Czech University of Life Sciences Prague

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Bachelor Thesis

Open data application analysis and design: a case study of the city of Belgrade

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Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

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Thesis title

Open data application analysis and design: a case study of the city of Belgrade

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Objectives of thesis

The main objective of the thesis is to understand the process of analysis and design of application using open data. This will be examined using a case study of city of Belgrade, Serbia.
The partial goals are:
- to study the current state of open data and electronic services in Serbia with focus on transportation;
- to design and evaluate a new application;
- to recommend solutions for open data use in Serbia based on the literature review and lessons learned from the application development.

Methodology

The methodology of the thesis is based on the study of literature and resources, as well as on the investigation of the availability and usability of the open data to obtain the information about the transport in Serbia.

When all the data is collected and analyzed, the sample open data application will be proposed and evaluated through SWOT and comparative analysis. After proposing the application and formulating recommendations, an overall conclusion will be given.

The proposed extent of the thesis

30 – 40 pages

Keywords

Open data, availability, public, online services, transport, traffic flow data, application, real-time data,

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Declaration

I declare that I have worked on my bachelor thesis titled " Open data application analysis and design: a case study of the city of Belgrade" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 14.02.2018 _____

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Open data application analysis and design: a case study of the city of Belgrade

Abstract

This thesis is focused on exploring the current state of public transport in Serbia and showing how making public information available will have great impact on its improvement. The research will be mainly focused on understanding the process of designing an application based on open data usage by creating a prototype of an application that will allow citizens to plan their trips and commute through the city of Belgrade.

Moreover, the author of this thesis will provide basic terms and concepts of e-government and show how it is connected to the idea of having an open government where citizens are able to interact with the government and actively participate in the decision-making process. In order to understand the current state of open data and its impact on future developments of open government, several International Benchmarks will be shown.

Keywords: open data, availability, public, online services, transport, traffic flow data, application, real-time data

Open data application analysis and design: a case study of the city of Belgrade

Abstrakt

Tato práce se zaměřuje na zkoumání současného stavu veřejné dopravy v Srbsku a ukazuje jak velký vliv na jeho zlepšení bude mít zpřístupnění veřejných informaci.Výzkum bude zaměřen především na pochopení procesu návrhu aplikace založené na otevřeném využívání dat vytvořením prototypu aplikace, která občanům umožní naplánovat své cesty a dojíždět přes město Bělehrad.

Dále autor této práce objasní základní pojmy a koncepce e-government a ukáže jehopropojení s myšlenkou otevřené vlády, v niž mohou občané s vládou komunikovat aaktivně se účastnit rozhodovacího procesu.Abychom pochopili současný stav otevřených dat a jejich dopad na budoucí vývoj otevřené vlády, bude zobrazeno několik mezinárodních benchmarků.

Klíčová slova: otevřená data, dostupnost, veřejnost, online služby, doprava, data toku provozu, aplikace, data v reálném čase

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1 Introduction

Over the past few years the Republic of Serbia has been developing the Action Plan that will introduce the open government concept and engage citizens in the decision-making process.

The Serbian government states transparency, free access to public information and e-government as their top priorities. Their main goals are to encourage citizens to participate in the creation of the public administration by using information and communication technologies and opening up to the civil society. (OGP, 2014)

But, even though Serbia has made a lot of progress since joining Open Government Partnership, most of the changes were focused on increasing public integrity and eradicating the corruption, following the efforts to create an economically stable society and improve the standard of living. The main focus was on changing the quality of life of the residents on the national level, while the existing problems within the cities were clearly neglected. The idea of developing more efficient and effective services of the city was put aside, and the lack of data-driven or smart cities is highly present.

The author of this thesis decided to explore that problem by focusing on the public transport and showing how open data could allow application developers and urban planners to manage city services and make them more appealing and user-friendly. Traffic and transportation have been an issue in the Republic of Serbia for many years now and it is certainly something to be fixed in order to fully improve the quality of life and social stability.

This research will be focused on presenting an application that will allow citizens to plan their trips through the city of Belgrade, but moreover it could be applied on any city in Serbia, since it will be mainly based on public transportation data provided on the internet by Serbian government and municipalities.

2 Objectives and Methodology

2.1 Objectives

The main objective of the thesis is to understand the process of analysis and design of application using open data. This will be examined using a case study of city of Belgrade, Serbia.

Following partial objectives will be set to assist in achieving the main objective.

Firstly, basic terminology will be introduced and various current concepts of e-government will be reviewed in order to understand the context of open data.

Secondly, a thorough literature review on the current state of open data provided by governments will be examined as the topic is closely related to open government data. Special focus will be dedicated to Serbia and the field of transportation.

Thirdly, the practical part will include a thorough research about the existing electronic services provided for the public transportation, as well as the development of open data in Serbia. In order to point out what is missing, various currently available applications will be compared and analysed.

Finally, based on that analysis, the author of this thesis will recommend possible solutions which will be presented through the design and the evaluation of a new application.

2.2 Methodology

The methodology of the thesis is based on the study of literature and resources, as well as on the investigation of the availability and usability of the open data to obtain the information about the transport in Serbia.

When all the data is collected and analysed, the sample open data application will be proposed and evaluated through SWOT and comparative analysis. Also, the preparation of

the design of the software will be shown using the FURPS+ tool.After proposing the application and formulating recommendations, an overall conclusion will be given based on the synthesis of the practical results and theoretical understandings.

3 Literature Review

In the Literature Review chapter, the author of this thesis will introduce the basic information about the e-government, starting with its beginnings and evolution, as well as showing its main purpose through various currently available definitions. Furthermore, the idea of the Open Government will be shown in order to get to the narrower concept that is tightly related to the topic of this research, and that is the concept of Open Data. All this will be followed by pointing out several international benchmarks that deal with the current state of the open government, as well as its future developments. Finally, before proceeding to the design of the application, a quick insight to what electronic services and open data applications are and who provides them, will be given.

