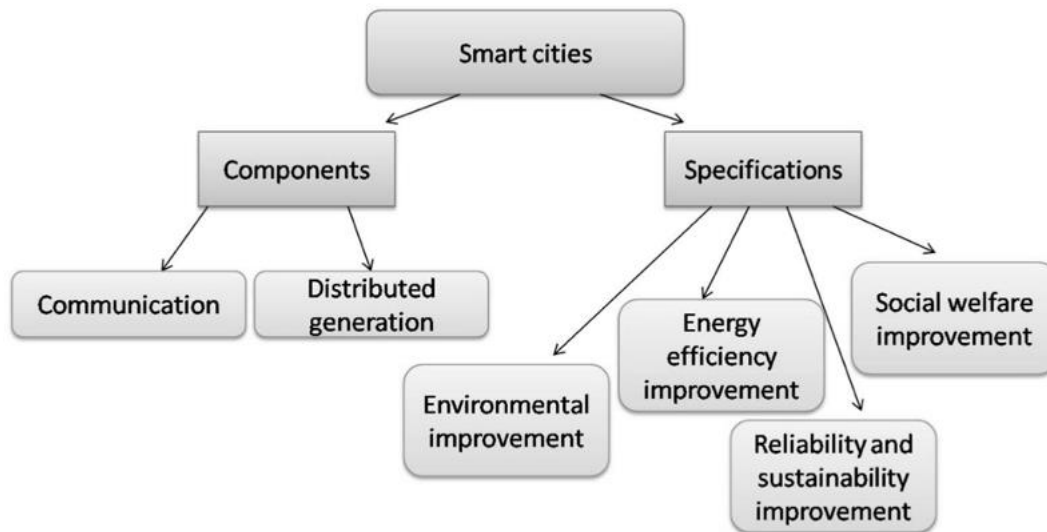
Source: Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, (2017).

There are various examples of applications by *means* of which the main objectives of a smart city can be achieved and that could be the course of development for a city. These courses advert to infrastructures, services and administrative systems with aim of creating an appositely environment and apply different characteristics of a smart city (Eremia, Toma & Sanduleac, 2017).

In the Table 2 are presented courses of development of a city as well as examples of different applications by means on which the concept of a smart city can be fulfilled.

Table 2: Directions of development of smart cities

Area of application	Description	Examples
Smart buidings	Smart buildings that incorporate the advantages of communication and control systems.	Optimizing the heating systems, ventilation, and air conditioning.
Education, medical and social care	Applications that allow improving the activity in these domains and ensure the access to all citizens to high-quality services.	Monitoring systems of the old people, monitoring by telemedicine.
Smart energy	Smart electrical energy system that interconnects all utilities and end-users via a smart infrastructure.	SmartGrid applications, optimization of network operation, comply the environment standards, smart lightning.
Smart grid (smart metering of natural gas, water, electrical energy)	Real-time consumption etering of energy, water, and natural gas.	On-line information of the consumption; Wireless smart meters.
Smart utulities (smart water distribution and smart waste management)	Intelligent management of the water distribution system and wastewater.	Smart waterwater systems; Real-time solid waste monitoring.
Smart parking	Managing the parking places using sensors, CCTV	Monitoring systems of the vehicles.
Integrated supply systems	Synchornizing the supply with the demand; measurement, monitoring and organization of the transportation around the supply chains of the cities.	
Smart and integrated transport	Traffic monitoring and real-time optimization using and combining all transportation means.	CCTV for traffic; Smart parking networks; Minimizing the impact on the environment.

Source: Eremia, Toma & Sanduleac, (2017).

Integral part of smart city concept is ICT. According to Eremia, Toma & Sanduleac (2017), ICT is important for smart city concept in sequence to:
- Efficiently use the infrastructures and allow a sustainable development from economic, social and cultural point of view,
- Create e-participation system which will allow include local citizens,

- More efficient reactions and adaptation to changes by ecouraging learning from experience and innovation.

By evolving ICT domain is creating robust integration of all dimensions of the smart city such as human intelligence, the collective intelligence and artificial intalligence of the physical infrastructures of the city. Intelligence of the city is created and reflected on interconnecting digital telecommunication networks, the intelligence merged into system that function, sensors and phsycal components and software tools (Mitchell, 2007).

1.7   Internet of Things (IoT)

Concept of Internet of Things (IoT) was introduced in order to ease the usage of databases and software applications. Sensors and software platforms collect the data which are stored on the cloud servers. Via software tools, the data could be collected manually or by automatic systems. Crucial point is the data security. It should be on the high level since this is an open environment and the access to information is relived (Eremia, Toma & Sanduleac, 2017).

According to (Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, 2017), Internet of Things consists of:
-   Perception layer,
-   The network layer and
-   The application layer.
The layers are shown on Figure 3.

Figure 3:Internet of Things layers

Perception Layer	Wireless Sensors – RFID - Cameras
Network Layer	Gateways, ZigBee, Bluetooth, PLC, WiFi, 2G, 3G, 4G
Application Layer	Smart homes, demand response, fault detection, power lines, Electric Vehicles (Evs), Renewable energy sources, smart cities, smart homes
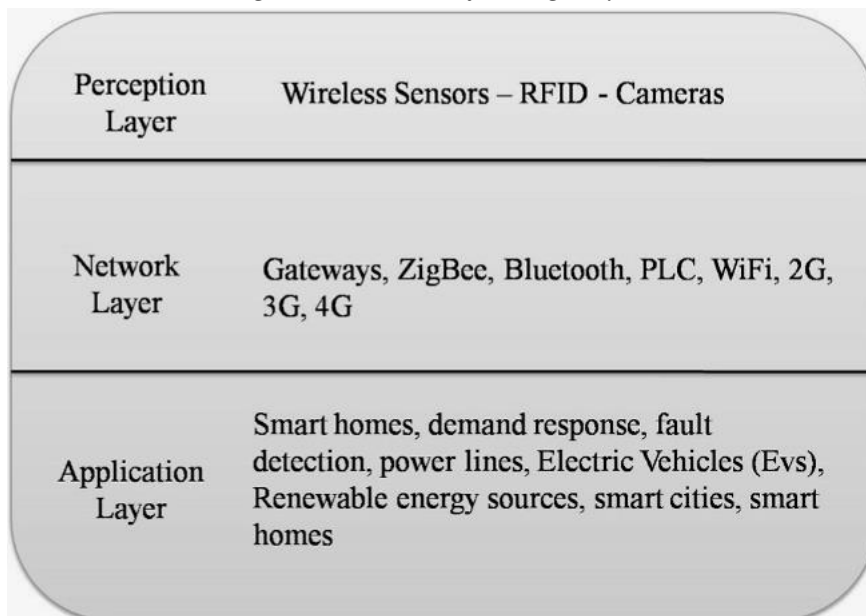
Source: Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, (2017).

The first layer, perception layer includes wireless sensors, Radio Frequency Identification Devices (RFID), Cameras, Global Positioning Systems (GPS). Simply, perception layer is a group of devices that can connect to the Internet. This group of devices is able to comprehend, sense objects, collect and exchange information with other devices using Internet communication networks (Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, 2017).

Under the Network layer are technologies such as Bluetooth, ZigBee, Gateways, Power Line Communication (PLC), WiFi, 2G, 3G and 4G. Network layer's job is to transfer data from perception to application layer, under the restrictions of the devices' capabilities, network limitation and the applications' restrictions. Hence, Bluetooth and ZigBee are used to transfer the information to the closest gateway supported by cappacities of the communicating parties (Eremia, Toma & Sanduleac, 2017). For transfering over long distance supported by application, network layer use internet technologies – Power Line Communication, WiFi, 2G, 3G, 4G.

The last layer, application layer receives the information that Network layer has forwarded and process them. With application layer it is easier to make strategies and manage them. Applications are creating smart systems, such as smart homes, smart cities, power system monitoring, renewable energy sources and energy management (Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, 2017).

Evolution of the Internet allowed connection among many different people and interconnection among each other. Not only that, but with the development of the internet interconnection is possible between objects (Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, 2017).

Figure 4: Internet of Things - based linkages
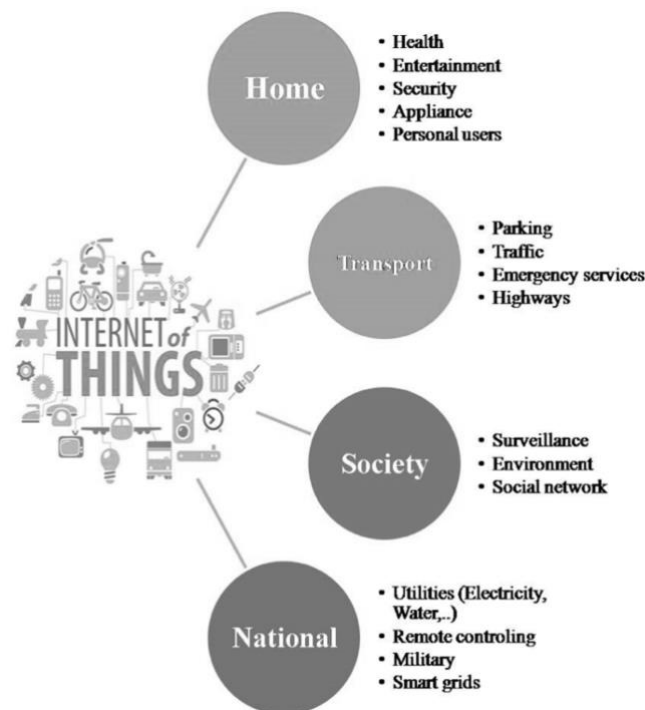
Source: Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, (2017).

Figure 4 present which objects are interconnected relying on IoT. When it comes to good sides that Internet of Things bring to smart cities, benefits are obvious. Internet of Things improve life and creates safer environment for citizens. This is achieved by creating cost-effective municipal services, enhancing public transformation and reducing traffic congestion. This concept is directly linked up with policy making on national level referring to energy conservation and pollution reduction, monitoring systems and needed infrastructures (Talari, Shafie-khah, Siano, Loia, Thommasetti & Catalao, 2017).

2 BUSINESS MODEL

Many theoretical and empirical researches are tackling the topic of what are business model and what is their definition. Is there a difference between business model and business plan? In the most simplified way, business model is the mechanism for generating profit in the company whereas business plan is quantitative method of presentation of the company's strategy and expected financial performance in years ahead (The Business Plan Shop, 2014). It is consisted of detailed processes and tasks for business model to work. It is noticeable that these two things are interconnected. Business plan exists to demonstrate that particular business idea is analyzed carefully and to show arguments why it should be pursued.

Universally accepted definition of business models does not exist (Peric, Durkin & Vitezic, 2017). This is the challenge for everyone who wants to investigate what is this idea about but at the same time it is interesting to take a part in discovering it and possibly being a part of establishing such an important part of business.

2.1 The building blocks of a good business model

It is hard to define the exact "building blocks" because there is no established definition of a business model. What can be done is to extract conclusion from overlapping in existing definitions of a business model. In their book in 2001, Amit and Zott (2001, p. 511) wrote "A business model depicts the content, structure and governance of transactions designed to create value through the exploitations of business opportunities". Working definition of a business model defined by Rosenbloom and Chesbrough (2007, pp. 12-13) states that "A better business model will always beat a better idea or technology".

Chesbrough (2007) also states that the benefit of this working definition is that each of its six parameters identifies where innovation might generate new value in an industry. A good business model articulates the value, which is created for users by the demand, identifies the market segment (target group/niche), clearly defines the structure of the value chain, taking into account company's suppliers and customers. It also specifies/identifies the revenue generation mechanism(s), shows a clear picture of where the company stands in the ecosystem (potential competitors) and defines the competitive strategy (Chesbrough, 2007).

"A business model is the method by which a firm builds and uses its resources to offer its customers better value than its competitors do want to make money doing so", a definition by Afuah and Tucci (2001, pp. 3-4). Defining the same thing Johnson, Christensen & Kagermann (2008, p. 53) stated "A business model, from our point of view, consists of four interlocking elements that, taken together, create and deliver value. The most important to get right, by far, is the first: customer value proposition, profit formula, key resources and key processes."

Taking into account all stated definition, there are four main building blocks of a good business model. Those four building blocks are (Johnson, Christensen & Kagermann, 2008):
1. Profit generator mechanism
2. Key processes and resources
3. Value appropriation
4. Customer value creation.

All four components of establishing a successful business model are equally important and if developed properly could drive growth for the company and put it far in front of its competitors.

2.2   Evolution of Business Model Research

Concept of a business model became known better in business world in the 1990s with the start of "dot.com" bubble (Zott & Amit, 2011). Technological innovations are usually linked with business models however the modeling of business models is separable from technology. One of the major challenges for newly established companies is how to monetize their idea or how to choose the right business model. By choosing right type of business model, start-ups are reassuring sustainable growth. It is important that they adapt to changes on the market which means they need to adapt business model accordingly. Business model design stands as a key challenge for anyone who wants to create a new business (Zott & Amit 2010). Business models integrate basic insights of innovation, business processes and routines (Cavalcante, Kesting & Ulhoi, 2011).

According to Magretta (2002), the term business model started to be used with the beginning of the personal computer and spreadsheet era. The reason to that is that personal computers and spreadsheets gave a possibility of testing and modeling various of the components. Magretta (2002) considers that business model should be modeled in terms of the value chain. It should be consisted of two parts. Whereas first part is about all the activities that are tightly connected with making something, the second part is connected with selling something (product or service). If established in a good manner, this business model shall demonstrate the unmet need for a new product or perhaps a process innovation. (Magretta, 2002).

Innovation is usually connected to product or service, but also to developing business models that strengthen the company's unique core competence (Anthony, 2012). In the beginning, it would be better for newly established companies to try multiple business models at the same time (Brown & Gioia 2002).

Business models serve to identify two important things for a company: value creation and value capture. It explains the set of activities from procurement of raw materials to making such a product that satisfy the final customer needs. All with the idea to create the value or achieve the competitive advantage. Usually, they can show where innovation can happen. They need to constantly be changed and adapted to current market changes or needs. That can be achieved through Business Model Framework (BMF). It is used so that companies evaluate their current business model in relation to its potential and where it would be and to define the necessary steps to achieving it (Chesbrough, 2007).

A good business model articulates the value, which is created for users by the demand, identifies the market segment (target group/niche), clearly defines the structure of the value chain, taking into account company's suppliers and customers. It also specifies/identifies the revenue generation mechanism(s), shows a clear picture of where the company stands in the ecosystem (potential competitors) and defines the competitive strategy (Chesbrough, 2007).

"System that solves the problem of identifying who is (or are) the customer(s) engaging with their needs, delivering satisfaction and monetizing the value" (Baden-Fuller & Haeflinger, 2013). This is how Baden-Fuller and Haeflinger (2013) defined the term business model. It is stated that business model is formulated in a two-way approach. At first, there should be a link between the company's performance and technology, and then second approach is the development of the right technology as the result of user engagement and readiness or openness to develop a business model.

It is a fact that startups fail due to not having enough funds or not meeting the predefined economic expectations. Both types of startups (innovative and traditional) are faced with these failures. These failures are linked to limitations on strategic, organizational or entrepreneurial levels.

Even thought the business models help create a value for the company and the customer it is important to distinguish that they do not make company's business unique. As Sorenson stated, unique value is achieved in the way business model is established and developed, but also how it supports the associated business plan and the activities regarding company's strategy.

2.3   Types of Business Models

The first step in designing the business model is to choose the type of business model. Enterprises have either rigid or flexible business model and they can face operational problems and organizational challenges. Once the business model is chosen, company should constantly innovate it not just to stick to initial business model and its elements.

2.3.1   Rigid

Business Model Canvas

Canvas business model is consisted of nine building blocks: key activities, key resources, partner network, value propositions, customer segments, channels, customer relationships, cost structure and revenue streams. All of them define how company delivers, creates and captures value (Osterwalder & Pigneur, 2010).

Flourishing Business Canvas

A visual design tool that enables to any group of stakeholders easier collaboration to decide main economic, social and environmental aspects of an organization's business model. By "easier collaboration" it is meant that through its common language the Flourishing Business Canvas enables stakeholders to work together on better articulating of important aspects of their business model. To distinguish this Flourishing from Business Model Canvas, the creators of this canvas, added 5 more questions. Those questions target identification of the risks and opportunities of the relevant objectives (Upward & Jones, 2015).

IBM's Component Business Model (CBM)

Component Business Model looks at company-wide costs. It maps similar activities that are supported by human capital and technology assets which allows banks new insights and better allocation of the investments (IMB, 2006).

Fluidminds Business Model

Patrick Stähler developed this innovative methodology which was based on his design thinking at the University of St. Gallen (Stähler. 2001). This business model methodology explains a business model through four main building blocks: Value architecture, Value proposition, Revenue model and Team and Values (Stähler, 2011).