3.1 E-government

The increased usage of modern technology did not only transform the economic and social aspects and shifted the focus from industrial to information society, but it also changed the way people view the government and how they expect its services to be delivered.

According to British sociologist, Frank Webster, saying that there is more information available nowadays is stating the obvious, what is different and what changed the way we live our life is the character of information. (Webster, 2006)

People got used to living in a hectic environment, where most of the businesses and transactions are conducted online, allowing them to save time and money by receiving and providing the requested service in real time. What made it possible is definitely the evolution of information and communication technologies, since it had great impact on the development of e-commerce and improvement of private sector services. From that point on, it became clear that the same changes would have to be applied in the public sector as well.

Being aware of the power of communication and information exchange nowadays is crucial for understanding why there is an increased need to reinvent the way governments conduct their services and interact with citizens.

According to (Castells, 2009), the e-government could be defined using the concept of the communication: *"Communication is the sharing of meaning through the exchange of information. The process of communication is defined by the technology of communication, the characteristics of the senders and receivers of information, their cultural codes of reference and protocols of communication, and the scope of the communication process. Meaning can only be understood in the context of the social relationships in which information and communication are processed."*

The essential part of implementing the communication technologies in the government services is not only the mere process of receiving and giving the information, it is about who are the key actors in that exchange of information. In the e-business there is a transaction between the private sector service and the customer, where the relevant electronic service should serve the customer. Same model is being applied in the development of the e-government, where the citizen should have the key role. Living in the digital era, the new generations will not settle for inefficientprovision of public service that requires too much time and occasionally gives poor results. Long waits, filling out countless number of forms, going through many different public sector departments in order to do something simple as renewing the ID card or getting the driver's licence, is something that does not fit in the information society that we currently live in. It is rather a traditional or even old-fashioned way of doing things that anyone who is aware of the opportunities that technological revolution has brought us, is just not willing to settle for.

Of course, it is important to keep in mind that there are still some target groups that feel more comfortable with doing things the traditional way, either because they are older and therefore not interested in new technologies or maybe because they have a lack of knowledge and opportunities to use them. That is why, as mentioned before, it is important to build the e-government considering the social aspects as well. That is the key advantage of e-government. It's not only about making it more inovative so that it keeps up with the modern age, it is about making changes so that all citizens can benefit from it. It should lead to government regaining the trust from citizens by including them in the decision-making process.

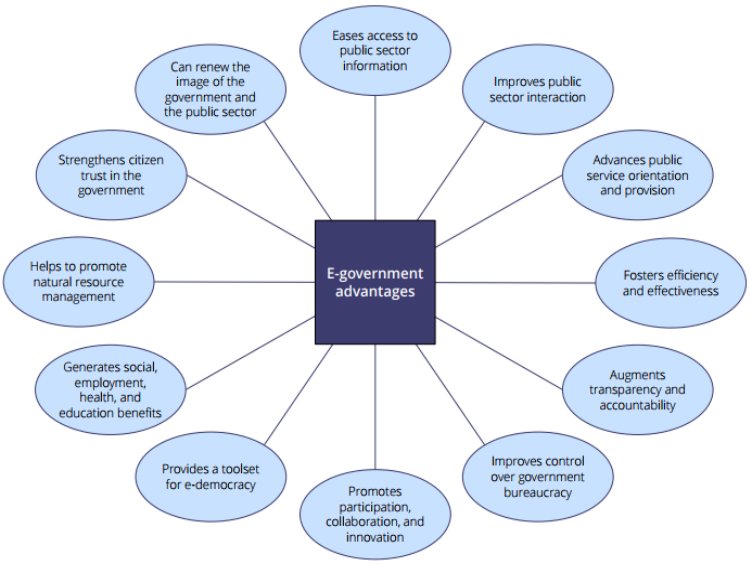


Figure 1Expected e-government Advantages. Source: (Wirtz, a další, 2015)

The main idea is to create internet portals that would work as one-stop-shops accessible to users 24/7. Also, these government websites will not only provide general information, but will be designed in a way that individuals can ask questions regarding their particular case or problem. As Alexander Schellong said, e-government is about putting citizens online instead of in-line (Schellong, 2009) by allowing them to perform almost any type of transaction through the online governmental portals.

3.1.1 Definitions of e-government

Moreover, the author of this text decided to provide several definitions of e-government since it is still a relatively new topic that concerns different scientific fields and in order to define it properly it is crucial to take into consideration different approaches and points of view.

Carter and Bélanger(2005)*: "E-government refers to the use of information technology to enable and improve the efficiency with which government services are provided to citizens, employees, business and agencies."*

Silcock(2001) *simply states*: *"e-Government is the use of technology to enhance the access to and delivery of government services to benefit citizens, business partners and employees. It has the power to create a new mode of public service where all public organizations deliver a modernized, integrated and seamless service for their citizens."*

Heeks (2001) argues that:"*Overall, then, e-governance is the ICT-enabled route to achieving good governance. We might prefer to think of it as 'i-governance' – integrated governance – since it integrates both the processing and the communication technologies; and since it integrates people, processes, information, and technology in the service of achieving governance objectives*."

Evans and Yen (2006) definition is: "*Simply speaking, E-Government means the communication between the government and its citizens via computers and a Web-enabled presence. The advantages in timeliness, responsiveness, and cost containment are outstanding*."

SpirakisSpiraki and Nikolopoulos(2010): "*Electronic government is the use of Information and Communication Technology in the transformation of government; primarily aiming to the improvement of accessibility, effectiveness and responsibility. It is based on the diffusion of the information and the information policy development. Electronic government guides to increasing citizens' participation and active citizens' development affecting the mechanisms of democracy.*

Even though there is a slight difference between the given definitions in terms of how broad is the sense of it, all of the authors agree that the essential part of the e-government is the use of technology in order for the government to communicate and exchange the

information with the citizens. Moreover the new electronic provision of governmental services will be beneficial and more effective for business, employees and agencies in the public sector.

While Carter and Belanger and Silcock focus on the government improving its services through the usage of modern technologies and making it more appealing for the users, Heeks and Spirakis and Nikolopoulos take these characteristics even further stating that e-government does not only cover the communication between the government and citizens, butits development should also cover the way government manages internal issues, clearing that way the path for the expansion of e-democracy activities such as virtual town meetings, open meetings, feedback polls or e-voting. All this should lead to increased political transparency, as well as the citizens' involvement in the decision-making process.

The term e-government describes the electronic handling of administration and democracy processes in the context of governmental activities by means of information and communication technologies to support public duties efficiently and effectively.(Wirtz, et al., 2015)

Finally, there is another definition proposed by Wirtz and Daiser that managed to sum up all of the previously mentioned definitions by highlighting the main characteristics of e-governmentand that way covering its wide range that goes from defining the e-government only as delivering the information and services to citizens, to pointing out its importance for the e-democracy development, as well as its crucial influence on all public stakeholders.

3.2 Open Government

It is impossible not to introduce the concept of open government when talking about the benefits and objectives of open data.

The core of this initiative was to create a transparent, participative, and collaborative government by involving public stakeholders in public policy and public administration

processes. In addition, this change should lead to more effective and more efficient administrative procedures and prepare government for the digital challenges.(Wirtz, et al., 2015)

Most of the governments nowadays are making large datasets available online in order to regain the trust in government and its services, fight corruption and encourage people to actively participate in changing the public sector. The accurate term to describe itis change or reinvention, but it is certainly not something new or recently discovered. The main principles of the open government are based on the ancient idea of democratic society, where citizens should be able to express their will in many different ways, and not only through a voting system.

Even though there are different definitions of what open government concept represents, all of them agree that there are three main pillars and conditions that every government should fulfill in order to reach the objective of creating the public value that contributes to citizens, organizations, and society and strengthens the relationship between the government and its stakeholders. (Wirtz, et al., 2015) The first one is the **transparency** of all governmental actions which brings us back to the importance of the open data. By releasing the data to the public through the open data portals and websites, government creates accountability and increases the efficiency of the legislative processes. It also creates an open society that is aware of the power of the exchange of information creating the basis for the second pillar of the open government, **participation**. And while the citizens are being engaged in the decision-making process during the second aspect of the open government development, the third one is all about the **collaboration**. *Accordingly, there is an ongoing global data revolution that seeks to advance collaboration around key social challenges, provide effective public oversight of government activities, and support innovation, sustainable economic development, and the creation and expansion of effective, efficient public policies and programs.*(2015)

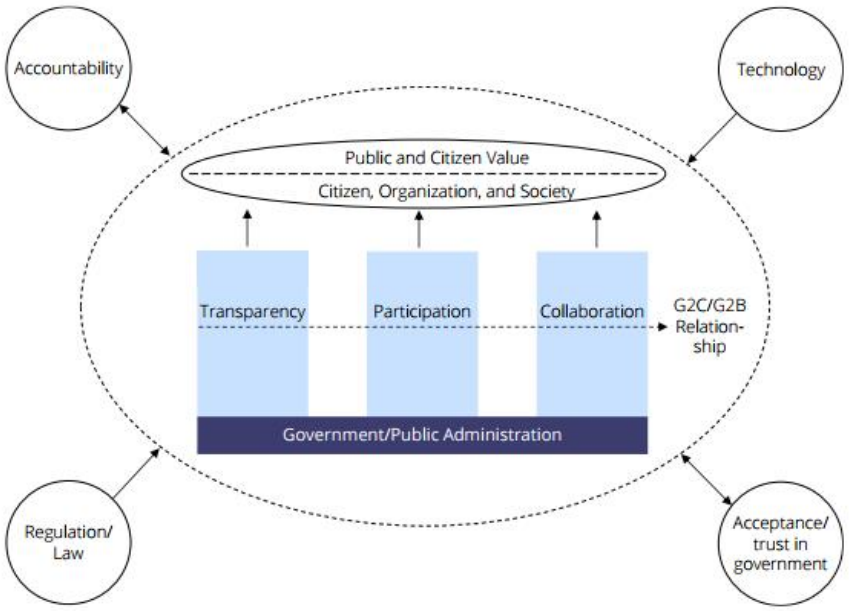


Figure 2Open Government Framework. Source: Wirtz, Bernd W. and Daiser, Peter. 2015. E-government. Strategy Process Instruments

In addition to the three pillars that structure the open government, Wirtz and Daiser propose that accountability, keystone of any democratic society, the use of communication technology that allows the exchange of information, the acceptance of the new concept and thereby the trust in government by citizens, as well as its legal aspects(different for different countries), are the external factors that not only build the internal factors, but also they constantly interact with them and lead to strengthening the government to citizens and government to business relationships. *Especially transparency and public access to information are regarded to support acceptance, and participation and collaboration are considered to increase trust since they allow public stakeholders to become part of administrative actions.*(Wirtz, et al., 2015)

Finally, it is crucial to point out how open data connects two complementary concepts that are e-government and open government. They both have the same goal of reinventing the government and in order to achieve that goal its collaboration is essential.