VARIM model

This model stands for value, adaptability, inimitability, rareness, and monetization. It helps engineers and managers to assess the potential success and profitability of the new business idea or innovation. The creator of this model, Allan Afuah argues that in order to fully utilize these characteristics is to create strong intellectual property for the firm's technologies. Another way is to capture in time first-mover advantages by pre-empting the competition (Afuah, 2014).

Business Model Navigator

One more business model that was developed at the Institute of Technology Management at the University of St. Gallen in Switzerland by Thomas Mollers and Camillo Visini. This model identifies what are the key drivers of business model success and at the same time encourage business model innovation (Gassmann, Frankenberger & Csik, 2014). The research was based on the analysis of 250 business models. This business model gives an answer to four central dimensions: Who, the What, the How and the Value (Gassmann, Frankenberger & Csik, 2014).

2.3.2   Flexible

Board of innovation business model kit

Used as a visual tool to explore different business models to support existing solution. It raises consciousness of stakeholders about the value exchange among them. It is consisted of 10 value-exchange elements used for visualization of the business model and 6 stakeholders that represent the organizations between that exchange happens (Board Of Innovation, 2016).

Causal Loop Diagram (CLD)

Causal loop diagrams are consisted of four elements: the variables, the links between them, the sings on the links and the sign of the loop. The aim is to form a sentence that identify the key variables, which designate causal relationship between key variables (Lannon, 2016).

2.4   Designing of Business Model

Business model is a system which is in the service of the company doing several functions. as an express value propositions of the firm, identification of the market and revenue generation mechanism. Business model identifies the value chain, the firm's position in it, cost structure, complementary product to produce the service or the product and defines a competitive strategy. Value of the firm is measured by financial metrics, without any social or environmental impacts (Chesbrough, 2010).

When designing a business model, elements that are presented in the Figure 5 should be determined (Teece, 2010).

Figure 5:Elements of business model design
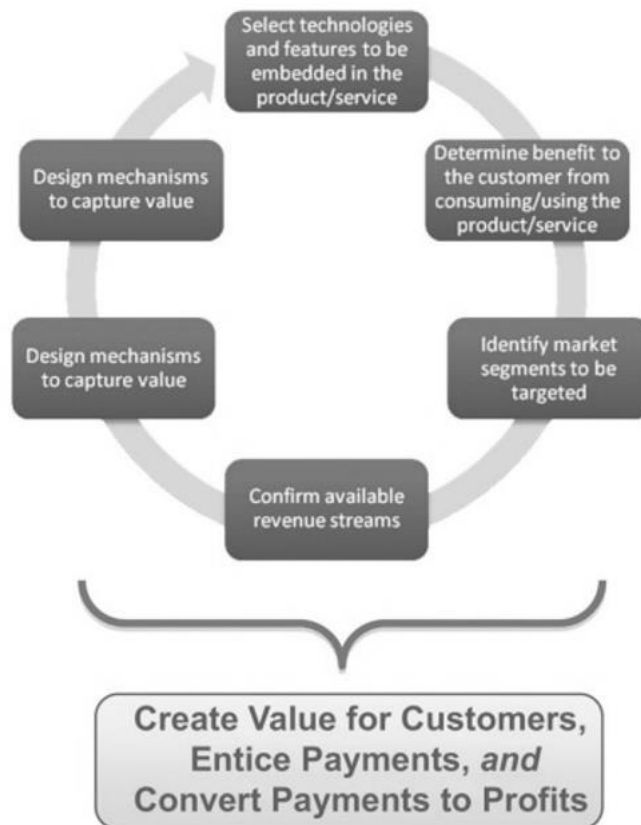
Source: Teece, (2010).

If the firm introduces an innovation in its business, it wants it to be profitable. But it does not necessarily always have to be that way. In order for it to be profitable, business model design should be strong and clear. Businesses need to understand what the customer needs are but also technological trajectories. If business model is hard to copy yet effective and efficient, it is more likely that it will produce the profit (Teece, 2010).

Business model is designed well if it articulates value proposition well which are tempting for customers, achieves convenient cost and risk structures. Well designed business model allows businesses significant value capture from their products and services they deliver.

Elements of business model design are (Teece, 2010):
- Selection of the technologies and features to be embedded in the product or service,
- Determination of the benefit to customer from consuming or using the product or the service,
- Identification of the market segments that will be targeted,
- Confirmation of the available revenue streams and
- Design mechanisms to capture value.

Every element is mutually connected and together they represent creating value for customers, decoy payments and convert those payments to profit.

The key element of a well business model design is identification or designing a mechanism to capture value from innovation. Designing that mechanism requires creativity, insight, good deal of customer, competitor and supplier information and intelligence (Teece, 2010). It could happen that the person who is designing business model is able to design innovative business model but not to articulate it fully. In that case, experiment will be done and learning along the way will be mandatory.

The right business model is hard to find right from the beginning. In majority of cases it will be replaced by new, improved version in order to follow market and technological trends. When selecting the right 'architecture' and pricing model for a firm, it is important to understand which choices are available and how to validate the speculations and projections about costs, customers, competitors, complements, distributors and suppliers.

It takes the knowledge of specific needs and fact inquiries, an understanding of customer needs but also expectations of the service/product, and how the competitor is positioned on the market and what would be their responses on the product the firm is offering/providing. When assumptions are proven, it is necessary to react fast and adjust accordingly. In her article for Harvard Business Review, Magretta (2002) stated that business models are 'variations on the generic value chain underlying all businesses'. This means, according to Magretta (2002), for a sustainable business model it is important to organize value chain and to know where to position within it.

In comparison to Magretta (2002), Zott and Amit (2008) believe that successful mapping of a business model is refered to two product market choices: cost leadership and differentiation (Zott & Amit, 2008).

2.5 Business Model Innovation

There are many definitions of the innovation. The term 'innovation' is defined as to "make changes in something established, especially by introducing new methods, ideas, or products" ("Innovation", n.d.). Business Model Innovation is redesigning the existing business model in a way it captures new market trends or it captures customer value in a more efficient way then the previous one. It can also attract more customers.

Business Model Innovation usually stems from existing products or services, technologies and markets with the mission of attracting more customers. Those changes tend to be hard to imitate and they usually represent a competitive advantage for the firm. What could be challenging is what business model innovation wreathe (Girotra & Nettesine, 2014).

A Chief Executive Officer (CEO) study which was cunducted in 2006 by IBM was consisted of interviews with 765 corporate and public sector leaders across the world. The results showed that the companies which were financially successful put more emphasis on business model innovation then those companies which underperdormed. Interesting quote was from one of the interviewed CEOs. He said that products and services could be copied but business model is what differentiate company from the rest (Giesen, Berman, Bell & Blitz, 2007).

That study helped IBM to create a framework dentified three main type of challenges of business model innovation, those are: Industry Model Innovation, Revenue Model Innovation and in Enterprise Model Innovation (Giesen, Berman, Bell & Blitz, 2007).

Industry Model Innovation

This type of business model innovation means that innovations are made in the "industry value chain". Good example of such a case is company Virgin. Virgin was first into music business and retail and then expanded to various industries such as airlines, railways, beverages, financial services, fitness, etc. By doing this, company only made their consumer management stronger. Industry value chain could also be achieved by redefining existing industries as Dell did by going directly to consumers rather than going through distributers. Third way of achieving innovation in the industry value chain involve the development of entirely new industries or industry segments. Example of such a case is company Google. This leverages unique assets.

Revenue Model Innovation

As its name states, this type of business model innovation involves innovating in the ways how company is generating revenues. It can either be by reconfiguring revenues or by establishing new pricing models. Sometimes it can be combination of both. Customer experience, their perception of a product or service is getting stronger which also leverage new technologies. Company that innovated by introducing new pricing model was Gillette. They did it with the strategy of reducing the price of razor in order to sell razor blades.

Enterprise Model Innovation

Enterprise model innovates in the enterprise structure and its part in new or already established value chains. This type of business model innovation reexamines organizational boundaries. It can be accomplished through integration, via specialization and via network plays (Giesen, Berman, Bell & Blitz, 2007).

However, implementation of the innovation is not an easy process. The use of frameworks is desirable due to hesitations of the companies to innovate if activities are not counted as core competence for the company. Existing frameworks allow managers to use existing frameworks to create innovative business models. Furthermore, it is more open and systematic and not internally focused and isolated. If understood and done properly, business model innovation could become the competitive advantage for the business (Girotra & Netessine, 2014).

2.5.1   Design thinking for Business Model Innovation

Design is not only the creation of products or services; it is the mechanism to transform the way companies create value. Highly applicable to systems, procedures, protocols and customer experiences (Naiman, 2019). Strategy professor at Darden School UVA and design thinking educator states that Design thinking for innovation release people's full creative energies, win their commitment and radically improve processes (Liedtka, 2018).

Design thinking is used to create alternatives and new opportunities. It is used for testing and learning and generating multiple prototypes. If businesses implemented design thinking as problem solver, that will allow decision makers to discover new aspects and perspectives of existing idea, discover wrong assumptions before executing an untested idea (Osterwalder & Pigneur, 2016).

Design process is a complex process consisted of five phases. These phases are: Discovery, interpretation, ideation, experimentation and evolution (Sniukas, 2015).

Figure 6: The five phases of the design process

Source: Sniukas (2015).

Discovery

The first phase of design thinking process is Discovery. This phase is used to brainstorm the ideas for new business model, and it is all about the ways to collect data. The best way to start doing so is to start with people who use the product or service, aka customers. It is important to understand their needs and frustrations regarding the product or service that the business is offering. Research should be conducted with satisfied, unsatisfied, potential and customers who do not buy the product or service at all. If it is possible, company should reach out to competitors' customers in order to realize what makes them satisfied with their particular product or service, why they choose competitor instead of your business. The first phase is getting to know customers, their expectations and pain points (Sniukas, 2015).

Interpretation

Phase two is about interpreting the gathered data from first phase. The goal of this phase of design thinking process is to interpret previously gathered data in a way to map unused business opportunities in the market. The reason why this phase is important is because the feedback is provided directly from customers. Collected data could clearly show what are the customers expectations and pain points. This phase ends when it is clear what are the opportunities to innovate with business model design (Sniukas, 2015).

Ideation

Ideation represent the third phase of design thinking process. In this phase, a company should develop ideas on how to take advantage of mapped opportunities from second phase. The creation of ideas highly depends on the depth of doing discovery phase. If done well, the creation of new ideas will be much easier, and they will be more likely succeed. Furthermore, learningfrom existing business model innovations and industries can naturally lead to generating more ideas (Sniukas, 2015).

Experimentation

Once the opportunity for innovation is mapped, the ideas were born and the ways on how to develop those ideas are established, they should be tested. Experimentation phase is focused on experiment how to make one idea work rather than which business model alternative works best because testing different business models requires a lot of resources and sometimes it is unnecessary. However, this phase does not have to be expensive. It just needs to validate the idea even if it requires just to ask existing or potential customers what they think about new idea. After validation, it is ready to start a business (Sniukas, 2015).

Evolution

The end phase of this process is the Evolution phase. Even if the idea that was created, validated and successfully implemented through previous phases, it is crucial to interpret the outcomes of it. This is the phase in which the reflection of the outcomes is done, and it can be seen as the phase that iterates a new cycle of these five phases. After the experiment was conducted, it was realized what worked well and what did not. Also new revelation about it were made and that was properly interpreted. After proper interpretation, business models could be fine-tuned or redesigned and then experiment again or the business can already replace existing one (Sniukas, 2015).

2.5.2   Exponential business model design

Effective business model is an important part of the path to success for one company. However, it requires innovative, planned and structured approach. Business models are designed towards achieving company goals through defining, creating and delivering value. In order to do so, it is of great significance to define and identify key partners, key resources, value propositions, customer relationships, channels, customer segments, revenue streams and cost structures. If defined well, this could create sustainable and effective business model long term. Traditional business models are designed with the aim of reducing cost by x percent or increasing revenues or profits by x percent.

Apart from traditional, exponential business models aim to make change which is 10 times greater or lesser than the current value. However, it is not an easy task. The task to redesign existing business model should involve thinking outside of the organization. New markets and ideas will appear from the outside, not only if striving for the changes within the organization. In order to build good exponential business model, it is helpful if company studies successful and profitable business models, not to imitate it but to learn from successful examples.

Examples of companies that implemented exponential business model were Slack, Uber, Amazon, Airbnb, etc. The way Airbnb increased their 10x value without having their own room was by implementing the technology in at least one building block, in this case value proposition. Airbnb owns a software platform to connect demand and supply in terms of people who are looking for accommodation and people who own one and want to make revenue out of it. Airbnb also provides new services, such as Airbnb Experiences and they made alternative value propositions using their existing technology. Doing this, they are reaching different kinds of customers (Pijl, 2018).

Nowadays, everything strives to be digital. This is the digital era and businesses should digitalize their existing product or services. Same is with business models. Digitalization

of business model opens the door of new possibilities and new markets, which automatically means approaching customers with better offers (Pijl, 2018).

When mangers need to craft the new ideas, risk and uncertainty is something they need to embrace. They should approach the situation with keen curiosity. First step towards transformation is the clear plan for transformation. After that, craft a business model as an ideation exercise, going in depth with every aspect. Special emphasis should be on revenue streams and if it is possible to add value in a way to create more channels to gain revenue. When it comes to exponential business models, the best way to unlock ten times greater value is with technology and talents. This brings to spotlight the most effective business model – The Business Model Canvas, which emphasize the core elements of a business model in nine building blocks. It is a tool for designing, describing and analyzing business models. Building blocks guide the making of a Business model (Pijl, 2018).

2.6   Canvas business model

Companies constantly try to be the leaders in their industry. They strive to be better than the competition. To do things first, they want to be perceived as the creators rather than followers. Various of seminars were organized around the topic of innovation, a lot of books were written, but what was most effective was the tool that was allows managers to outperform their competitors not only in financial segments but in areas that cut company's costs. That tool is Business Model Canvas, which was proposed by Alexander Osterwalder in 2008, a Swiss business theorist, author and consultant. This tool was intended to help businesses improve existing or develop new business models. Alexander is also known for his work on business modeling.

Business model Canvas contain nine building blocks. In general, Canvas allows businesses better insight into external and internal factors that have impact on business (Ebinum, 2016). Business model Canvas emphasize both types of factors, external and internal. External factors that affect how business is done are customers and internal depicts inside the organization. What connects them is the value they exchange between them, the value which is exchanged between the business and customers. That is value proposition (Ebinum, 2016).

Nine building blocks of Business Model Canvas determine the sustainable growth of the business. Therefore, they are ultimate determinate of the success that business model will make. Even if business model is successful and nine blocks are established well, it is important to innovate Canvas over time. It should be reestablished or upgraded in order to be sustainable. Even to keep the competitive advantage over disruptive businesses that arise (Dudin, Kutsuri, Fedorova, Dzusova & Namitulina, 2015).

2.6.1 Nine building blocks of Business Model Canvas

Business Model Canvas is consisted of nine building blocks. These building blocks establish business model and they make it ensure sustainable growth of the business. It structures an idea in a coherent way.

In Figure 7, nine building blocks are shown as:
- Customer Segments,
- Value Propositions,
- Channels,
- Customer Relationships,
- Revenue Streams,
- Key Resources,
- Key Partners,
- Key Activities
- Cost Structure.

Figure 7: Business Model Canvas

Source: Business Model Generation.

1. Customer Segments

Customer Segments define groups of customers and divide base of customers into groups depend on their demographics or interests or spending habits (Ebinum, 2016). Target customers are described in this segment. As that is the crucial component of value proposition, more attention should be dedicated to this segment (MaRS, 2012).

2. Value Proposition

In Business Model Canvas, everything is equally important, but value proposition could be one of the most important part of it. It links the left side – external factors with the right side – inside factors of the company. It is easier to complete Canvas if this part is defined well (MaRS, 2012). Value should be determined in the starting point of the business and should be nourished through the growing phase. In that way, the customers will connect to its value, they will recognize the importance of that product or service and the loyalty and base of customers will be high. Value proposition could be different for companies. It can either go from differentiating their value with quality or quantity from service, speed, delivery, customer satisfaction, etc. (Mulder, 2017).

3. Channels

Channels are about the connection between target customers and value proposition. These connections could be made through three different facets of making connections - communication, sales and logistics. Communication channel shows what are the channels used to communicate to potential customers. It can be through personal contact, interactive media or mass media. Or combination of all.

What is used depends highly of what is the purpose of the business. Nonetheless, which way of communication is used, the goal is to appoint potential customers to go through the stages of the buying process. While communication channel leads potential customers through the phases of buying process, the sales channel is used to agree on transaction. Both buyers and sellers agree on transaction. There are few sales channels. Those channels are intermediary - web, distributor, retail and agent. The goal is to find repeatable process that will bring the company a success.

That means that the sales' key characteristics are independent from one transaction to another, including transaction value, length of sales cycle, buying center and delivered product. If business achieve this independence it assures its growth and potential for expanding.

Logistics refer on the ways of delivery of the product or service to its customers. Some products could be delivered via web, others require more complex ways od delivery. Sometimes it may be necessary to have product solution manufactured or assembled close to the final customer (MaRS, 2012).

4. Customer Relationships

This building block defines the type of relationship the customers should have with you. Value proposition appoints which type of relationship it will be. Interaction with the customers could be automated, or 24/7 customer support, or web and social media presence. Depending on value proposition, type of business and costs the appropriate option is chosen (MaRS, 2012).

5. Revenue streams

Revenue streams on a basic level determine how business is done. It is not the same as price, but it is connected to it in a way that the price affects revenue stream. Looking at revenue streams, one can notice how the business is connected to its customers and what are the key activities (MaRS, 2012). If the revenue does not exist, the business does not exist in the long run. Revenue streams directly affect costs and should be organized very careful when designing a business model (Mulder, 2017).

6. Key Resources

When building value proposition, the key part are resources needed to build it. Whatever is outside of the control of the business and that can be leveraged to create and show value proposition are key resources. In this context, Intellectual Property (IP) is the key resource, technical expertise, human capital, financial and physical assets, key contracts and relationships (MaRS, 2012).

7. Key Partners

In this first building block, external partner/companies/suppliers/parties are listed (Ebinum, 2016). In sequence of making business model work, a business should establish the network of partners and suppliers as join ventures or strategic alliances. When starting the business, a company will be perceived as credible company if it has formed partnerships with such a respected company. This can help companies to be better than competition, because it uses the specialization and know-how of partnering companies (MaRS, 2012).

8. Key Activities

Key Activities are consisted of the most crucial activities the business need to overtake for its business model to work. Activities that the businesses need to overtake are including production, all business activities, quality check, networking and active problem solving. Key activities drive the loyalty of the customers. They should be formed in a careful way so they can create sustainable business model (Wallin, Chirumalla & Thompson, 2013).

9. Cost Structure

Cost structure is tightly connected to value proposition and its creation. Together with key activities and key resources value proposition is defined. According to Alex

Osterwalder, there are few ways of analyzing this building block. One of the ways is that business should decide if they are value driven business or cost driven business. Small businesses are usually cost driven in comparison to bigger businesses. If company wants to be perceived as the company with better quality products, or more efficient company, it will be focused on clear definition of value preposition, no matter what the costs are.

If that is the case, those businesses are value driven businesses and have completely different cost structure then those whose focus in on costs. In the end, no matter where the focus is, the cost structure should support business model (MaRS, 2012). Another way of analyzing this building block, according to Alex Osterwalder is to analyze the key components of cost structure. They might vary, depending of the business industry.

These components are more economic perspective. It includes comparison of variable and fixed costs, economies of scope and scale with the aim to achieve lower cash outflow (Wallin, Chirumalla & Thompson, 2013).

2.7   Business Models for Social Enterprise

Social Enterprises are businesses that impact its society. These businesses are not traditional businesses because these businesses aim to be profitable, but at the same time to affect and make positive social change. To have impact (Burkett, 2016). Social enterprises tackle social problems, create new employment opportunities and help the community (Burkett, 2016).

These types of enterprises organize itself around features such as having an impact aligned with public or community benefit. This impact can be achieved through economic, social and cultural or environmental mission. Social enterprises need to trade and derive a part of the income in order to complete its mission, but they reinvest the rest of the profit or surplus (Burkett, 2016).

Based on features they organize itself around, there are three types of social enterprises:

Type One: Employment focused Social Enterprises – This type of social enterprise directly affects vulnerable groups of people in a way they train, support and employ. Vulnerable groups of people could include people that experience some form of exclusion and disadvantages. An example of such an enterprise is a café that employ people who are homeless (Burkett, 2016).

*Type Two: Social Enterprises who provide services in direct response to a social or economic community need or achieve a particular social impact (*Burkett, 2016) – the example of such social enterprise is Light4Life. There is a need for the product but at the same time there is an impact on the society.

Type Three: Social Enterprises who generate income for charitable or impact purposes – an example of such an op shop whose purpose is to generate income so that it can support bigger charity or social purpose program (Burkett, 2016).

What is common to these types of social enterprises are their business models. All types have different business models whereas they appoint on the relationship between commercial and impact objectives (Burkett, 2016).

Two key points that can be understood with a business model of a social enterprise are (Burkett, 2016):
1. Understanding of the fundamentals of business concept;
2. To test and develop prototypes in order to check if the impact and business itself is doing well or aligning well in practice.

Benefits of social enterprises business models are the opportunity to circumvent failures and at the same time to increase the chances of new social enterprises to become sustainable in terms of their social impact but also financially (Burkett, 2016). Social enterprises also use Business Model Canvas, but these enterprises aim to identify and appoint to social impact they are trying to achieve not only on their business characteristics (Burkett, 2016).

It is not possible to be a social enterprise if social objectives are not met, if that is the case then it is only a regular business. If, on the other hand, the business model is not effective financially then there is no business. The most successful and unique businesses are the ones that achieve both (Burkett, 2016).

The term 'double-sided platform' is common in business modeling and this term is the most appropriate when explaining the difference between 'commerce' and 'impact'. When a business has two different customer groups, the aim in commercial business is to ease interaction between these two groups. In social enterprise, the aim is to ease connection that enable the business to be viable but at the same time to convey social impact (Burkett, 2016).

There is no complicated way in presenting this on Business model Canvas. The way to do it is to separate the impact side of the social enterprise and a commercial one. It is suggested to separate and visualize it. Consequently, it will be clear how two sides interact and what is the story between commerce and impact. Therefore, it is important to have comprehensible and consistent relationship between the two when telling the story behind a business model (Burkett, 2016).

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The importance of visualization of the impact and commerce on the Business Model Canvas is reflected in the opportunity to innovate, but also to see how they interact and support each other. It is clearly the most crucial part of enterprise design (Burkett, 2016).

Nine building blocks are the same as in a commercial business model, but in case of social enterprise it is required to add impact side in order to see how the commerce and impact interact. On Figure 8 is presented how Business Model Canvas of a social enterprise should look like (Burkett, 2016).

Figure 8: Business Model Canvas for Social Enterprise
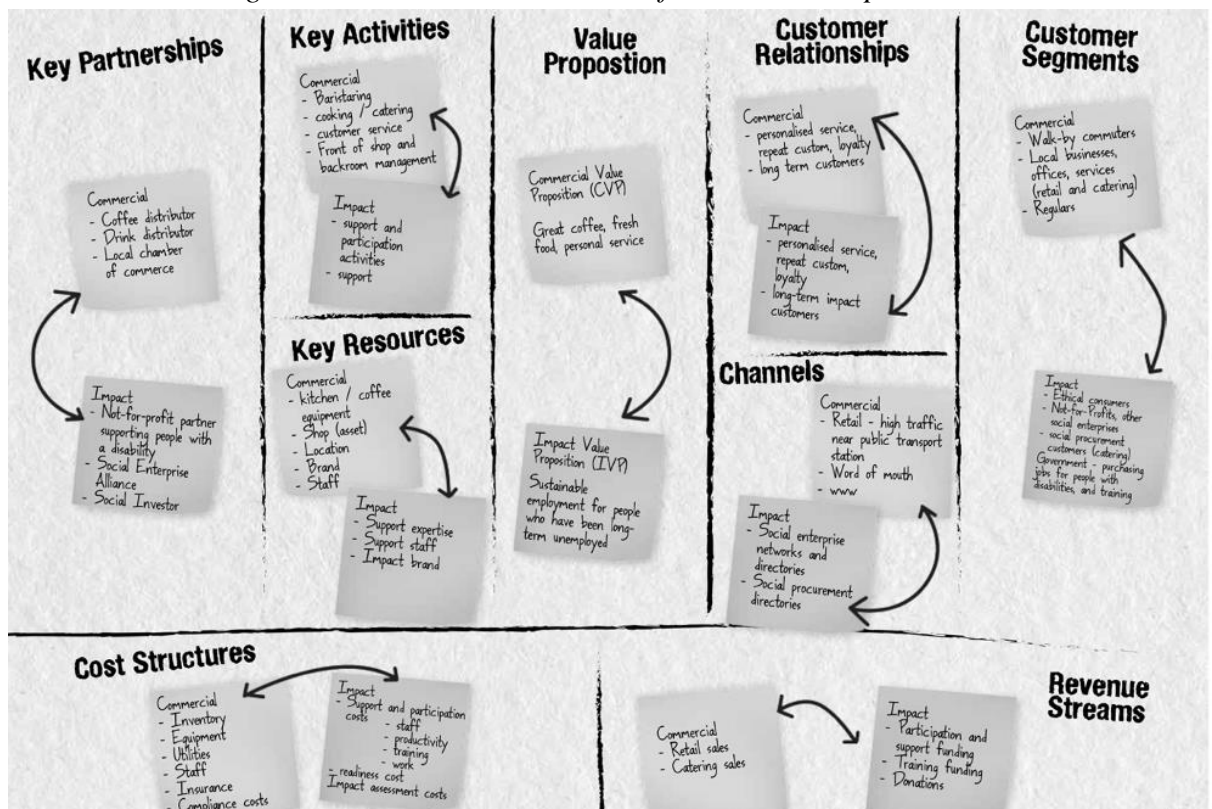
Source: Burkett (2016).

3 RESEARCH

3.1 Light4Life

Even if technology has advanced, road traffic safety is not satisfying. Participants in traffic do not feel safe as participants in traffic. With technology advancing, the possible distractions while being in traffic are advancing as well. There are many distractions that take drivers attention. It is important to understand that with new technologies that arrise it is possible to advance the safety on the road. Moreover, increasing safety directly affect and the same time reduce number of road traffic accidents, number of injured people (minor or severe injuries) and number of people who die in road traffic accidents. Indirectly, it will reduce costs for governments. Costs such as costs of imprisonment, costs of legal charges and costs of hospital treatment of all participants in an accident. Therefore, it is important to invest in research on how to advance road safety. There are possibilities to improve specific aspects of traffic.

More specifically, aspect of pedestrian safety. Usually accidents on crosswalks occur due to driver's inability to see pedestrian in time or the driver is not aware that there is a pedestrian crossing. In order to use the technology and to improve that particular situation where driver is not aware that someone is crossing the road, Light4Life is invented. There is not enough emphasize on pedestrian safety in society. That part of road traffic safety should be tackled and improved. This solution shall be installed near schools, Universities, public institutions, boulevards or places where visibility of pedestrian is low. It is clear where are these critical points for pedestrians in cities.

According to WHO's Global Status Report on Road Safety (2018), injuries caused by road traffic accidents are eight leading cause of death in the world for all age groups. Road traffic accidents are first leading cause of death among children ages 5-14 years old and young adults ages 15 to 29 years old. In the report (2018) is stated that more people die from tuberculosis, HIV/AIDS of diarrheal diseases. It was stated that there is a strong correlation between the income level in the countries the road accidents occurred and the risk of a road traffic death. Furthermore, the risk of road traffic death is three times higher in low-income countries than in high-income countries. The average rate of death per 100,000 population is 27.5 in low-income countries, while in high-income countries the average rate is 8.3 deaths per 100,000 population. (World Health Organization, 2018).

Between 2013 and 2016, high- and middle-income countries reduced the number of road traffic deaths while during the observing period low-income countries there were no reduction in the number of deaths. According to the same report WHO (2018), registred the global rate of road traffic death is 18.2 per 100,000 population. If observing the situation on continent base, the difference is also noticeable. The highest regional rates of road traffic deaths are in Africa. The rate is 26.6 deaths per 100,000 population. After

Africa is South-East Asia with the rate of 20.7 deaths per 100,000 population. The rate of 18 and 16.9 deaths per 100,000 population respectively is in Eastern Mediterranean and Western Pacific regions. The lowest regional rates are in the Americas and Europe, whereas the regional rates are of 15.6 and 9.3 deaths per 100,000 population respectively.

In Americas, Europe and Western Pacific reduction in the rates of deaths was noticeable since 2013. On Graph 1 are the rates of road traffic death per 100,000 population by World Health Organization regions in 2013 and 2016 (World Health Organization, 2018).

Graph 1: Rates of road traffic death per 100,000 population by World Health Organziation regions: 2013, 2016
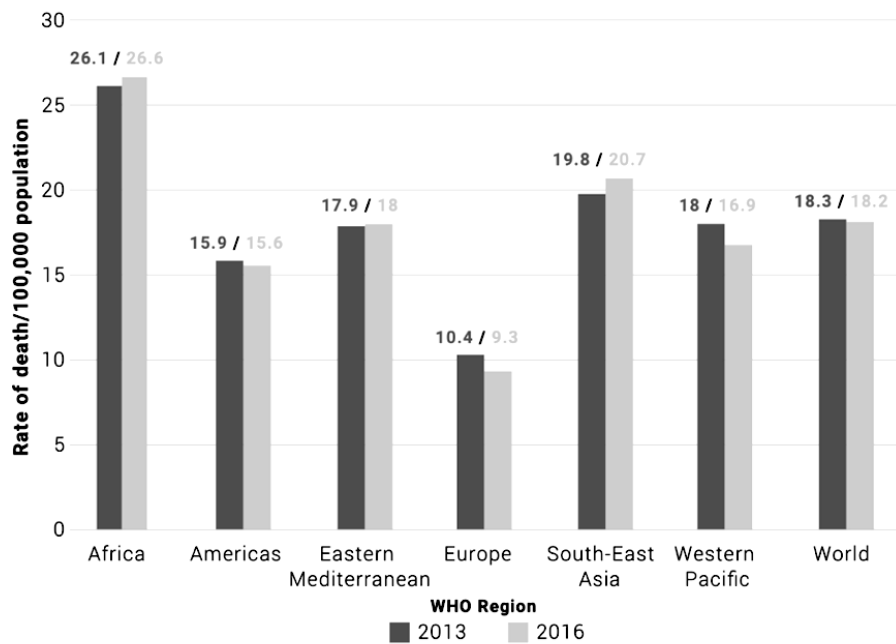
Source: World Health Organization (2018).

Road traffic accidents data include all participants in traffic. The number of deaths varies in the type of road users. Worrying fact is that vulnerable road users such as pedestrians, cyclicts and motorcyclicts are included in more than half of all global deaths (World Health Organization, 2018). These data show that the safety of these vulnerable group of road users is not on the satisfing level. Out of all deaths, pedestrians and cyclicts represent 26%, whereas motorcyclicts encompass 28%. Passengers in the car comprise 29%. In the report are included unidentified road users which take remaining 17% of all deaths.

Unidentified road users could be any of the group that are mentioned. Since the distribution of deaths among road user categories are based on the data which are reported by countries, it could be that some countries data are incomplete, or not available therefore the percentage of unidentified road users is high (World Health Organization,

2018). This suggests, that the overall percentage of deaths among vulnerable road users could be even higher.

Light4Life is a solution for advancing safety of pedestrians on pedestrian crossings without traffic light signalization. Light4Life solves the problem of frequent traffic accidents that occur on pedestrian crossings. This solution is consisted of three types of sensors and a set of LED lights. Sensors are placed on both sides of crosswalk, while LED lights are placed in front of pedestrian crossing.

Vision of this product is to increase drivers' caution when pedestrians are crossing the road. Goals are to reduce the number of accidents that occur on pedestrian crossings and to reduce number of injured or death pedestrians.

Short term goals are implementing Light4Life in two pedestrian crossings in Podgorica, Montenegro and applying for the patent in Montenegro. Long term goals are founding a company and expanding the implementation of the product in the territory of Montenegro, then expanding to other countries in the region. Users of the product all participants in traffic. Light4Life is consisted of two segments – Sense Node and Light Node. Sense node is consisted of sensors for movement detection: Passive Infrared Sensor (PIR) sensor, Radar sensor and Ultrasound sensor.

Every sensor is connected to central microcontroller unit that process data collected by sensors. Furthermore, microcontroller unit controls LED driver that is in charge of activation of LED lights which are placed in the road, in front of the pedestrian crossing. LED driver has an option to automatically regulate power with the regards to energy savings or efficiency and consumption optimization. There are two possible option of the solution Light4Life. It can be:

- Solar version or
- Baterry version.

Key advantage of these versions of the solution is to avoid connecting to public electricity network and having an eco-friendly product. Light Nodes (LED lights) connect to Sense Node whereas in this case it has double role – powering and controlling of LED lights. Depending on the needs or conditions on the field, communication between Sense Node and Light Node could be wired or wireless. Case for Sense Node and Light Node are backed by IP68 standard rating.

Apart from this Light Node, Sense Nodes are projected to accept wide range of LED lights specialized for cross walk lightning. This makes Light4Life solution scalable.

When pedestrian approaches the pedestrian crossing, their movement activates the sensors and they send signal to the main microcontroller unit to activate LED lights.