Many of the models of e-government focus on development stages, starting with digitizing the back office and then putting front-office services online, before being able in technical, organizational, competence and political terms to progress towards an open government framework built on using ICT to become transparent, participative and collaborative.(Regional School of Public Administration, 2015)

While open government gives the structure of how should governments nowadays look like and what are the objectives they should strive to accomplish, the e-government provides the technological framework. It allows the development of electronic public services or as mentioned in previous chapter, the one-stop-shop internet portals where the open data is being released and made accessible for anyone to use and where the citizens can actively participate in the process of shaping the government. Therefore, it is safe to say that the open government concept goes even further than the e-government, but both are dependent on each other and essential in order to reinvent the way the government conducts their services and to foster the growth of an open, transparent and collaborative society.

3.3 Open data

The field of Open Data is a relatively new concept introduced by Tim Berners Lee in the late 1990s. It received bigger public attention with the launch of Open Government Partnership in 2009 supported by Barack Obama's administration. Since then it has been moving really fast and therefore it is prone to changes. In order to properly define it, it's important to be aware of several key terms and principles, as well as the objectives that influenced its increased development.

According to Open Data Handbook (Open Knowledge International), open data has to be free to access, re-use, share and modify by anyone. These characteristics lead to the interoperability between different organizations, as well as to the interaction between citizens and government in order to create large datasets and build efficient public service

delivery. Therefore, open data is a type of data that has a mission to transform the way people conduct their business or manage different transactions, to create new infrastructure that will control economic resources, and to influence the prosperity of different fields, such as health care, education and science. Apart from its numerous social benefits, it is also considered that open data is the data collected by government using the taxpayers' money which means that is something that should be accessible outside of the governmental halls and on disposal to the civil society.

Open data can be considered as the corner stone in the development of the open government, since data becoming open and transparent leads to a complete transformation of the culture of government and civil society. According to OGP, the end goal of openness is "data for everyone; the data people need and data people can easily use." (Open Government Partnership, 2016) Even though in the past few years there has been a significant progress when it comes to embracing the concept of open data, the society is still far from reaching this end goal. Mainly because the really needed data is still missing or difficult to find, or if it is accessible then the quality of datasets is low or incomplete. In order to overcome these issues it is not enough to only release the data and make it public. It is crucial that the governments accept citizens as their key resource of the information, as well as to carefully manage this information within the public sector in order to create more accurate and effective datasets. That way the democratic society will be able to see the potential of the open data and the positive impact that it has on improving the government.

3.4 International benchmarks

In the following chapter results of some of the international benchmarks will be provided in order to show the progress and future objectives of both e- and open government.

3.4.1 UN E-government Development Survey 2016/2018

The Survey conducted by United Nation every two years serves as a tool for the government leaders to identify the progress of the e-government implementation and to effectively deal with future challenges regarding its development.

By conducting the survey it is possible to calculate EGDI or E-Government Development Index that evaluates the three most important aspects of e-government: provisions of online services, telecommunication connectivity and human capacity. It is important to be aware that the methodology has the same basis throughout the years, but the values vary since the concept of e-government is not something constant and it follows the changes in the development of the technology. Also, the survey is conducted by comparing national websites and how e-government policies are being implemented in different countries that are members of the United Nations.

The assessment rates the e-government performance of countries relative to one another as opposed to being an absolute measurement.The results are tabulated and combined with a set of indicators embodying a country's capacity to participate in the information society, without which e-government development efforts are of limited immediate use.(2017)

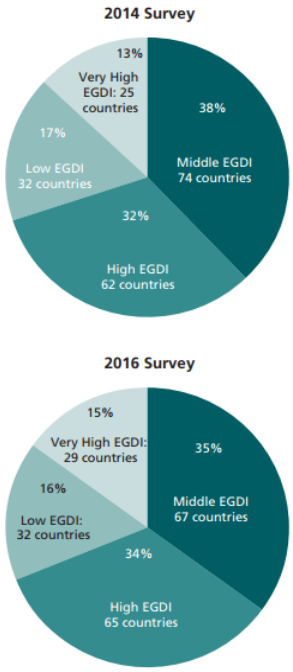


Figure 3 Number of countries grouped by E-Government Development Index (EGDI) levels, in 2014 and 2016. Source:http://workspace.unpan.org/sites/Internet/Documents/UNPAN97453.pdf

According to the UN survey conducted in 2016, the number of countries that started to use the e-government in order to conduct public services electronically and through the online one stop-shop portal has significantly increased. Evidently governments all over the globe are opening their data in order to enhance the e-government concept, as well as to make the public sector transparent and therefore accountable and effective. Not only electronic services are being improved. The number of countries that are implementing the second pillar of open government, participation, has increased a lot over the past few years. But most importantly, the availability of internet and broadband has increased in order to make electronic services accessible for everyone. All of the countries have agreed that bringing universal access to the internet for those least developed countries should be part of the UN's Sustainable Development Goals.

As previously mentioned, digital changes are happening constantly and governments need to keep up with the development of the information and communication technologies in order to make the most out of it and build a public system that is resilient and that serves to the civil society. Therefore the new survey for the 2018 is already being prepared and

according to the UN's public administration it will move in this direction by conducting an analysis of the progress of the e-government trend worldwide.

3.4.2 Open Government Partnership

Open Government Partnership is a multilateral initiative introduced in 2011 by eight founding countries: Brazil, Indonesia, Mexico, Norway, the Philippines, South Africa, the United Kingdom and the United States. Since then more than 70 governments joined the partnership and agreed to conduct almost 2500 different open government reforms. The OPG's mission is to help the countries perform those reforms with the following strategy (2017):

1. Maintain high-level political leadership and commitment to OGP within participating countries
2. Support domestic reformers with technical expertise and inspiration
3. Foster more engagement in OGP by a diverse group of citizens and civil society organizations
4. Ensure that countries are held accountable for making progress toward achieving their OGP commitments

Their aims are ensuring that the main idea of the open government is being delivered by encouraging transparency, engaging the citizens in the decision-making, fighting the corruption, and including the use of modern technologies in order to transform the governments' administration.

For the country to join the OPG it is necessary to write the Letter of Intent where it accepts the terms of the Open Government Declaration.

Today, the eight founding nations of our partnership are going even further -- agreeing to an Open Government Declaration rooted in several core principles. We pledge to be more transparent at every level -- because more information on government activity should be open, timely, and freely available to the people. We pledge to engage more of our citizens in decision-making -- because it makes government more effective and responsive. We pledge to implement the highest standards of integrity -- because those in power must serve the people, not themselves. And we pledge to increase access to technology -- because in this digital century, access to information is a right that is universal.

And really, in the case study about the early initiatives of the Open Government Partnership, the progress in the collaboration betweenthe governments and its citizens is clearly visible, and that is what they refer to as "the heart of OGP".(Open Government Partnership, 2016)

In Costa Rica, they developed a mechanism through which the local groups will be able to participate in all policy making decisions, as well as to work on creating more effective public services. The government of Chile introduced the Lobbying Act that should secure the basic principles of democracy and regulate the relationship between officials and citizens that were being influenced by them. And while in Tanzania they are developing a website with basic information about available public services that could lead to lower transaction costs and faster delivery of the results, Israel became an example to followwhen it comes to collaboration between civil society and government. Together with the Parliament, citizens managed to collect data about the state budget and to make it available to citizens, journalists and members of the Parliament.

Each of these cases showsthat the key objective of the open government, creating the public value, is making a significant progress globally. And according to the OPG that is the direction in which they plan to continue in order to fulfill all the necessary reforms.

3.5 Electronic public services

Electronic public services are considered to be higher level of e-government, since their implementation fulfils the main idea of more efficient, effective and transparent governmental departments.In order to transform the government, it is necessary to completely change the traditional approach, where the focus is on the provider instead of on the user. So, the main question that needs to be answered when developing an electronic service is “What do users want and what do they expect from e-government?” (Bernd W. Wirtz, 2015) It is all about creating portals that will quickly and easily deliver traditional services through the usage of new technologies.

In the context of e-government the provider of the electronic service is the government, while the end user is the citizen that searches or provides some information to the government through a web-based user interface. *The providers of e-government information and services establish the basis for service provision within the underlying electronic networks. They supply services that can be used by the recipients. For e-government, public administration (administration) is the prevalent information and service provider.*(Bernd W. Wirtz, 2015)When developing these kinds of portals, the providers need to take into the consideration numerous elements in order to avoid possible issues that might arise when designing, implementing or maintaining the portal. It is crucial that the information is always up-to date, as well as understandable and relevant for the users. Moreover, in terms of a user-oriented web platform, it is important that the provided electronic services are easily accessible, as well as transparent so that the concept of the e-government remains present. It is possible to achieve this by following various user-oriented e-government demand factors that are organized into the USS system and divided in three categories in such way that they not only provide the user-oriented information, but also the provider-oriented one.

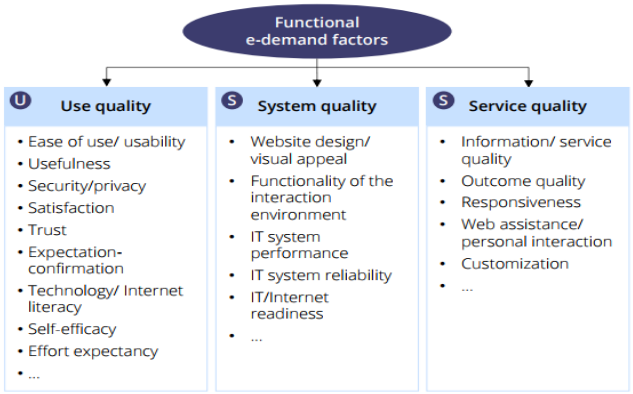


Figure 4 USS E-Demand Factor System. Source: Wirtz, Bernd W. and Daiser, Peter. 2015. E-government. Strategy Process Instruments

According to Wirtz and Daiserthese e-demand factors should be considered as a foundation when developing and maintaining an e-government portal, since by fulfilling them it is more likely to obtain an effective e-government service platform based on users' preferences.

Since these kinds of portals offer various individual governmental services it is important that they are organized and categorized by specific service preferences showing users' needs from public stakeholder's point of view.

In the following table some examples of available electronic services and categories in which they are grouped are shown.

E-Government Service Preferences	Information and Service Examples
Civic and immigration services	ID card, residence permit, and driver license application, divorce information, voter assistance
Health and medical services	Insurance services, facility information, nutrition information, vaccines information
Business and employment services	License application, financial services, legal assistance, job portal, job hunting information
Taxes and duties services	Tax declaration service, tax payment service, property tax information
Car, transport, and road services	Vehicle registration, public transport information, parking license service, accident information
Housing and property services	Affordable housing information, construction permit services, utility information
Social and volunteering services	Social security information, community program information, donation service
Family services	Child care information, adoption information, day care center information
Government, law, and order services	Electoral matters, consumer protection, crime and government reports, coast guard information
Arts, culture, and tourism services	Locations, activities, funding and support, visitor information
Recreation and sport services	Park and nature information, sport locations, sport activities, youth event information
Libraries and education services	Enrollment, e-book services, student support, rules and policies, adult education
Environment and recycling services	Garbage and recycling information, animal control, air and water quality information

Figure 5 E-Government Service Preference Categories. Source: Wirtz, Bernd W. and Daiser, Peter. 2015. E-government. Strategy Process Instruments

From here it is apparent that the goal is to create the so-called "one-stop e-government" where all public sector services are provided and available to citizens at any time, allowing them to avoid long waits and bureaucratic difficulties. However, shifting the entire governmental service provision online requires gradual development and technology implementation in order to achieve the highest level of e-government service provision. During this process many factors need to be taken into consideration such as personalization and customization, e-service management, self-service strategies, and especially privacy and security risk management. But, even though this kind of change is rather challenging and requires time, the results that it provides are quite fruitful, and that is best seen in the example of electronic tax regulations, where electronic data is being processed directly, which reduces the transmission time, or the possibility to fill out the forms online that not only saves time, but also reduces the chance of making a mistake while doing it.