Microcontroller unit gives the order to LED lights to activate, which results in turning on the LED lights which are placed on crosswalk. This way, the driver is notified in time that someone is crossing the road and that he needs to adjust the speed.

In the report it is stated that 54% of people who lost their lives in road traffic accidents are pedestrians, cyclists or motorcyclists (WHO, 2018). Only in Montenegro, in five years (2013-2018), 32618 road accidents occurred, according to data provided by the Police Administration of Montenegro (Police Administration of Montenegro, 2019). Out of that total number, 10928 people suffered minor injuries, as well as 1577 pedestrians who suffered minor injuries. Severe injuries were registered with 2361 road traffic accident participants, while there were 537 pedestrians who suffered with severe injuries. During these five years, 59 pedestrians lost their lives in road traffic accidents that occurred on pedestrian crossings (Police Administration of Montenegro, 2019).

In the Appendix are the data provided by Police Administration of Montenegro.

3.2   Competition overview

Market size of road safety is valued for approximately 2.7 billion USD dollars in 2018 (Grand View Research, 2020). It is expected that until 2025 road safety market will reach 5.16 billion USD dollars (Zion Market Research, 2019). Road traffic accidents data presented in the WHO's Global Status Report on Road Safety (2018) are assurance that there are enormous possibilities to improve the safety of all participants in traffic. Not only that, but these are the factors that appoint that there is a lot of possibilities and space to enter the market of road safety.

When it comes to road safety in terms of pedestrian road safety there are companies that tackle this topic. Light4Life is among them. Competition in this part of road safety is medium strong. The argument for this is that there are multiple companies that solve the same problem, but the solutions differ. Direct competitors of Light4Life are companies: Lane Light, Tapco and APL Systems.

Lane Light is solving exactly the same problem as Light4Life does. Lane Light is company with headquarters in Canada. Their system offers the same features as Light4Life but is mainly concentrated on the United States (US) market. This is the main difference in comparison to Light4Life. Lane Light have a different positioning at the market. This company target US market while Light4Life aim to start from Europe and then to expand to other continents.

Tapco is family owned company that operates since 1956. This company is based in the United States. They implement innovative traffic and parking control solutions as well as services from proven experts. The same as Lane Light they operate in the US. Tapco

company offer a few solutions when it comes to pedestrian safety. Whereas one of the solutions is the same one as Light4Life offer. The main difference in comparison to Light4Life is the market they are serving. And the strategy they have. Light4Life wants to be leader in one type of product and want to specialize in making one type of smart pedestrian crossing while Tapco apart from smart pedestrian systems has various of services. Tapco Company is considered as the strongest competitor due to its long presence on the market and palette of products they are offering.

APL systems are the only competitor of the ones that are mentioned that operates outside of the US. APL systems company is situated in Italy. They have one type of smart pedestrian crossing which solve the same problem, but in a slightly different way. They are illuminating a pedestrian from above and from LED lightning sign. Light4Life illuminates pedestrian from in road LED studs. Light4Life system is easier to install.

The core competitive advantages of Light4Life are:
- Easiness of installation,
- Great knowledge of the operating market,
- Targeting different markets,
- Frequency counter and
- Specialized in producing one type of product.

3.3   Research approach and objectives

According to the topic of interest for this Master thesis, research required to use qualitative source of information and analysis. Qualitative source of information and analysis included conducting semi structured interviews with pedestrians or drivers on one side and business specialists from the field of interest on the other side. Business specialists varied from Police Administration officers, Secretariat for Traffic (Ministry of Traffic of Montenegro), Business Model specialist, Socially responsible company to Traffic Directory. The aim of the research was to validate the need for the product Light4Life and to collect relevant information in order to design a business model that will be effective and sustainable. Conducting the interviews, better insight into habits of both pedestrians and drivers were provided. Better understanding to what were their problems while driving or crossing the road. This helped to validate the idea and improve the end product.

Before conducting interviews with pedestrians, their habits were unknown. Habits such as how do they crossing the street - weather they cross it on pedestrian crossings, or they are doing it wherever they want to. It was not clear if they feel safe while crossing the road, what are the biggest challenges they are facing when crossing the road. Before conducting the interviews, it could only be assumed how severe the situation concerning pedestrians and cyclists was. The gathered information served to better understand the

needs of end users and to find better approach when pitching idea to potential customers. The aim of the research was to validate the need for a product Light4Life and to understand what people who will use it have to say in order to improve the product.

Two types of interviews were conducted. The second one, with business specialists involved different people from the field of research topic. Assumptions that were made on prior to conducting the both types of interviews, were set aside because the opinion of the interviewees was needed. It was crucial to get their honest and thrutful opinion on the research matter.

The interviews were conducted with six business specialists and 12 pedestrians. Interviews with business specialists lasted approximately 30 minutes per interview, on average. Interviews with pedestrians lasted seven minutes per pedestrian, on average. Interviews were resolved around the road traffic safety, with the focus on the safety of vulnerable road users such as pedestrians and cyclists. The focus of in-depth interviews was assessing the current state of road safety and how it can be improved as well as business model design and the importance of a business model for a startup.

Interview questions for pedestrians were all the same, while interview questions for business specialists were had variations. That depended on the profession of the interviewees. The in-depth interviews with business specialists had around 25 core questions (with sub questions, depending on who the interviewee was). The interviews that were conducted with pedestrians had 23 questions. Age range of all interview participants varied from 19 to 55. Almost every participant in both types of interview had different background and their answers were more interesting due to that. All participants were from Montenegro. Therefore, the interviews were conducted on Montenegrin language since it was more favorable by participants.

3.4 Interviews results with pedestrians and drivers

The purpose of these interviews was to find out what were the crossing habits of pedestrians, are they careful enough, how do they feel when crossing the road, what is their opinion of Light4Life solution and mapping of the potential critical points for pedestrians in the city Podgorica, capital of Montenegro. The interviews were conducted with 12 pedestrians, whereas five were males and seven of the interviewees were females. Majority of interviewees are also drivers, 90% of them.

Every interviewee had different background and their answers were diversified. Some of them had even interesting suggestion for Light4Life. Even though, the respondents had different backgrounds, overlapping in answers when it comes to identifying critical points for pedestrians or cyclists in our city was common. The detailed interview questions are attached in the Appendix.

Majority of respondents follow the rules and cross the street only on pedestrian crossings and if there is light signalization, they tend to follow it. Only 10% interviewed pedestrians and drivers rarely use a pedestrian crossing. If majority of people cross the street only on places where there is a pedestrian crossing, and the accidents are still occurring to a large extent could be a worrying sign.

When asked if they feel safe when they are crossing the road, six respondents stated that they do not feel safe, while other seven stated that they do. But with note that they only feel safe if drivers are driving slowly. Even though they feel safe when crossing the road, they have faced dangerous situations many times when they were crossing the street on pedestrian crossing, even 90% of them. Not only that but they know people who were hit by a car or who hit a pedestrian on pedestrian crossing. The most common answers in their experiences with "almost" situations on pedestrian crossing involved drivers' inability to notice them – pedestrians. Common problems were:

- Low visibility of the pedestrian when crossing the road,
- Fast driving
- Pedestrian crossings with multiple road tracks and situation when the driver in the first lane notice the pedestrian and stops, but the driver in another lane is not aware of that situation and do not see the pedestrian.

The situations they faced overlapped with answers on general question to describe the most dangerous situations that pedestrians are facing when crossing the road. Other answers to these situations are when crossing street in the night, crossing street where there is low frequency of pedestrians and drivers are used to it and then drive fast, low visibility of the pedestrian crossing, when pedestrian have to cross the street with multiple road tracks. Crossings with aisle are especially dangerous for pedestrians. This question was helpful because it validated the assumption on which problem Light4Life will solve effectively. Surprising moment when majority of respondents, 55% of them, stated that in general it is not safe to be a pedestrian in Podgorica but when asked if they are feeling safe when crossing the road, majority of the respondents, 55% of them, replied affirmatively.

It was noticeable that some respondents that have survived the accident or that were involved in an "almost" situation were deeply scared to walk in their city. And they were still angry on those drivers. Somehow, these situations leave a mark on person and this is where Light4Life can make impact as well. These people were so relieved when Light4Life was presented to them, that they even stated: "*Light4Life is amazing solution that will help pedestrians to feel safer and less nervous when crossing the road. But it will also help drivers to notice pedestrians when crossing the street*".

Every respondent strongly agreed that Light4Life should be implemented in city of Podgorica. By implementing Light4Life in Podgorica, the safety of pedestrians and cyclists can be improved was another question on which 100% of interviewed pedestrian and drivers answered affirmatively. All of them would also participate in crowdfunding campaign and would sign a petition if that would be needed. These interviews were extremely helpful because the possible critical points where the solution can be implemented in city of Podgorica were mapped with the help of interview respondents. When pilot project will be implemented, the locations for its implementation will be easier to identify.

According to some of the respondents, Light4Life solution have disadvantages such as price of the product, technical implementation, maintenance of the product. Respondents were worried if there will be technical difficulties when implementing a solution. Some stated that the solution do not have any disadvantages but only benefits for both citizens and municipalities.

When asked about the opinion on Light4Life, some answers were as followed - *"Very innovative solution"*. Other stated *"Useful solution because I feel secure that I will be noticed and visible when crossing the road."* or *"I like the idea so much. In my opinion the number of road accidents on pedestrian crossings can be reduced if this solution is implemented. And also, for improving safety and visibility of pedestrians I think it is a great idea"*. Another statement was *"The biggest problem for me when crossing the road is that I am not sure if the driver will see me, and Light4Life will help me with that. Not only that but it will especially be effective on locations where drivers are not used to stop due to low pedestrian frequency"*.

By doing these interviews, it can be concluded that pedestrians validate Light4Life and would like to have it implemented in Podgorica and they would feel more secured when crossing the road. The assumptions that were made prior to interview, proved to be right and this gives confidence boost that Light4Life is going in the right direction.

3.5   Interviews results with business specialists

As mentioned earlier, six in-depth interviews were conducted with business specialists. The purpose of these interviews was to validate the need of Light4Life, to understand what people from the field think about this product and to assess possible improvements of the solution. As well as what is the right way to design a business model, what are the important factors to consider when designing it, how to achieve sustainability of the business if the business has social impact. Interviewees had different background, therefore the interview questions differed.

Interview questions are in the Appendix.

Table 3: The summary of interviews that were conducted with business specialists

	Age	Gender	Occupation	Job position
Interview 1 [1]	32	Female	Private sector Telecommunication company	Business Analysts
Interview 2 [2]	25	Female	Private sector Telecommunication company	Business Analysts
Interview 3 [3]	38	Male	Civil servant Directorate for Road Traffic of Montenegro	Director
Interview 4 [4]	45	Male	Civil servant Police Administration of Montenegro	Deputy of the Chief of Security in the Police Administration of Montenegro
Interview 5 [5]	63	Male	Civil servant Secretariat for Traffic	Deputy Secretary of Transport
Interview 6 [6]	32	Male	Private sector Swiss Contact	Eco System Facilitator

Source: own source.

The first two people that the interviews were conducted with were from telecommunication company that operates in Montenegro – Telenor company [1&2]. Telenor is one of the companies that is perceived as socially responsible company. The aim of this interview was to understand why it is important to help local community even if company is already established and successful. Also, it was an opportunity to know if these types of businesses would be interested in investing in Light4Life. This information will be important for Customer Segment and Revenue stream when designing a business model for Light4Life.

The first respondent is business analyst in Telenor and is one of the juries that are selecting startup projects for Telenor Foundation. Telenor Foundation is founded in 2014, as a non-governmental organization with the aim of promoting and developing the concept of social responsibility in Montenegro. Telenor is continually investing in Montenegro by supporting the development of its social potential ("Telenor fondacija", 2018). Both interviewees strongly think that it is important for a company to be perceived as a socially responsible company.

As the first person stated, every company should strive to be useful to its local community. In this way, company will also benefit. Not in materialistic way but in human capital in terms of knowledge that will company get by investing in socially responsible startups and the support that will company receive from local community.

Other person stated that due to the fact that in Montenegro there is a few companies which are socially responsible companies, in her opinion it is important to motivate others by setting an example in investing social startups and help local community. Telenor company has a budget for investing into projects that are socially responsible. Independent body – Telenor Foundation is founded because of that and the Foundation have its own strategy, mission and vision.

Up until this year, Telenor Foundation organized competition that must be aligned with the strategy of the Foundation, the field of interest they will invest in for that year. Every project is directed to local community. This year, due to the situation with COVID-19 no competition was organized. Since Telenor company has many branch offices around Montenegro, it was interesting to get to know what the factors are to consider when making a decision on where to open a branch office.

Board of Directors is a decision-making body of Telenor company. There is a hirerachy in decision-making process. Firstly, managers and employees' meetings are held in order to adopt working plans for the upcoming period. Secondly, all the projects that were accepted on the first level meetings, need to get the approval of higher levels in the hierarchy, depending on the value of the projects. Usually, the decision whether the project will be implemented is made by the company owners.

Telenor has a go-to-market process, which covers the rules of what needs to be satisfied when implementing a product or project on the market. Every project goes through the processes of analysis and implementation and these phases need to pass certain decisions and procedures. As both of the interviewees stated, the whole process of decision making is well organized and has its own flow. Even when opening a branch office, there is a process of searching for a suitable location, cost-benefit analysis, and then the process that was previously described.

The most important part of the interview was when the questions about Light4Life was asked. When asked if Telenor would be interested in buying the information from Light4Life about the frequency of the place where solution is implemented with aim of opening a new branch office, first responded answered that Telenor currently is not thinking about the expansion in terms of new branch offices. However, if they would be opening new branch offices the frequency of the place where the solution Light4Life is implemented, would be an interesting qualitative data for them when they would be making the decision about the possible location for new branch office. This was very

interesting information because Light4Life can have another revenue stream in its business model.

When asked about what are the key factors that startup need to have in order to be interested to Telenor Foundation to invest in it, first respondent stated that it need to be aligned with the topic of the competition and the strategy of Telenor Foundation. Speaking of startup alone, it needs to have good idea and end product, well designed business model in order to be interesting for an investment.

When choosing the project for a Telenor Foundation, speaking from a point of a jury member, startup idea should be innovative and its solution should be applicable on the market, if the cost of making the product align with the budget that is intended for the investment. Other interviewee agreed and added that it is important that startup products are not easy copied. First respondent stated that business model is crucial for startups. Startups should often revise its business model depending on the product they are offering or changes and needs on the market. It can even be every few years, not necessarily months. Both of the interviewees stated that the knowledge about competition can be very helpful when designing a business model. Knowledge on the competition include information about the products, price, positioning on the market, focus group or market share.

When asked about what would be arguments for first investment in Light4Life, and what would be the arguments to consider for reinvestment in Light4Life, both interviewees think that for the first investment, the strongest argument would be the impact solution has on the society. Speaking of reinvestment, the strongest argument would be additional features that are developed in the meantime but more importantly the benefits that end users experienced during the first investment. This can be in terms of number of lives saved or number of accidents that were prevented or reduced. In short, the impact the solution had on the society.

Both of the respondent said that Light4Life is innovative, interesting and much needed solution for our city. They would like to have it implemented in our city.

The third [3] interview that was conducted as a part of qualitative master thesis research was done with the director of the Directorate for Road Traffic of Montenegro. The aim of this interview was to assess the need of the Light4Life and the current state of the road traffic safety in Montenegro. But also, to get to know how much money is intended by the State budget for Road Traffic Safety. It was important to acknowledge what are the possible obstacles Light4Life could face from the perspective of person who is expert in the field of Road Traffic and at the same time person who is in charge of making the decisions about road safety on the national level.

When asked does he feel safe when he crosses the street, he stated that the consciousness of the drivers about pedestrians was improved in last ten years. However, in his opinion the society still did not reach the phase in which it can state that we are completely safe when crossing the road. Most of that is due to the awareness of the drivers, and their perspective when It comes to pedestrians. The Directorate for Traffic of Montenegro receive complaints for road traffic safety but in terms of the infrastructure that have to be fixed or implemented on the roads across Montenegro. Also, they receive complaints on the drivers and their way of driving and passing on places they are not supposed to pass.

The concept of a smart city still did not come to life in Montenegro. But we are slowly going to that direction. Directorate for Road Traffic of Montenegro would be willing to help Light4Life with the support, if needed, with legal framework. He stated that the project should be presented to signaling engineers so that they can plan to project system Light4Life in its future projections. Hence, if it will be included in future projections it would be easier to get investment. Not only the project should be presented to signaling engineers but also to investors in this sense this would be Municipality.

The Directorate for Road Traffic of Montenegro could support project financially but only if that is planned in advance, so that the state budget can intend money for that investment for the next year. Very interesting statement about opinion on Light4Life was when the interviewee said, "Very interesting idea, definitely great idea, elegant solution for the real and obvious problem we are facing".

There was a word about cooperation model when doing a business with government. Cash flow of doing a business with government depend on the type of cooperation model. If type of cooperation model is an Agreement or sponsorship for a project, then the procedure is short. If, however, the cooperation model is the investment and if the Directorate for Road Traffic is the investor on the project, then the procedure is longer, and it goes through Public Procurement process. Furthermore, that process can last up to a very long time, but the Public Procurement process last for 40 days.

The possible disadvantage of Light4Life could be the price of the solution.

Fourth [4] respondent was from Police Administration of Montenegro. His job position is Assistant to the Chief of Security in the Police Administration. The aim of this interview was to get to know how Police is tracking the data about road traffic accidents, how many critical points in traffic are there in the country. The interview was consisted of 22 core questions.

In Police Administration there is a Department of Security of Road Traffic. This Department is in charge of taking care of the problems that involve all participants in traffic and that includes pedestrians as well. A very useful information was delivered by

this respondent when he stated that Traffic Administration is in charge of taking care of the complaints that are concerning signalization on the road. When Police Administration receive a complaint for road signalization, they forward it to Traffic Administration.

Police Administration could support project Light4Life as a suggestion to Municipality to implement this project but could not participate financially.

Even 235 pedestrians were fined in 2019 due to violating the rules obliged to them.

The key metrics for tracking the safety of pedestrians in a city are monthly reports from all local units on the number of accidents in their city and they compare the results with the same period in the years before. They track this more frequently during the tourist season. When road traffic accident happens, the report is made, and it is sent to Police Administration. The most important part of the interview was when the respondent stated that it is possible to track the progress which Light4Life made for the crossing road where it is implemented because Police department is tracking data about the exact locations where the accidents that involved pedestrians occurred. This input is important because we can have accurate data and accurate impact that Light4Life achieved with its solution. In respondent's opinion the pilot project phase should last up to one year in order to get valuable data and to see its impact. He believes that Light4Life should be implemented in Podgorica. First as a pilot project and if it is proved to be good, then to implement it in other cities across Montenegro. The safety of pedestrians or cyclists could be improved with the implementation of this project.

This implementation of the solution can help Police Administration to track the number of accidents in the city. They would even be interested to cooperate with Light4Life.

The fifth [5] interview was conducted with the Deputy Secretary of Transport. The aim of this interview was to assess if the Secretary of Transport would be interested in Light4Life project and to understand which type of partnership they would be interested in.

The concept of smart city has already begun to be implemented in our city. The pace of the implementation of this concept depend on people who are in charge, and who have expertise in the field of the concept of smart city. He expects that in five years we will have a significant part of this concept implemented in city of Podgorica. Secretariat for Traffic would be interested in implementing a smart city solution that improves the safety of pedestrians.

The most important answer was when the respondent stated that in his opinion, Municipality would rather choose an option of paying for the maintenance of the product for a few years and leave the implementation costs to Light4Life, then to pay the full price

of the product. But this is strictly his opinion and he added that that depend on the policy of the Municipality. However, that decision should be made directly by municipality.

Quality is the main factor to consider when deciding if this institution will invest in a project. "Quality is much more important than the price of the product" – was the answer of the respondent to the question about what the key factors are to consider apart from price when deciding for an investment in a project. The procedure for implementing a project depends on the size and complexity of the project. If the project is smaller and simpler, then the procedure for investing in project is shorter. Whereas the decision could be made by Secretariat for Traffic or the Major based on a suggestion of the Secretariat for Traffic. If, however, the size of the project is big and complex, then the decision is made by City Assembly. In his opinion the procedure for an investment for a project Light4Life, should be short and fast.

The Municipality of Podgorica and Secretariat for Traffic have already done some steps toward improving pedestrian safety. They tracked the frequency of the pedestrians on a few locations across the city. The tracking was done manually. The safety measure they implemented was a sign which shows the pedestrian crossing. The sign, however, is only connected to a power supply and just point that there is a pedestrian crossing. It is not a smart sign.

The respondent for sixth [6] interview was Eco system facilitator in Swiss Contact company. He has an experience in doing counseling to startups and he helps them achieve growth and success. He helps them with designing business model and executing them. This interview was fundamental due to the fact that it was conducted with person who has experience in designing business models. The aim of the interview was to get to know what the most important factors are when designing a business model and to apply them on Light4Life's business model.

He defined business model as a cross section of the current state of companies' goals, plans and strategy. That is a presentation of who we are, what are we doing and where are we striving to achieve. It is important to revise business model quarterly, on six months or one year. This depend on the size of the company. For newbie companies it should be changed more frequently, on quarterly basis. While, established companies who are present on the market for some time can do it every six months. Revising on a one-year basis is advised for big companies with well-established supplier and distributor channels and business. Business model should be changed or updated so it can be important for the exact moment company is in. The best example for that is the situation companies and their business models are facing with COVID-19. Many businesses had to adapt and change business models they had in the beginning on this year due to this unpredicted situation.

Business model do not directly create a value for a company. It creates a consciousness for the business on the current state of the company, what is business offering to its customers and where it should strive to be. Business model serve as a guide how to achieve what you want. He states that it is not rare nowadays that companies do not know what they want. Business model should be updated from time to time.

There are two most important factors to consider when developing a business model. The first one is the product. More concrete, if the product that will be offered on the market is solving the problem to its customers. The second factor is the willingness of its customers to pay for the solution of that problem. "Without these two factors it is not worthy to develop a business model in the first place". In Alexander Osterwalder, Business Model Canvas there are two most important parts that are important to consider when designing a business model. These are Customer segment and Value Proposition. Another important factor to consider when designing a business model is the team and timing in terms of the current market situation. Team that executes the idea should be diversified because what is the standard in one industry can be innovation in another. Timing is important because it is important to put the product on the market at the right time.

There are differences in designing a business model for social entrepreneurship and commercial business model. When designing a commercial business model, the main concern is not the impact on the society but rather the profit that will be made. When working on social businesses, impact is crucial part of social businesses apart from costs and price. Impact for social business is an added value to its core business.

The right way to assess the value proposition when designing a business model, on an example of a Light4Life is to get to know what is the value that our customers will receive if they will use my product. Light4Life has two groups: the end users and customers. The end users are pedestrians while customers are businesses or municipalities. For municipality or businesses, the best way to asses value proposition is to know how much money was saved if the Light4Life is implemented. Not only money but also in terms of bad publicity. His advice when presenting the project to municipality was to quantify the data about the costs of one road traffic accidents for municipality. And to quantify the impact that will be made. Value proposition for pedestrians is measured by how much they feel safer since Light4Life is implemented and even better idea would be to ask parents how much safer they feel to let their kid walk to school since the Light4Life is implemented.

Business model does not directly create a value for a company. It creates a consciousness for the business on the current state of the company, what is business offering to its customers and where it should strive to be. Business model serve as a guide how to

achieve what you want. He states that it is not rare nowadays that companies do not know what they want.

The knowledge of the competition must affect design of a business model. But it is not crucial. More important is to focus on Customer segment. From customers it should be known why they are not satisfied or what is missing in the product their competitors are offering. Under competition, it is not only meant on companies that solve the exact same thing as your company, but on all solutions that are connected to the nature of the problem we are solving.

As an alternative for doing business with government would be a bigger company which want to be socially responsible, crowdfunding and local companies. According to him, the best opportunity is that big company invest in Light4Life where they involve local community in order to map the potential pedestrian crossing where Light4Life will be implemented. Another opportunity is combination of crowdfunding and investment from big company. This would be done in a way where company is investing the same amount that was collected by crowdfunding.

He strongly believes that Light4Life should have a primary type of business model should be business to government. It should strive to make a change in the policies whereas Light4Life should become a standard in how pedestrian crossing will look like.

His opinion is that Light4Life should be tested in the city.

3.6   Summary of the interviews with pedestrians

Interviews were extremely helpful for future development of the project. Every input, suggestion and answer that is gathered from the interviews with pedestrians, drivers and business specialist resulted in new insights about what should be done better regarding the product. Also, that proved that the need for the product is high. Beside product improvements and the validation of the necessity of the solution, with the help of interview respondents top 10 locations in the city of Podgorica for implementation of the solution Light4Life were mapped.

Majority of pedestrians were both drivers and pedestrians, whereas they appointed what are the most dangerous situations for pedestrians and from drivers' point of view what are difficulties in noticing the pedestrians. They all agreed that the most dangerous situation for pedestrians is when he/she have to cross the road where there are multiple road tracks there is no light signalization. According to them, another very dangerous situation is when the driver in the nearest road track notices the pedestrian and stops, but the driver in the second lane is not aware of that situation and he continues driving.

Every interview participant agreed that the Light4Life solution is useful, that it should be implemented in the city of Podgorica and that their feeling of safety while crossing the road or while driving is much higher when Light4Life is implemented. Interviewed pedestrians perceive themselves as pedestrians with good pedestrian habits, 90% of interviewed participants in traffic always cross street only on places where there is a pedestrian cross and they always follow traffic signalization. The same percentage of participants in traffic faced dangerous situation while crossing the road at least once or they were with a person who faced dangerous situation while crossing the road.

One friend was hit by a car on a crossing road and the other interviewee was almost hit by a car. It was noticeable that this interviewee was still under trauma when telling the story. She stated *"I was almost hit by a car on the pedestrian crossing… I still have trauma when I talk about it. I don't know how I managed to jump aside, because If I did not do that, I am sure I would not survive it. Even the workers from surrounding shops were terrified. They thought that I was hit by a car. The car passed at high speed and did not see me crossing the road"*. General state of road safety should be improved. Majority of pedestrians think that it is not safe to be a pedestrian in Podgorica.

Every respondent would sign the petition for implementation of Light4Life in the city of Podgorica if there would be such petition. They were all in agreement also in terms of participation in crowdfunding campaign for Light4Life pilot project if there would be such a campaign.

Common answers on questions about the possible disadvantages or threats that Light4Life could have or face, interview respondents stated that the price could be the main concern, or the technical implementation. Most of the respondents stated that there are no disadvantages but only benefits for everyone.

3.7 Impact Business Model Canvas – Light4Life

As the qualitative part of the research is done, the findings helped to design a Business Model Canvas for a startup Light4Life. Firstly, in bullet points the findings from interviews will be presented on each Canvas business model. Afterwards, every element of Business Model Canvas will be explained in depth.

3.7.1 Customer Segments

Solution Light4Life create value for two types of customers. Therefore, there are two most important customers that can benefit from Light4Life. This solution is specific, so the end users are not its customers. Research that was conducted only confirmed that the customers are not the end users. Rather the customers are the buyers of a solution.

Since there are two types of customers for a solution Light4Life, this startup should have two types of business model. Primary type of business model is Business to Government (B2G) and secondary type of business model is Business to Business (B2B) type of business model.

It can be concluded that primary customers in Customer Segment of Impact Business Model Canvas are Municipalities. Secondary customers are non-governmental organizations (NGOs), socially responsible companies and individual donors. However, the impact of every customer segment is the same. Their impact on society is valuable. It results in increasing safety of all participants in traffic, opportunity to save at least one life, reducing the number of traffic accidents that occur on crosswalks.

The end users in this case would be the citizens. The customers would be Municipalities, Socially responsible companies, non-governmental organizations or individual donors. In order to attract customers, Light4Life would first implement pilot project on the critical locations in a particular city and then use it as a success story to attract new customers. Either Municipalities or socially responsible companies or NGOs.

Table 4: Impact Business Model Cavas for Light4Life

KEY PARTNERS	KEY ACTIVITIES	SOCIAL VALUE PROPOSITION	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
Commercial: - Companies that produce LED lights - Companies that produce sensors (all types of sensors we need) - Developers that will develop microcontroller unit - Municipalities - Socially responsible Companies - Individual donors - Investors - Transport companies (for equipment) **Impact:** - Socially responsible investor - Social Enterprise Alliance	**Commercial:** - Pilot project - An agreement with Municipalities - Technology Development - An agreement with suppliers of sensors and LED road studs - Transportation of the equipment - Human capital - Implementation of the solution **Impact:** - Support and participation activities - Reliable solution - Efficient cooperation	**Commercial:** - Eco friendly solution to effectively solve the problem of road traffic accidents - Product only works when and if it is necessary - Frequency counter (both car and pedestrian counter) - Simple solution with simple implementation - Market knowledge - Targeting the most critical locations in the city for pedestrians **Impact:** - Local economic development - Revitalizing and supporting local economy - Employment - Sustainable and meaningful jobs - Increasing safety of all participants in traffic - Reducing the number of road traffic accidents that occur on pedestrian crossings	**Commercial:** - Long term customers - Repeated customers, loyalty **Impact:** - Long term customers - Repeated customers, loyalty	**Commercial:** - Municipalities, - Non-governmental organizations, - Socially responsible companies, - Individual donators **Impact:** - First on Balkan to implement such solution - Socially responsible - Increased safety among all participants in traffic - 1 saved life - Reducing number of traffic accidents
	KEY RESOURCES **Commercial:** - Sensors (3 types) - LED road studs - Machines to implement it in the road - Truck to transport the equipment if not then company that will be in charge of transport - Employees - Office **Impact:** - Support expertise - Support staff - Impact safety of all participants in traffic		**CHANNELS** **Commercial:** - Offline and online media - Direct reach - Email **Impact:** - Social enterprise networks and directories	

COST STRUCTURE	REVENUE STREAMS
Commercial: - Marketing, - Human Capital - ICT Infrastructure - Maintenance - Equipment - Implementation - Rent - Electricity - Transport - Inventory - Utilities - Insurance - Salaries - Tax - Training **Impact:** - Support employees - Stuff training - Increase the safety on locations in cities where the solution is implemented - Efficient and reliable solution - Impact assessment costs - Work readiness costs (licenses, permits)	**Commercial:** - Solution sales - Maintenance fee - Data sales about frequency of the place where the solution is implemented **Impact:** - Participation and support funding - Donations

Source: own source

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3.7.2   Social Value Proposition

If social value proposition is observed as "Why?" customers should choose Light4Life over its competitors, or "Why?" Light4Life should be chosen, what is its unique advantage and offer to its customers then the research that was conducted helped to shape the answer to these questions.

Light4Life is eco-friendly solution. In order to take care of planet Earth and place we live at, Light4Life was imagined to be eco-friendly solution that would use solar road studs and there would not be any need for power supply. Although there will be classic version of the solution (with regular power supply) – wired version, important part is that the version of the solution that will be available is eco-friendly version. In this sense, the awareness about environment we live in will be affected and hopefully raised by implementing such a solution.

The impact of this version of the solution will be tremendous for every end user of Light4Life, but more importantly for customers. In this case those are Municipalities or socially responsible companies.

Important value proposition is that the solution will only work when or if it is necessary which means that there will be no need to stop the traffic if there is no detected pedestrian, cyclist or even animal. Other solutions on the market stop the traffic so pedestrians could cross the road. Conducting the interviews, both pedestrian and drivers confirmed that this is the effective solution for increasing the safety and visibility of pedestrians. In order to measure the impact of implemented solution, one of the Key Performance Indicators (KPI) will be the frequency of the particular crossing road on which the solution is implemented in. Frequency in terms of number of cars and pedestrians that crossed the road on that particular location where the solution is implemented on.

With these data Light4Life can know If the place on which the solution is implemented is the right place. The data can be helpful also to Police Administration to track the number of cars or pedestrians that pass this particular location. Apart from that, the data could be used as a Revenue stream, which will be mentioned later in the Revenue Streams part of Impact Business Model Canvas.

Also, one of the KPIs will be the Police Department's data about the accidents that occurred on those particular locations.

After qualitative part of the research – interviews – it was clear that not only interviewed pedestrians and drivers but also business specialists think that Light4Life is a simple solution and that fact only adds to its competitive advantage.

Key social value propositions for Light4Life among others are market knowledge and targeting effectively critical points for pedestrians. There is no similar solution to Light4Life present in Balkan region. This offers possibility to expand quickly and attract many customers among Balkan countries but also gives competitive advantage in terms of market knowledge of this region. By the time new firms appear at the market, Light4Life will have know-how and be will be dominant on Balkan region market. And by the time, look to expand on other European countries.

With the help of qualitative research, Light4Life has already mapped critical locations in the Podgorica and Belgrade where Light4Life could be implemented.

3.7.3   Channels

Solution itself is innovative but not revolutionary. Approach to promoting Light4Life's value should be in compliance with today's trends and with alignment with its customers views. Even if startup Light4Life have assembled solution, there is no point if there are no customers willing to pay for this solution.

In order to reach customers, Light4Life is going to use media, as well as social media. Although Light4Life do not have commercial business model, it is important to use social media platforms in order to promote the solution and its impact on society. Consequently, we will affect our customers (Municipalities, socially responsible businesses) to become aware of Light4Life's solution and what it does.

Using social media and media in general, Light4Life will make unconsciousness pressure on its customers in a way that it will show the need for the product and the impact this product can make on the society. This will be achieved by creating a content that will show there is a need for the product and that society wants this solution implemented in its city.