3.6 Open data application

While electronic public services allow citizens to interact with government online, through a web service, the open data applications take it to the next level and make it possible to get information realised by government in real time so that citizens can make everyday life decisions relevant for their geographic location.

Most of these applications are focused on improving the quality of life in the city by keeping track of its performance, not only based on available governmental data sets, but also by engaging the citizens and encouraging them to share information regarding certain public services. If there are smart phones, there can also be so –called smart cities, since every citizen is, in a certain way, a user of his city.

Therefore, in France, General Secretariat for Modernization of Public Action has created an open source application called The National Address Base which uses the open data provided by civil services and state agencies with purpose of decreasing the emergency response time, as well as to strengthen the partnership between public and private sectors by encourage the citizens to share more accurate location data. In London, the Bus Guru

application takes data from Transport for London and gives commuters the real-time information about the bus arrivals, journey duration and estimated time arrival. And in New York they have taken it even further and developed DontEatat application that collects information from city's inspection open data set and sends a text to the user about the restaurants' health code violation.

Figure 6 DontEat.at Source: https://mashable.com/2012/11/07/open-data-city-apps/#C.2hxPSsuaqk , 2012

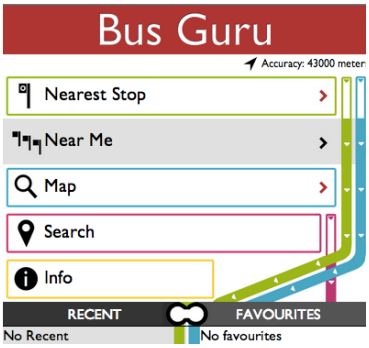


Figure 7BusGuru Source: https://mashable.com/2012/11/07/open-data-city-apps/#C.2hxPSsuaqk , 2012

From the mentioned examples it is plain to see that open data applications can support a wide range of services that goes from improved transport, to better health care and basic social needs. But what they all have in common is the cooperation between the government and the citizens, which fulfils one of the most important pillars of the open government. Therefore, it is safe to say that sometimes not only the government and its departments are the provider, but also the users of the applications that are engaged in constantly improving its accuracy by communicating with each other. And that would be the main purpose of the open data application. It is about governments providing transparency and encouraging citizens to make the most of the new technologies in order to build a more open, safer, and well informed society.

4 Practical part

After introducing and explaining the basic terms relevant to the topic, such as e-government, open government and open data application, in the literature review, the practical part will be focused on understanding these concepts by designing an application that is mainly based on open data usage. The prototype will be provided in the Appendix (see 8.1) and it will serve as a practical example that shows the benefits of these kinds of services, and how they need to interact in order to get the final result.

4.1 Case study

The purpose of the case study is to examine how open data can be used to design an application that could improve the quality of life of the citizens.

The main focus will be on determining the provision of public transport in the city of Belgrade since this has been a major issue for a long period of time. In order to be able to give a possible solution, it is necessary to analyze in depth the current condition of these services. By knowing what is missing or not working properly it will be possible to demonstrate why a different kind of application is necessary to be developed, as well as to include all the crucial features that it should have.

4.2 Business analysis

A few years ago, the new method of payment and management of the public transport service has been introduced by GSP Belgrade (Serbian: GradskoSaobraćajnoPreduzeće, English: City Transport Company) with purpose of increasing the revenue of the public transport authority and making the transport services more effective and appealing for the commuters by giving them the accurate information on its usage.
Even though, according to the reports from September 2012 (2012), the revenue in deed has increased, this new way of management has also brought a lot of controversy. It seems that only the public authorities felt its benefits, while the citizens and the need to improve the overall quality of life in the city of Belgrade, have been left behind.

The system requires that passengers equip themselves with a magnetic, rechargeable smart card, which at the time of boarding must be 'passed' on the electronic displays installed in every bus and trolleybus.In addition, by sending a text message one can learn about the

arrival times at each stop, and those who own a smartphone can download the inevitable app from the dedicated site.(Sicurella, 2012)

To begin with, this kind of system is very inconvenient for people that use public transportation only from time to time, as well as for tourists that are looking to get around the town just for a few days. You not only have to pay for the magnetic card, but also you have to pay for each ride individually by recharging the card, which can only be done on the kiosks and not electronically for example. Also, the previously mentioned mobile application that would provide commuters with information about the arrival time of the next bus, where it is located and how to get to the desired destination, has been said to be updated by the end of the year 2012 in order to implement these options. However, some of the important features are still missing, leaving the citizens with the option to send a text message in order to get the information about the next available bus.

Another crucial issue is the extra cost that the citizens are facing. In the research conducted during the 2012 when the system has been introduced for the first time, the price of the ticket for one ride has been increased for 10 dinars and started to cost 70 dinars (0,61 euro), while the monthly ticket went from being 2680 dinars to being 3220 dinars, which is almost 28 euro. When we consider that the average monthly salary in Serbia is 42200 dinars (about 360 euro), it is clear that the citizens have to give up almost 8% of their monthly income in order to pay for the public transport that is in a rather poor condition.

Introducing a new application based on open data provided by the government, would not only provide the commuters with the information such as when is the new bus coming, its current location or how to get to the desired destination, but it would also have an option to buy the ticket through the application. All this would lead to a more efficient transportation service that saves citizens' time and money and makes their lives easier. Maybe the revenue of the public authority will not be much higher in the beginning, but on a long term it would lead to having fewer expensesby not having to produce magnetic cards ergo not having to put several machines that read these cards in every vehicle. Also, the prices of the tickets could be lower, so the public transportation would stop being a privilege that only people with higher salaries can afford themselves to use, and it would become a right that every tax payer should have.

Furthermore, some of the applications that provide services such bus schedule or maps with places where traffic jams are possible to happen will be presented in order to show

what's currently missing on the market and how it can be improved with the increased release of open data on the internet and the implementation of the open data application.

4.2.1 Bus Plus

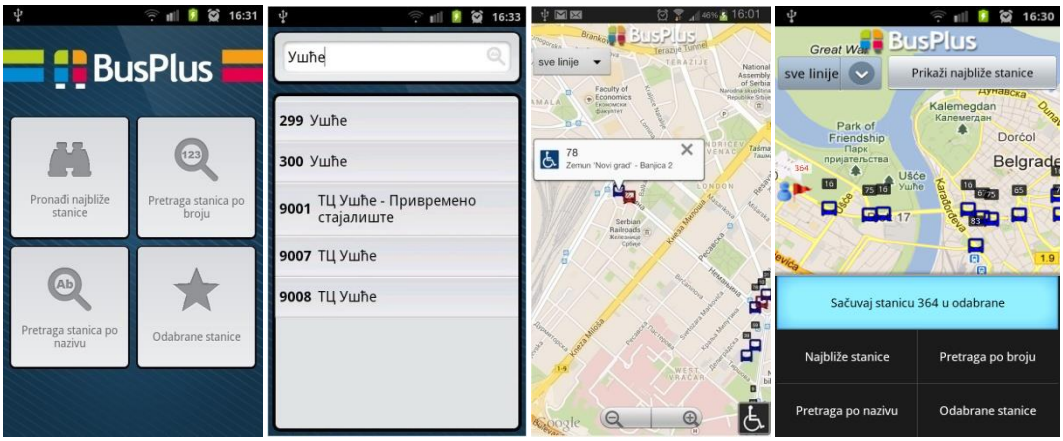


Figure 8 BusPlus application. Source: https://www2.busplus.rs/lt/android-bus-plus-aplikacija

This application is currently being updated and its main features should allow commuters to get real-time information about public transport based on their location. Also there will be a special option where users can track the buses or trams that have special entrance for disabled persons.

Even though the idea is good and the application would somehow help citizens to use the transport services more effectively, there are still some disadvantages. Firstly, the application is only available in Serbian language, which makes it impossible for tourists to use it, and leaves you with limited number of potential users. Another downside is that it is only available on the Google Play store for Android platform and it is not possible to download it on iPhone or to access it on the web. And lastly, it is mainly focused on getting the information about the bus stops and the arrival of buses and trams. Any other information about the traffic in general is missing, so it is only helpful for the people using the public transportation ant not the ones that are going by car or want to find out something about the roads and highways for example.

4.2.2 BelCam

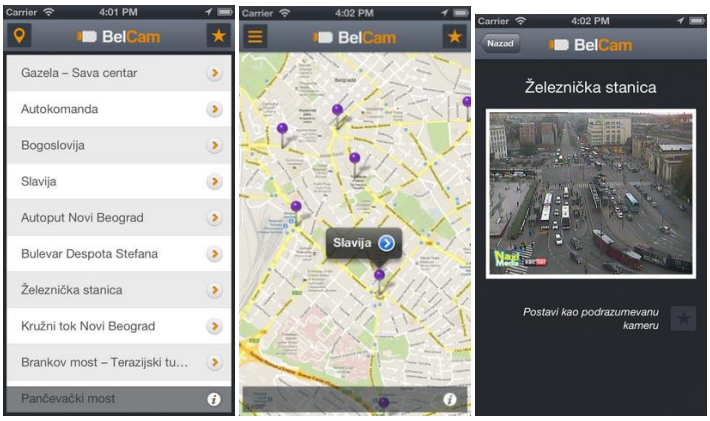


Figure 9 BelCam application. Source: http://www.ianatomija.info/2012/11/belcam-saobracajne-kamere-u-beogradu.html, 2012

BelCam gives us the missing information for the car travellers on the BusPlus application. It uses the cameras all over the city of Belgrade in order to collect and show the current state of the traffic in the city. The application is showing you over the camera the streets that might interest you based on your location. But in this case we are missing the version for the android platform, as well as the option to be in touch with the public transportation.

Finally, it would be possible to get this kind of information over the Google Maps, but most of the services are not available in Serbia and those that are could only be used with an iPhone.Therefore, the main idea is to create an application that combines all the features of currently available services on the market by using the open data provided by the government of Serbia. That will make public transport more effective and more appealing, leading to improved quality of life and constant cooperation between the government and the citizens.

4.3 Keystakeholders

Like with most of the applications developed using the open data, this one as well should primarily serve to the citizens, or in other words, to the taxpayers who made possible the collecting of the data.But even though the main users of the application would be the residents of Belgrade, the public sector could benefit from it as well, since it will make the public transport more appealing and therefore widely used. Also, it will be very helpful for the tourists and foreigners allowing them to discover the city and plan their journey through a user-friendly application.

Furthermore, using the CATWOE analysis, main goals, functions and potential users of the proposed service will be shown, as well as its impact on the environment.

4.3.1 CATWOE analysis

- **Clients**

  All commuters moving through the city of Belgrade that want to check the bus schedule, receive a travel alert along their route, avoid traffic jams and get all the necessary information for the safest and easiest traveling.
  In order to use the application, all the users will have to create an account and register. Also, they will need to enable the location on their device in order to allow the real-time tracking. That way the distance between the real world and the visual representation on the maps will be minimized.

- **Actors**

  The main actors will be the admin of the application and the city officer that will implement the system, feed data and maintain it.