Besides reaching its customers indirectly, direct reach to customers will be crucial to make initial customers. The plan is to contact potential Municipalities or socially responsible companies through direct acquaintances and propose a meeting. Another way is through email campaigns. Throughout the campaign of attracting and reaching to customers, the impact of this solution will be in focus. It is important for customers to understand that even if the solution itself will be pricy or expensive, it will be worth it because of its impact.

Lastly, in order to reach international customers Light4Life will use Google AdWords to position better its website on internet search engines. Keywords that are going to be used are words such as "pedestrian safety", "crossing road", "road traffic safety", etc... Having

a good search engine optimization will attract new customers and help Light4Life to be visible not only on social media platforms, but to a wider audience.

3.7.4 Customer Relationships

Customer relationship in B2G or B2B type of business model differ from business to customer (B2C) type of business model. Light4Life strive to have long term relationship with its customers based on loyalty and good customer care. Aim is to have repeated customers which means that the Municipality or socially responsible company will buy a solution more than once. However, this will be achieved through a solution that once implemented, will work efficiently and will make good results once implemented.

In case that sensors or LED road studs get broken it will be important to act promptly and replace broken parts. Customers, but also end users will have the possibility to report any problem with the solution that was implemented in their city either through the website of Light4Life or on social media. If end users are happy or satisfied, most likely customers will be as well.

3.7.5 Key Activities

So as to achieve its impact and purpose, Light4Life have to define activities and tasks to be that have to be fulfilled. Qualitative research was helpful to define those key activities. Key activities may be crucial to increase the chances of success of this startup.

First activity that Light4Life should do is to find suppliers for sensors and LED road studs. It can be the same company for both parts of the solution or it can be two different companies. Anyhow, they have to establish an agreement.

Secondly, Light4Life have to resolve the question of the transportation of the equipment. Will it be outsourced or not? In any case, an agreement will have to be made. Light4Life will have to find experienced company that will be in charge of implementing the solution once implemented.

Once these are communicated and signed, key activity to reaching its business purpose would be assembling the solution. Afterwards, implementation of the pilot project will be the crucial step. Pilot project will serve as a "proof of concept" and its success story will attract other customers. Aside that, but it will be helpful to a startup itself to improve product. Pilot project will serve as a testing phase of the startup.

Toward implementing a pilot project, it will be essential to establish an agreement with Municipality and resolve any administration issues in terms of the permissions. Even if the customer will be socially responsible company, Light4Life has to have a good

cooperation with Municipality due to the administration that will have to be done prior to implementing a solution in the road.

3.7.6 Key Resources

Key activities are not possible to put into action if the key resources are not available. These two elements of Impact Canvas are interconnected.

Light4Life has to make sure its product is fully working. This solution is consisted of three types of sensors and LED road studs. Three types of sensors serve to reduce the error possibility in detecting a pedestrian or cyclists. These are ultimately two most important resources of Light4Life.

Indispensable part of the key resources are employees who will actually assemble the parts once they arrive to Light4Life offices. Experienced employees who will also be in charge of the Technology and Product Development. Of course, in order to deliver the wanted results, the office will have to be provided.

If this startup decide that they will be in charge of the transport of ordered equipment, then the truck will be needed. If not, then the important resource will be the company that is doing the shipping.

Along with the decision about the transportation of the equipment, the decision for about which company will implement the solution in the road should be made.

3.7.7 Key Partners

The current situation with COVID-19 and global pandemic has changed the pace of how things are done. Everyone is facing similar problems. The ones who will succeed are the ones who will adapt the fastest to these changes.

With this in mind, Light4Life will have to expand its list of partners. Not only that the Governments, in this case Municipalities are cutting its budgets, but companies are doing the same. Light4Life is currently looking for an investor. The business specialists in interviews that were conducted advised that it would be good if Light4Life have external investor if that is possible.

Up until now, Light4Life had two potential investors. If these negotiations are successful, then there will not be need for Municipality interference. Only in terms of administration. Both investors are companies from Slovenia.

However, if by any case, Light4Life do not manage to find an investor, this startup can partner with Municipalities or socially responsible companies in order to fulfil its business purpose. It is interesting to emphasize that Municipality of Podgorica, the capital of Montenegro, showed an interest in this startup. This happened upon COVID-19 news in Montenegro and lockdown that ceded, which is March this year.

Companies that produce sensors and LED road studs are desirable partners to Light4Life. Not only desirable but essential. Reliable partners that will supply its products in time. Companies that are working in the sector of road traffic safety will be contacted and agreement will be made. Every part of the product will be negotiated. From the product itself, its functionalities, warranty, terms of the cooperation to transport of the equipment and factory errors of the product. It can be concluded, that every scenario will be negotiated or investigated prior to choosing the right partner.

Integral part will be to find a partner for transport of the equipment. Two companies for shipping in Montenegro are contacted, but there is no official agreement yet. If Light4Life receive an investment and if the cost-benefit analysis show that it is better to have its own truck so that the equipment will be done in-house, then that will be the case.

Another possibility to find funding for this project is individual donors gift this solution to its city or any other city. This possibility is less likely to happen, but it is not impossible.

3.7.8   Revenue streams

Business model of Light4Life as it is will draw revenues from its sales of the solution, Maintenance fee and the sales of the data about the frequency of the crosswalk in which the solution is implemented. The frequency in terms of number of cars and pedestrians that passed that crosswalk or that crossed the street.

In both types of the interviews that were conducted as a part of qualitative research, so with pedestrians, drivers and business specialists a worry that Municipalities will not be ready to pay for the full price of the product was expressed. Furthermore, a solution was made.

Due to that concern, Light4Life will provide two options to Municipalities. They will either:
-   Buy a solution and get the maintenance for free or
-   Pay maintenance fee for 10 years on a monthly basis.

In the first option, the initial costs for Municipalities are higher. If it is observed long term, it is cheaper. During the interviews, when second option was mentioned, positive

and encouraging answers were given. Business specialists stated that this can be better accepted option for Municipality.

This is encouraging because if Municipality choose second option whereas implementation costs are left to Light4Life, but they agree to pay maintenance fee on a monthly basis for ten years, Light4Life wins. And the revenues from choosing the second option are very high.

The frequency of cars and pedestrians will be tracked, and these data will be sold to different companies for their Development possibilities. This revenue stream is expected to generate less money than the first two but is an additional form of revenue.

3.7.9   Cost structure

This startup will conduct business on the principle of the order by order. Once the order is placed and the agreement is sign, Light4Life will order the necessary equipment form its suppliers, arrange the transportation and assemble the solution. This way, the inventory costs will be lower.

Among costs that have to be included are costs for rent of the offices that Light4Life will use for its purpose of doing business. Rent costs are accompanied by utility costs. People or employees that will work on the implementation of the solution but also on the development of the business have to have salaries and insurance.

Since one of the channels and maybe critical channel to raise awareness about the importance of this solution will be social media then marketing will represent essential cost. Budget for this part will need to be accounted. It is assumed that this will accumulate immense part of the costs.

If the Municipality choose an option to implement the whole solution immediately instead of option to leave the implementation costs to Light4Life and pay maintenance fee for ten years, then the maintenance costs of the implemented solution will increase. This amount of these costs depends on the option that Municipality choose.

What is not dependent on the options they choose are the costs of equipment or costs of implementing the solution in the road.

The costs of engagement of the external company for shipping of the necessary equipment need to be taken into consideration. If Light4Life, chooses to buy the truck and do it in-house, then the costs of this truck will arise.

More or less, but the employees will have to have trainings for the work they do. These are the costs that will arise in future, but that need to be included in a business model.

Last but not the least important are the costs of tax and the costs of administration in terms of permits that are required for business alone. These costs account for permits that necessary to implement solution in the road, permits to work, permits to employ, etc.

3.8 Limitations of developing a business model with Canvas methodology

Like every human is different, the same applies for business models. Even though there are many useful tools to build a business model, most of them are only focused on the value it brings for customers. The same applies for Canvas business model (Widmer, 2016).

Rodrigues and Lopes (2018) it is argued that busines model canvas is limited in three ways. The first way it is limited and not so dynamic is because Business Model Canvas is based on theory. These theories include positioning (Porter, 1980) or resource-based approach (Barney & Hesterly, 2012). The limitation is that these theories are not able to show the dynamic perspectives in a way it could not tackle unstable markets (Rodrigues & Garcia Lopes, 2018). Secondly, this tool is not consisted of theoretical characteristics of dynamic capabilities therefore its static foundations are revealed (Rodrigues & Garcia Lopes, 2018).

Business Model Canvas suggests that it is important to monitor and evaluate how the value is captured, but the way it is possible to do it – through two indicators – is sufficient. Revenue streams and cost structure are not sufficient indicators on how well business is doing or how well the value is captured. Business Model Canvas is missing indicators for individual performance, not only combined results (Rodrigues & Garcia Lopes, 2018).

Beside these limitations, one is connected with value proposition. Business Model Canvas do not include business problems such as the cases of liquidity problems. It is suggested that Business Model Canvas should be used as a tool for a start of business design, rather than all-encompassing tool (Coes, 2014).

It can be concluded that Business Model Canvas is a convenient tool that can be helpful for starting a business modulation. Competitors, liquidity, dynamic, social trends are the things which are excluded and not covered with this tool. It is important that Business Model Canvas is updated consistently as business evolve. One thing is sure, and that is that it could not be a replacement for a complete business model planning – just to be one piece of the puzzle.

Living in the global pandemic, when everything is uncertain, two things are sure: the economy will fall, but it will also have to rise again. Many businesses were lost due to this global pandemic. Global economic crisis is approaching. Many more businesses will be lost. Economy will need new businesses that solve problems. It will need both commercial business and social enterprises that will tackle social problems that were emphasized even more by this crisis. Once again, business with technical innovations will drive growth and recovery of the economy. Now, more than ever, it will be crucial how new businesses enter seriously shaken markets.

Furthermore, it will be important to devote extra time in designing a proper business model for newly established firms or to adapt existing business model to the changes on the market. Even without a global pandemic and economic crisis, many businesses neglect the need to update constantly their business model. Constant adaptation helps businesses to notice the opportunities that arise on the market but as well to notice in time possible obstacles and adapt to them or overcome them easier.

Business Model Canvas should be updated on a regular basis. That way, it will drive the innovation in the way how the business is done. Another benefit to regularly updating business model is could help business to gain competitive advantage over competitors. Innovative business models are design by creating and following the trends. The update of the business model shall follow firms' growth and expansion. At the same time, the firm should be aware of business models' limitations.

The building blocks of Business model Canvas are directly connected to the type of the research that is conducted. Therefore, a researcher should structure its qualitative or quantitative research to get concise and quality elements of Business Model Canvas. When the business model is designed, it will be important to test it and to make a prototype of the product or a service and test it. Consequently, businesses will better understand peoples' decision-making process. These are the main takeaways from this Master thesis.

CONCLUSION

In order to collect relevant information for research purposes of this master's thesis, qualitative research was conducted. This research required careful consideration on how and with whom to conduct in-depth interviews. Interviews were conducted with two groups. First group are business specialists or experts from the field of interest, while the second group are the actual end users of the solution Light4Life – pedestrians and drivers. This research enabled better insight into how decision makers in public sector make decisions for investments, what are the relevant factors but also to understand how socially responsible companies consider investments into startups. It also helped to understand what the habits of pedestrians are when crossing the road and to assess overall

state of road safety of pedestrians from their point of view, but also from drivers' point of view. The ultimate goal was to build cost-effective business model but at the same time sustainable business model.

Findings from qualitative research discovered there is a possibility for Light4Life to enter the market. Even though pedestrians have good habits as pedestrians, which means that they follow the light signalization (if there is any) and they cross the street only on marked zebra crossings, they all stated that they think that there would be good to have some kind of solution that will allow them to be more visible to drivers when crossing the road. All of them agreed that solution such as Light4Life should be implemented in their city. All of them would sign a petition if needed to implement it in the city and also would financially contribute to crowdfunding of this solution.

An overall impression is that both types of interview respondents liked Light4Life and believed that it can partner with Municipality or socially responsible company in order to implement this solution in their city. The proof that they understood the core value proposition and impact of Light4Life is that all of them proposed the best locations in city to implement Light4Life. The main concern of majority of respondents were the price of the product. Furthermore, pricing and prototyping are future phases of project Light4Life.

There is no any similar product installed in Montenegro. Therefore, there were no similar business models to the one Light4Life has. When the internet search was conducted, similar companies that operate in the US or in Italy were found, but their business model is not found. The main difference between Light4Life and existing companies or solutions is in the way of illuminating the pedestrian and the market the companies are operating in. Light4Life strive to be specialized in one type of product whereas other companies have different types of solutions apart from pedestrian safety solutions.

Extensive research was directed to help a researcher to learn separation between theory and practice of designing a business model. Theory helped to learn what is the difference between a commercial business model and a business model for social enterprise. There are different business models apart from the one which is the most common – Business Model Canvas. Other business models are IBM's model, VARIM model, casual look diagram model, etc.

All of them help shape the model by which business will operate, but neither of them could ultimately enable a business to reach its goals if the business does not adjust or readjust in order to respond to the market in broader sense. Businesses should always be aware of the limitations any tool for designing a business model may have. In this sense, there is no difference with Business Model Canvas – tool that was used when designing a business model for Light4Life.

Business Model Canvas should serve as a tool to start designing business model, but apart from this tool a business should make a competitive overview before entering a market. That could not be done through Business Model Canvas. A new market entrant should carefully plan future business growth plan based on different factors not only on its business model.

Business model that was designed in this master thesis for Light4Life doing an extensively qualitative research conclude that there is a need for a solution such as Light4Life. End users but also experts from the field gave a valuable insight into how much this solution is necessary. This business model is built using valuable information provided during the research. However, this business model should be tested. Once it is tested in practice, it will be crucial to update missing elements that build business model but also to position better on the market in the future. It will be much easier to update and change business model once business is established. This business model is based on assumptions of a niche tested group.

Along with this testing of a business model and earlier mentioned next phase of the project which include prototype and pricing analysis it will be essential for Light4Life. Future research will be about this. Additional research is required due to Business model Canvas limitations. Future research will in detail research competition (even if it was covered a bit in this master thesis), SWOT analysis and legal frames when it comes to road traffic safety.

To conclude this master thesis research, after conducting deep and detail qualitative research, it could be concluded that Light4Life have designed effective rigid business model that have to be tested on the market. This is exampling an innovative development of the business model for solution that aim to increase safety of vulnerable road user group – pedestrians and cyclist, but at the same time that helps drivers to notice pedestrians in time. The research also confirmed there is the need for this solution not only in Montenegro, but also in other European countries.

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APPENDICES

Appendix 1: Povzetek (Summary in Slovene language)

Light4Life je bil v osnovi ustvarjen z namenom pozitivnega vpliva na družbo, sicer pa rešitev v prvi vrsti stremi k zmanjšanju števila nesreč na prehodih za pešce. Sistem Light4Life sestavljata dva segmenta; tri vrste senzorjev gibanja in set lučk Light Emitting Diode (LED). Light4Life deluje na princip pametnih sistemov, ki v realnem času zaznava gibanje pešcev, ko želijo uporabiti prehod čez cestišče. Vozniki so o gibanju pešcev opozorjeni z lučkami, ki so vgrajene v sistem, s tem pa je njihov odziv na dogajanje v prometu lažji in hitrejši. Rešitev prispeva k dodatni vidnosti in varnosti pešcev, saj lahko vozniki svojo hitrost prilagodijo ali po potrebi tudi hitro ustavijo.

Zaključno delo torej naslavlja inovativno rešitev Light4Life, ki še ni prodrla na trg. Primerno umestitev rešitve na trg se v delu načrtuje z orodjem oblikovanja poslovnih modelov, imenovan Platno poslovnega modela (angl. Business Model Canvas; BMC). BMC je strateško orodje, ki ga je leta 2008 predstavil Alexander Osterwalder, končni cilj le-tega pa je razvoj novih ali izboljšava že obstoječih poslovnih modelov. BMC sestavlja devet gradnikov, ki skupaj tvorijo poslovni model, obenem pa stremijo k trajnostni rasti podjetja. Model sestavljajo: ključne aktivnosti, ponudba vrednosti podjetja, odnosi z javnostjo, segment potrošnikov, glavni viri obstoja podjetja, kanali distribucije in prodaje, stroškovna struktura in prihodkovna struktura. Začetna podjetniška ideja tako dobi jasno strukturo, ki je predstavljena na razumljiv način (Osterwalder & Pigneur, 2010). Z njim se ugotavlja, kako izdelek, ki ima sicer specifično tržno nišo, najbolje približati ciljnim kupcem. Ob omenjenih ugotovitvah magistrsko delo koristi tudi sorodnim zagonskim podjetjem pri umeščanju novih rešitev na trg ter pri vzpostavljanju trajnostnih poslovnih modelov.

Raziskovalni del magistrskega dela zaobjema pregled potencialnih kupcev in uporabnikov rešitve Light4Life, naknadno pa z orodjem BMC oblikuje poslovni model podjetja.

Namen
Namen magistrskega dela je obravnavati problem prometnih nesreč, ki se zgodijo na prehodih, s tem pa poskuša prispevati k njegovemu preprečevanju in / ali zmanjšanju. Sedanje rešitve ne rešujejo problema pogostih prometnih nesreč, ki se zgodijo na prehodih. Z izdelkom Light4Life je to mogoče in z veliko nižjimi preventivnimi stroški kot stroški škode, kar temelji tudi na povzročitvi iz malomarnosti.

Cilj
Glavni cilj magistrskega dela je oblikovanje poslovnega modela za projekt Light4Life. Podporni cilji so naslednji:
1. Predstaviti teoretično ozadje problema prometnih nesreč in poslovnih modelov;
2. Predstaviti trenutno stanje na področju varnosti v cestnem prometu;

3. Izvesti raziskavo, ki bo potrdila potrebo po tem izdelku in spodbudila razvoj njegovega poslovnega modela.

4. Preučiti izzive in nepredvidene dogodke, povezane s takšnim procesom razvoja poslovnega modela, in tako informirati tako teorijo kot prakso.

Raziskovalno vprašanje

Naše glavno raziskovalno vprašanje je: "Kako oblikovati inovativen poslovni model za projekt Light4Life, ki temelji na elementih poslovnega modela Canvas?"

Raziskovalna Metodologija

Metodologija raziskovanja v tej magistrski nalogi temelji na kvalitativnih metodah zbiranja potrebnih podatkov. Poglobljeni razgovori so opravljeni z ustreznimi strokovnjaki s tega področja. Šest intervjujev je vključevalo vprašanja, ki so zajemala teme varnosti v cestnem prometu, prometnih nesreč in preprečevanja le-teh ter možnosti sodelovanja z občinami pri uvajanju Light4Life. Med anketiranimi strokovnjaki so bili predstavniki Policijske uprave Črne gore, družbe, ki jo v Črni gori dojemajo kot družbeno odgovorno podjetje, vodilne partnerske organizacije za izvajanje mednarodnih razvojnih projektov, Ministrstva za promet Črne gore in Občine Podgorica (glavno mesto Črne Gore).

Da bi dobili vpogled v dojemanje končnih uporabnikov o varnosti v cestnem prometu med prečkanjem ceste, so bili opravljeni tudi intervjuji z udeleženci v prometu (tako pešci kot vozniki). Opravljenih je bilo dvanajst tovrstnih razgovorov. Pred izvedbo poglobljenih razgovorov je bil opravljen celostni pregled literature, da bi raziskali teoretično, praktično, kontekstualno in razvijajočo se naravo sinteze raziskav. Pregledana so bila spletna mesta ključnih organizacij, znanstveni članki ali članki ustreznih avtorjev s priloženega seznama literature.

Ugotovitve raziskave so interpretirane tako, da prispevajo k vzpostavitvi poslovnega modela s pomočjo platna poslovnega modela in njegovih elementov. Vsak element platna je bil podrobno raziskan, da bi ugotovili, kateri je najboljši način za približevanje trgu. Pridobljeni odgovori so bili analizirani in povezani z vsako komponento platna poslovnega modela ter nadalje uporabljeni za razvoj poslovnega modela za zagon Light4Life.

Appendix 2: Interview questions for 15 pedestrians/drivers

1. **Gender?**
   a. Male
   b. Female
2. **Age?**
   a. <15

2

       b.   16-30

       c.   31-50

       d.   >50

3.   Occupation?

       a.   Student

       b.   Unemployed

       c.   Civil servant

       d.   Entrepreneur

       e.   Private sector

4.   What are your habits as a pedestrian?

       a.   I always use a pedestrian crossing and follow the traffic lights

       b.   I rarely use a pedestrian crossing

       c.   I cross the street wherever I can, regardless of a traffic ligght

5.   How often do you walk a day?

       a.   Less than an hour

       b.   1-2 hours

       c.   More than 2 hours

6.   Do you feel safe while crossing the road?

       a.   Yes

       b.   No

7.   Did you face any dangerous situation while crossing the road?

       a.   Yes

       b.   No

8.   What was that situation? (please describe)

9.   Do you think the safety of pedestrians can improve?

       a.   Yes

       b.   No

10.   Do you think it should be improved?

       a.   Yes

       b.   No

11.   Do you drive?

       a.   Yes

       b.   No

       c.   I have a driver's license, but do not drive

12.   As a driver, do you think that it would be helpful to have better way to notice the pedestrians?

       a.   Yes

       b.   No

13.   Did you have any 'almost' or dangerous situation while driving that included pedestrians?

       a.   Yes

       b.   No

14. **Did you face the situation where you did not notice pedestrians?**

    a.   Yes

    b.   No

15. **From your point of view, as a driver or even pedestrian, is it safe to be a pedestrian in our city?**

    a.   Yes

    b.   No

16. **What is the most dangerous situation for pedestrians? (please describe)**

17. **What is your opinion on solution Light4Life?**

18. **Do you think that Light4Life should be implemented in our city?**

    a.   Yes

    b.   No

19. **Can you name few places in the city where the solution is the most necessary?**

20. **If there is an option for crowdfunding, would you be interested to participate?**

    a.   Yes

    b.   No

    c.   Not sure

21. **If there is a petition to sign in order to implement this solution in our city, would you sign it?**

    a.   Yes

    b.   No

    c.   Not sure

22. **Do you think that with Light4Life the safety of pedestrians or cyclists can be improved?**

    a.   Yes

    b.   No

23. **What are the disadvantages of L4L or possible threats?**

Appendix 3: Interview questions for 6 business specialists

Interview 1 & 2
Socially responsible company – Telenor Montenegro (two people)

1. **Gender?**

    a.   Male

    b.   Female

2. **Age?**

    a.   <15

    b.   16-30

    c.   31-50

    d.   >50

3.   Occupation?
    a.   Civil servant
    b.   Entrepreneur
    c.   Private sector

4.   How much is important nowadays for a company to be perceived as a socially responsible company?

5.   **Do you have a budget for that particular part?**

6.   Why is important to be perceived as such a company?

7.   Would you be interested to buy information about the frequency of one particular road crossing for your R&D purposes?

8.   Would you invest in businesses that improve the safety of all participants in traffic in the country that you are operating in?

9.   What are the important factors to consider prior to investment in startup ideas?

10.   What kind of partnership would you love to have with startups that you cooperate with?

11.   What are key competitive advantages that startups should have in order to be perceived as better than competition so that you would rather choose them over competition?

12.   How do you make investment decisions?

13.   What are the key metrics you use to manage the business?

14.   What is your value proposition?

15.   Would you invest in a startup whose primary type of business model is B2G? Why or why not?

16.   How much their business model is important when making a decision about investment?

17.   What is the most important factor in their business model that gives you the confidence that they are on the right track?

18.   What is your opinion on solution Light4Life?

19.   Do you think that Light4Life should be implemented in our city?

20.   Can you name few places in the city where the solution is the most necessary?

21.   Do you think that with Light4Life the safety of pedestrians or cyclists can be improved?

22.   What are the disadvantages of L4L or possible threats?

23.   What would be the strongest argument to invest in a solution such as Light4Life?

24.   What would be the strongest argument to reinvest in a solution such as Light4Life?

Interview 3
-   Directorate for Road Traffic of Montenegro (one person)

1. **Gender?**
   a. Male
   b. Female
2. **Age?**
   a. <15
   b. 16-30
   c. 31-50
   d. >50
3. **Occupation?**
   a. Civil servant
   b. Entrepreneur
   c. Private sector
4. **What is your position at your job?**
5. **Do you feel safe while crossing the road?**
6. **Did you face any dangerous situation while crossing the road? If yes, please describe.**
7. **Is there any department that is in charge for pedestrian safety?**
8. **How many complaints do Directorate for Road Traffic of Montenegro /Pedestrian safety department receive on a yearly basis regarding traffic safety (pedestrian safety)?**
9. **How much money is assigned to Directorate for Road Traffic of Montenegro /Pedestrian safety department by the State budget on a yearly basis?**
10. **How much of that money goes to Road traffic safety?**
11. **If there is a smart city solution in order to increase the safety of pedestrians and cyclists, would Directorate for Road Traffic of Montenegro be interested to participate by funding this project?**
12. **What kind of participation/partnership with a startup that increase pedestrian safety would you be interested in?**
13. **What are the key metrics how you track the safety of pedestrians in your city?**
14. **Do you have marked black points in the country for pedestrians?**
15. **Do you have marked black points in the road traffic in the country?**
16. **How many black points (dangerous points) are there in our city? Country?**
17. **What is your opinion on solution Light4Life?**
18. **Do you think that Light4Life should be implemented in our city?**
19. **Can you name few places in the city where the solution is the most necessary?**
20. **Do you think that with Light4Life the safety of pedestrians or cyclists can be improved?**
21. **What are the disadvantages of L4L or possible threats?**
22. **What would be key metrics on how you track the safety of pedestrians in your city after implementing L4L?**

23. What are the key metrics to consider that it was the right decision to implement a project L4L in the city and to possibly decide to implement a new one?

24. Would you use L4L solution in order to track how much the road safety was improved in the city/country in general?

Interview 4

- **Police Administration of Montenegro (1 person)**

1. **Gender?**
    a. Male
    b. Female

2. **Age?**
    a. <15
    b. 16-30
    c. 31-50
    d. >50

3. **Occupation?**
    a. Civil servant
    b. Entrepreneur
    c. Private sector

4. **What is your position at your job?**

5. **Did you face any dangerous situation while crossing the road? If yes, please describe.**

6. **Did you face any dangerous situation while crossing the road?**

7. **Is there any department that is in charge for pedestrian safety?**

8. **How many complaints do Police Administration/Pedestrian safety department receive on a yearly basis regarding traffic safety (pedestrian safety)?**

9. **How much money is assigned to Police administration/Pedestrian safety department by the State budget/Police Administration on a yearly basis?**

10. **How much of that money goes to Road traffic safety?**

11. **If there is a smart city solution in order to increase the safety of pedestrians and cyclists, would Police administration be interested to participate by funding this project?**

12. **What kind of participation/partnership with a startup that increase pedestrian safety would you be interested in?**

13. **What are the key metrics how you track the safety of pedestrians in your city?**

14. **Do you have marked black points in the country for pedestrians?**

15. **Do you have marked black points in the road traffic in the country?**

16. **How many black points (dangerous points) are there in our city? Country?**

17. **What is your opinion on solution Light4Life?**

18. **Do you think that Light4Life should be implemented in our city?**

19. Can you name few places in the city where the solution is the most necessary?

20. Do you think that with Light4Life the safety of pedestrians or cyclists can be improved?

21. What are the disadvantages of L4L or possible threats?

22. What would be key metrics on how you track the safety of pedestrians in your city after implementing L4L?

23. What are the key metrics to consider that it was the right decision to implement a project L4L in the city and to possibly decide to implement a new one?

24. Would you use L4L solution in order to track how much the road safety was improved in the city/country in general?

Interview 5

- **Secretariat for Traffic; Municipality of Podgorica (one person)**

1. **Gender**?
   a. Male
   b. Female

2. **Age**?
   a. <15
   b. 16-30
   c. 31-50
   d. >50

3. **Occupation?**
   a. Civil servant
   b. Entrepreneur
   c. Private sector

4. What is your position at your job?

5. Did you face any dangerous situation while crossing the road? If yes, please describe.

6. Did you face any dangerous situation while crossing the road? If yes, please describe.

7. How many complaints do Secretariat for Traffic receive on a yearly basis regarding traffic safety?

8. How much money is assigned to Secretariat for Traffic by the State budget on a yearly basis?

9. How much of that money goes to Road traffic safety?

10. When will the concept of Smart city begin in our cities?

11. If there is a smart city solution in order to increase the safety of pedestrians and cyclists, would Municipality be interested?

12. What kind of partnership would you be interested in?

13. Would Municipality prefer one-time payment of the installation or subscription fee for maintenance (for a few years) whereas installation costs would be left out?

14. Would Municipality rather choose a company from Montenegro to install the product for safety improvement of pedestrians in the cities or other company?

15. What are the main factors to decide, apart from the product price?

16. What is the average cash flow of doing business with Municipality? How long do you have to wait until you will receive the money when doing business with Municipalities?

17. How do you make investment decisions?

18. What are the key metrics how you track the safety of pedestrians in your city?

19. Do you have marked black points in the country for pedestrians?

20. Do you have marked black points in the road traffic in the country?

21. How many black points (dangerous points) are there in our city? Country?

22. What is your opinion on solution Light4Life?

23. Do you think that Light4Life should be implemented in our city?

24. Can you name few places in the city where the solution is the most necessary?

25. Do you think that with Light4Life the safety of pedestrians or cyclists can be improved?

26. What are the disadvantages of L4L or possible threats?

27. What would be key metrics on how you track the safety of pedestrians in your city after implementing L4L?

28. What are the key metrics to consider that it was the right decision to implement a project L4L in the city and to possibly decide to implement a new one?

Interview 6
- Ecosystem Facilitator – Swisscontact (one person)

1. **Gender?**
    a.   Male
    b.   Female

2. **Age?**
    a.   <15
    b.   16-30
    c.   31-50
    d.   >50

3. **Occupation?**
    a.   Civil servant
    b.   Entrepreneur
    c.   Private sector

4.   What are important factors to consider when developing a business model?

5.   Are there any differences when developing a business model between commercial and social entrepreneurship business model?

6.   How to assess value proposition the best?

7.   **How to shorten cash flow in order to be sustainable when doing a business with government?**

8.   How does business model create value for a company?

9.   How often should business model change?

10.   Can knowledge about competition affect the development of a business model?

11.   What are the key factors that startups should know about the competition in order to design a business model effectively?

12.   In Osterwalder's BMC – what is the most important part?

13.   Is the team important factor when developing a business model?

14.   What are alternatives for a doing business with government if you are social entrepreneurship startup?

15.   Do external factors such as market trends, competition affect, social trends BM?

16.   What is your opinion on solution Light4Life?

17.   Do you think that with Light4Life the safety of pedestrians or cyclists can be improved?

18.   What are the disadvantages of L4L or possible threats?

19.   What is the biggest advantage of a solution L4L?

20.   What type of business model should L4L strive to make?

21.   How to be sustainable business (L4L), because of its type of business model (B2G)?

22.   What are the best sources of finance for this startup?

Appendix 4: Interview answers – pedestrian/driver interviews

Interview 1

First interview that was conducted was with a 37 years old male who works in private sector. He is a well-behaved pedestrian, which means that he always crosses the street only on places where there is a pedestrian crossing and follow the traffic lights (if there are any light signalization). He walks one to two hours a day. On question if he feels safe when crossing the road, he stated that he does not feel safe when crossing the road and confirmed that safety of pedestrians could and should be improved.

As a driver, he faced some 'almost' situations that included pedestrians. These situations happened on crosswalks when he was unable to notice a pedestrian, or pedestrians were crossing the street on places where there was not pedestrian crossing… Therefore, in his

opinion it is not safe to be a pedestrian in his city (Podgorica). The situations he faced as a driver thought him to be more careful when approaching the pedestrian crossing but also to be more careful in driving in general.

He thinks that the most dangerous situation for pedestrian is when they cross the street on places where there is no pedestrian crossing, but also crossing the street on boulevards.

When Light4Life solution was presented to him, he said that it was interesting solution that should definitely be implemented in his city. He proposed few locations in Podgorica that would be suitable for the implementation of Light4Life. These included Boulevard Stanka Dragojevica or every boulevard with four and more road tracks. He would participate in crowdfunding campaign, if there would be any, in accordance with his financial situation. Along with supporting crowdfunding campaign, he confirmed that he would participate in signing a petition by saying *"I would be first to sign the petition if there will be one!"*. He concluded that with implementation of Light4Life, safety of pedestrians could be improved and that Light4Life do not have disadvantages but could only be very useful to everyone.

Interview 2

Second interview that was conducted as a part of qualitative master thesis research was with 26 years old male who works in private sector. His is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and he follows traffic lights signalization (if any). He walks very frequently, even more than two hours a day. As a pedestrian he feels safe when crossing the road. Even if he feels safe when crossing the road he faced dangerous situation while doing so. This happened on a pedestrian crossing when the car in the first lane noticed him, and he stopped the car, but the one in the second lane did not notice him and he continued driving. Luckily, interviewee noticed driver's inability to see him and he stopped.

From his point of view, the safety of pedestrians should and could improve. He has driver's license, but do not drive. However, he thinks that it would be helpful if there is a better way to notice the pedestrians. The most dangerous situation for a pedestrian is when pedestrian cross the street near round abouts, and the situation that he faced as a pedestrian, so called "multiple road tracks situation" whereas the driver in the first lane notices the pedestrian and he stops but the driver in the second lane does not see pedestrian and he continues driving.

When asked about the opinion on Light4Life he stated *"This solution would significantly contribute to increasing safety of pedestrians but also drivers. It would made easier to drivers to notice pedestrians"*. He continued with confirming that Light4Life solution should absolutely be implemented in his city. Locations for possible implementation of

the solution should be all boulevards with four plus road tracks and also every pedestrian crossing near round abouts.

He would be willing to participate in crowdfunding campaign as well as signing a petition. In his opinion, the safety of pedestrians will be improved once the solution is implemented. Possible disadvantage of the solution may be the price, but he is not sure because he does not know how much one Light4Life solution costs.

Interview 3

Third interview that was conducted as a part of qualitative master thesis research was with 25 years old female who works in private sector. She is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and she follows traffic lights signalization (if any). She walks one to two hours a day. As a pedestrian she does not feel safe when crossing the road. She has faced dangerous situation while doing so. Actually, she was hit by a car on a pedestrian crossing. This happened when the car just did not see her when she was crossing the road but luckily, she did not have any injuries.

From her point of view, the safety of pedestrians should and could improve. She is a driver. Furthermore, she thinks that it would be helpful if there is a better way to notice the pedestrians. Because of the situation she faced as a pedestrian when she drives, she is very cautious when driving and approaching the pedestrian crossing. She thinks that it is not safe to be a pedestrian in her city.

The most dangerous situation for a pedestrian is when pedestrian cross the street on boulevards where there are multiple road tracks.

When asked about the opinion on Light4Life she stated *"Very innovative solution. For everyone who is normal, this solution is awesome! It would be very useful in increasing the visibility of pedestrians"*. She continued with confirming that Light4Life solution should be implemented in her city. Locations for possible implementation of the solution should be all boulevards on which pedestrian crossings are marked without traffic light signalization, it should also be implemented near schools, Universities or public institutions.

She would participate in crowdfunding campaign as well as signing a petition. In her opinion, the safety of pedestrians will be improved once the solution is implemented. She thinks that this solution does not have any disadvantages or threats.

Interview 4

Fourth interview that was conducted was with 32 years old female who works in private sector. She is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and she follows traffic lights signalization (if any). She walks one to two hours a day. As a pedestrian she feels safe when crossing the road. Even though she feels safe when crossing the road, she has faced dangerous situation while doing so. She was crossing the road on pedestrian crossing and the driver did not notice her and he just passed in front of her while she was crossing the street.

From her point of view, the safety of pedestrians should and could improve. She is a driver. Furthermore, she thinks that it would be helpful if there is a better way to notice the pedestrians. She did not have any dangerous or 'almost' situations that included pedestrians. She thinks that it is not safe to be a pedestrian in her city.

The most dangerous situation for a pedestrian is when pedestrian cross the street on boulevards where there are multiple road tracks or when they cross the street on places where there is no marked pedestrian crossing.

When asked about the opinion on Light4Life she stated, *"Innovative solution that could be very applicable in Podgorica" (her hometown)*. She continued with confirming that Light4Life solution should be implemented in her city. Locations for possible implementation of the solution should be all boulevards on which pedestrian crossings are marked without traffic light signalization and near schools or Universities.

She would participate in crowdfunding campaign as well as signing a petition. In her opinion, the safety of pedestrians will be improved once the solution is implemented. She concluded by saying that this solution does not any disadvantages in terms of functionality, but she is more worried if the project will find the necessary funds.

Interview 5

Fifth interview that was conducted was with 25 years old female who is student. She is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and she follows traffic lights signalization (if any). She walks less than an hour per day, on average. As a pedestrian she feels safe when crossing the road. Even though she feels safe when crossing the road, she has faced dangerous situation while doing so. She was crossing the road on pedestrian crossing and the driver did not notice her and he just passed in front of her while she was crossing the street.

From her point of view, the safety of pedestrians should and could improve. She is not a driver. She thinks that it is safe to be a pedestrian in her city.

The most dangerous situation for a pedestrian is when pedestrian cross the street on boulevards where there are multiple road tracks or when the driver does not want to stop to let pedestrians pass or if they do not see them when crossing the street.

When asked about the opinion on Light4Life she stated, *"I think it is a really good idea that could encounter a good public response. It could contribute improvement of pedestrian culture in the city"*. She continued with confirming that Light4Life solution should be implemented in her city. Locations for possible implementation of the solution should be all boulevards on which pedestrian crossings are marked without traffic light signalization, streets with multiple road tracks with alternating lanes, near round abouts or pedestrian crossings with low pedestrian frequency.

She would participate in crowdfunding campaign as well as signing a petition. In her opinion, the safety of pedestrians will be improved once the solution is implemented. She concluded by saying that this solution could only have technical implementation problems, even though it seems very easy to implement. Technical problems include the difficulty in maintenance of the product.

Interview 6

Sixth interview that was conducted was with 26 years old female who is student. She is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and she follows traffic lights signalization (if any). She walks one to two hours per day, on average. As a pedestrian she does not feel safe when crossing the road. Due to that, she has faced dangerous situation while doing so. She was crossing the road on pedestrian crossing with multiple road lane, the driver in the first lane noticed her and stopped to let her cross the street, but the in the second lane was not aware of that situation and did not see her, continued driving. Luckily, she was not hit.

From her point of view, the safety of pedestrians should and could improve. She is a driver. She thinks that it is not safe to be a pedestrian in her city and that it would be helpful if there is a solution that could improve the visibility of pedestrians. She faced a dangerous situation where she did not notice pedestrian who was crossing the street.

The most dangerous situation for a pedestrian is when pedestrian cross the street on boulevards where there are multiple road tracks or when the pedestrian crossing is not marked properly and when the driver is in the area he did not drive before, could be dangerous because he does not know that there is a pedestrian crossing. Also, the problem for pedestrians is when it is dark or during the night, pedestrians are less visible.

When asked about the opinion on Light4Life she stated, *"Such a great solution! First of all, because of drivers themselves, but also because of increased safety of pedestrians"*.

She continued with confirming that Light4Life solution should be implemented in her city. Locations for possible implementation of the solution should be all boulevards on which pedestrian crossings are marked without traffic light signalization.

She would participate in crowdfunding campaign as well as signing a petition. In her opinion, the safety of pedestrians will be improved once the solution is implemented. She concluded by saying that the only possible disadvantage is that people are not aware how much this product is needed.

Interview 7

Seventh interview that was conducted was with 62 years old male who is a civil servant. He is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and he follows traffic lights signalization (if any). He walks one to two hours per day, on average. As a pedestrian he feels safe when crossing the road. Even though he feels safe, he has faced dangerous situations as a pedestrian but also in the role of driver. He faced this situation multiple time. When he was crossing the road on pedestrian crossing with multiple road lane, the driver in the first lane noticed him and stopped to let him cross the street, but the driver in the second lane was not aware of that situation and did not see him, continued driving.

From his point of view, the safety of pedestrians should and could improve. He thinks that it is relatively safe to be a pedestrian in his city. He also states that it would be helpful if there is a solution that could improve the visibility of pedestrians. He faced a dangerous that included a pedestrian, he did not notice a pedestrian that crossed the street.

The most dangerous situation for a pedestrian is when pedestrian cross the street on boulevards where there are multiple road tracks.

When asked about the opinion on Light4Life she stated, *"This is a very useful solution that is an extra help for drivers that should 'wake them up' and help notice pedestrians"*. He continued with confirming that Light4Life solution should be implemented in his city. Locations for possible implementation of the solution should be all pedestrian crossings with low pedestrian frequency, near sport facilities or near facilities that gather many people on one place. It would also be good if implemented on crosswalks with high pedestrian frequencies.
He would participate in crowdfunding campaign as well as signing a petition. In his opinion, the safety of pedestrians will be improved once the solution is implemented. He concluded by saying that the he does not see any disadvantage or threat.

Interview 8

Eight interview that was conducted was with 32 years old male who works in private sector. He is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and he follows traffic lights signalization (if any). He walks up to an hour a day, on average. As a pedestrian he mainly feels safe when crossing the road. Even though he feels safe when crossing the road, he has faced dangerous situation while doing so. He was crossing the road on pedestrian crossing and the driver did not notice him when turning right on the crossing road.

From his point of view, the safety of pedestrians should and could improve. He is a driver. Furthermore, he thinks that it would be helpful if there is a better way to notice the pedestrians. He had dangerous or 'almost' situations that included pedestrians. And he also knows a person who hit a child on pedestrian crossing. He states that these problems included the inability of driver to notice a pedestrian especially on locations where the pedestrian frequency is low, and drivers are used that on these crossings not many people cross the street.

The most dangerous situation for a pedestrian is when pedestrian cross the street on locations with low pedestrian frequency, especially during the night.

When asked about the opinion on Light4Life he stated, *"The biggest problem for me when crossing the road is that I am not sure if the driver will see me, and Light4Life will help me with that. Not only that but it will especially be effective on locations where drivers are not used to stop due to low pedestrian frequency"*. He continued with confirming that Light4Life solution should be definitely tested, then implemented in his city. Crucial is to be tested prior to implementing it. Locations for possible implementation of the solution should be boulevards on which pedestrian crossings are marked without traffic light signalization and where there is no traffic light and near schools.

He would participate in crowdfunding campaign only if he knew the places where the solution would be implemented. He would sign a petition as well. In his opinion, the safety of pedestrians will be improved once the solution is implemented. He concluded by saying that this solution does not any disadvantages, but he expressed worry about the difficulty of solution maintenance.

Interview 9

Nineth interview that was conducted was with 25 years old female who is a student. She is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and she follows traffic lights signalization (if any). She walks up to

one hour a day, on average. As a pedestrian she feels safe when crossing the road. Even though she feels safe when crossing the road, she has faced dangerous situation while doing so. Usually those situations happened when drivers were not aware that she is crossing the street, on boulevards with multiple road tracks.

From her point of view, the safety of pedestrians should and could improve. She is a driver. Furthermore, she thinks that it would be helpful if there is a better way to notice the pedestrians. She faced dangerous or 'almost' situations while driving that included pedestrians' multiple times. She also knows someone who was hit by a car while on pedestrian crossing. Still, she thinks that it is safe to be a pedestrian in her city. But only if you are careful.

The most dangerous situation for a pedestrian is when pedestrian cross the street on boulevards where there are multiple road tracks or in the night or in the dark when the visibility is low, and pedestrian has to cross the street.

When asked about the opinion on Light4Life she stated, *"A very needed and useful idea"*. She continued with confirming that Light4Life solution should be implemented in her city. Locations for possible implementation of the solution should be all boulevards on which pedestrian crossings are marked without traffic light signalization. Also, near schools and kindergartens. *"It should be mandatory to implement Light4Life near every school and kindergarten"* – was her statement when speaking of possible locations for implementation of the solution.

She would participate in crowdfunding campaign as well as signing a petition. In her opinion, the safety of pedestrians will be improved once the solution is implemented. She concluded by saying that this solution does not any disadvantages, but she added that she thinks it would be the most useful to be implemented in small cities.

Interview 10

Tenth interview that was conducted was with 24 years old male who is a student. He is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and he follows traffic lights signalization (if any). He walks one to two hours a day, on average. As a pedestrian he feels safe when crossing the road. Even though he feels safe when crossing the road, he has faced dangerous situation while doing so. Usually those situations happened when drivers were aware, he is crossing the road but did not want to stop.
From his point of view, the safety of pedestrians should and could improve. He is a driver. Furthermore, he thinks that it would be helpful if there is a better way to notice the pedestrians. He faced dangerous or 'almost' situations that included pedestrians' multiple

times while driving. Still, he thinks that it is safe to be a pedestrian in his city. Only, if you are very cautious.

The most dangerous situation for a pedestrian is when it is low visibility, bad weather conditions or during the night when pedestrians are less visible.

When asked about the opinion on Light4Life she stated, *"I like this idea so much! If the LED road studs lights are seen clear and well, it could be very helpful to decrease the number of accidents that occur on pedestrian crossings. It is also good because of the safety of pedestrians; I like this very much!"*. He continued with confirming that Light4Life solution should be implemented in his city. Locations for possible implementation of the solution should be all boulevards where pedestrian crossings are marked without traffic light signalization, pedestrian crossings near schools and kindergartens or Universities.

He would participate in crowdfunding campaign as well as signing a petition. In her opinion, the safety of pedestrians will be improved once the solution is implemented. He concluded by saying that this solution does could face some kind of threat by the way the particular city's urban plan. In terms of how this city regulates it zebra crossings. Some cities have underground pedestrian passages that are used, and it could be a threat for Light4Life. Otherwise, no disadvantages.

Interview 11

Eleventh interview that was conducted was with 25 years old female who works as a civil servant. She is a well-behaved pedestrian who crosses the street only on places where there is a marked pedestrian crossing and she follows traffic lights signalization (if any). She walks one to two hour a day, on average. As a pedestrian she does not feel safe when crossing the road. She personally did not have a dangerous situation while crossing the road, but her best friend had. Her friend was hit by a car when crossing the street on pedestrian crossing. The driver did not notice her friend and was driving fast whereas her friend thought the driver saw her. Unfortunately, she was hit.

From her point of view, the safety of pedestrians should and could improve. She is a driver. Furthermore, she thinks that it would be helpful if there is a better way to notice the pedestrians. She did not face dangerous or 'almost' situations while driving that included pedestrians. She thinks that it is not safe to be a pedestrian in her city. The most dangerous situation for a pedestrian is when pedestrian cross the street on boulevards where there are multiple road tracks.

When asked about the opinion on Light4Life she stated, *"I like the idea so much. In my opinion the number of road accidents on pedestrian crossings can be reduced if this solution is implemented. And also, for improving safety and visibility of pedestrians I*

think it is a great idea". She continued with confirming that Light4Life solution should be implemented in her city. Locations for possible implementation of the solution should be boulevards on which pedestrian crossings are marked without traffic light signalization.

She would participate in crowdfunding campaign as well as signing a petition. In her opinion, the safety of pedestrians will be improved once the solution is implemented. She concluded by saying that this solution does not any disadvantages or threats but rather is a benefit for the society if implemented.

Interview 12

Twelfth interview that was conducted was with 49 years old female who works in private sector. She rarely crosses the street on a pedestrian crossing. She walks one to two hour a day, on average. As a pedestrian she does not feel safe when crossing the road. She had two very dangerous situations when she was crossing the street. A car almost hit her; it was a miracle how she avoided that accident. According to her, everyone around were surprised but at the same time terrified of what happened. She was crossing the street and the driver drove fast and did not see her, so she jumped to the side in the last moment. When fell on the ground, she was not aware that she was not hit. She was in shock. People from the surrounding shops were also terrified.

From her point of view, the safety of pedestrians should and could improve. She is a driver. Furthermore, she thinks that it would be helpful if there is a better way to notice the pedestrians. She did not face dangerous or 'almost' situations while driving that included pedestrians. She thinks that it is not safe to be a pedestrian in her city. Not completely unsafe, but pretty unsafe. The most dangerous situation for a pedestrian is whenever he is on the pedestrian crossing without traffic light signalization because he is not sure he will be seen by drivers. Even if drivers drive slowly.

When asked about the opinion on Light4Life she stated, *"Light4Life is amazing solution that will help pedestrians to feel safer and less nervous when crossing the road. But it will also help drivers to notice pedestrians when crossing the street"*. She continued with confirming that Light4Life solution should be implemented in her city. Locations for possible implementation of the solution should be every school and pedestrian crossing near round abouts.

She would participate in crowdfunding campaign as well as signing a petition. Her words for crowdfunding campaign were *"I would be first to give money! Because of the children and older people"*. When asked about the signing a petition, she stated *"I would also be first to sign as well!"*. In her opinion, the safety of pedestrians will be improved once the solution is implemented. She concluded by saying that this solution does not any

disadvantages. The only threat she sees is street hooligans, her concern was that they could break the boxes where the sensors are placed.

Appendix 5: Road traffic accidents data by Police Administration of Montenegro (2013 – 2018)

Table 5: Road traffic accidents data by Police Administration of Montenegro (2013 – 2018)

Year	Total number of road traffic accidents	Number of road traffic accidents that resulted with death of road traffic accident participant	Number of road traffic accidents with injured/dead people	Number of people who died in road traffic accident	Number of pedestrians who died in road traffic accident	Number of road traffic accidents with injured people	Number of people with slightly injuries	Number of slightly injured pedestrians	Number of people with severe injuries	Number of pedestrians with severe injuries
					Road traffic acidents					
2013	5264	28	22	74	15	1216	1452	227	360	89
2014	5531	36	20	65	12	1278	1485	249	350	80
2015	4944	27	18	51	8	1509	1766	261	407	92
2016	5229	27	29	65	9	1642	1900	286	458	83
2017	5678	37	18	63	7	1776	2183	257	465	111
2018	5872	24	21	48	8	1810	2142	297	421	82

Source: Police Administration of Montenegro (2019).