- **Transformation**

  Key activities:

  - to have a view on when to expect a bus/tram
  - to see possible traffic jams along the route
  - traffic notifications (accidents, road incidents and repairs, estimated waiting on the pay tolls)
  - planning the safest and fastest traveling
  - to share the information about the traffic, roads, delays etc.

- **Worldview**

  The application will encourage the wide use of the public transport, mainly in the city of Belgrade and over some time in all the bigger cities in Serbia.
  It will facilitate the life in the city by making it possible to plan any journey and that way avoids traffic jams and reduces accidents as much as possible.
  Also it will enhance the trust in government and encourage citizens to actively participate in the society evolution by interacting with other users, sharing and receiving the everyday information.

- **Owner**

  The owner of the applicationwill be the city of Belgrade. All the data is mostly non-sensitive and has an impact on the civil society so it can be shared openly.

- **Environment**

There are some legal constraints that need to be respected in order to develop an application in accordance to the Serbian law, previously stated in the Serbia's letter of Intent to join Open Government Partnership (OGP, 2014):

- Respect for gender equality
- Protection of personal data
- High level of data security within the system

The application will be free for anyone to download, but since it will be based on the data collected using the tax money, that will be the primary mean of financing. It will allow constant maintenance of the application, as well as the release of the updates.

4.3.2 FURPS+

With purpose of meeting all the users' requirements by focusing on functional, as well as on non-functional aspects of the proposed application, the FURPS+ analysis will be conducted.

Functionality

- Registration – the users of the application will be able to choose whether they want to register and create their profile for more personalized experience or they will continue using it anonymously.
- Permission – the users should allow the application to access their location for more accurate information regarding the transportation service.
- Notification – in order to receive notifications about current state of the traffic, alerts about accidents or possible danger on the road, the users should enable this option when setting up the application.

- Localization – Serbian and English language version, to fulfill the needs of local citizens, but also of the tourists and foreigners
- List of services – list of all online services such as buying the ticket for the specific type of transport, bus tracker, report the transport issues and alerts, information about buses accessible with wheelchair etc.
- Online help – portal that enables the communication between the users of the application, as well as with the governmental departments that are providing the service
- Security – data exchange via secured protocol

Usability

- Simple, user-friendly interface
- Mobile application – available for both iOS and Android platform
- One-stop-shop application with all the necessary information, but easy to navigate

Reliability

- Accurate, real-time information based on sets of open data provided by the government
- Assured communication with other users, as well as with the governmental department providing the services
- Availability 99% (every day, during the week as well as on weekends, with special information during the holidays)
- System and database backups (daily, weekly or monthly)

Performance

- The size of the application will be approximately 40MB

Supportability

- Frequent updates will be available in order to keep up with the possible changes in the transportation sector

Non-functional features

- Personal data protection according to the legislation on personal data protection

4.3.3 Use Case Diagram

In the following chapter, the Use Case Diagram will be provided with the purpose of showing what the application will actually do and how the users will interact with it through several, different use cases.

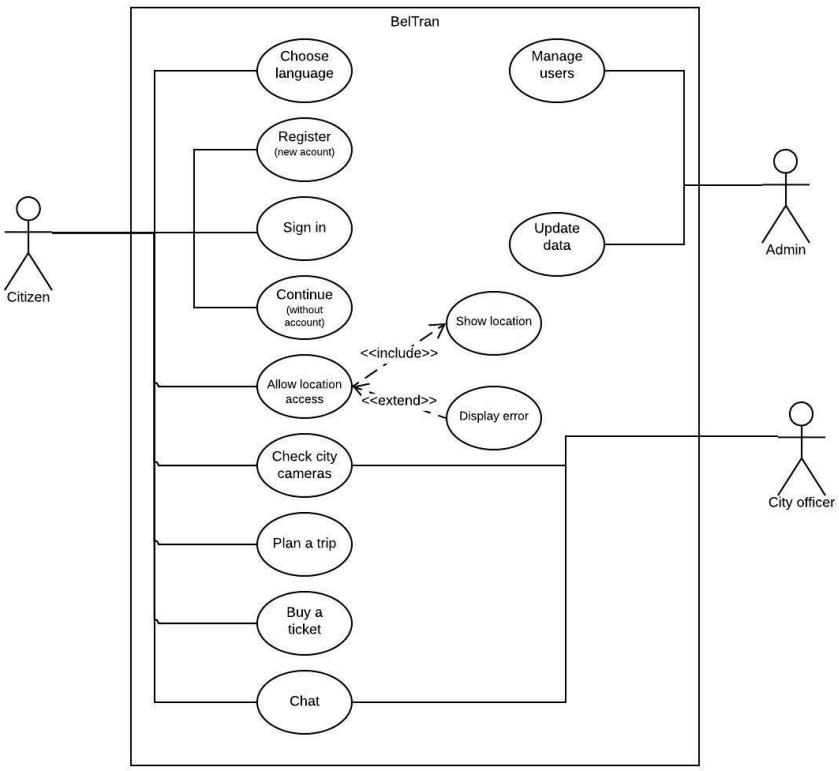


Figure 10BelTran application use case diagram. Source: own, 2018. Created in lucidchart.com

The primary actor is the Citizen using the BelTran application in order to fulfill its daily needs when it comes to the public transportation services. By downloading the application and doing anything with it, the citizen is the one that initiates the usage of the proposed system. Meanwhile, the secondary actor is the City Officer as the provider of the necessary information that is going to feed into the application. The City Officer will react only in case the Citizen does something with the application, e.g. he requests the access to the city cameras.

Each of the use cases represents a certain action available within the system, such as choosing the language, allowing the application to access user's location, registering to the system, viewing the schedule of all the available buses, trams or trolleybuses, planning the trip, purchasing the ticket for the desired trip with the corresponding tariff or chatting with other users of the application, as well as discussing issues and possible improvements with the relevant governmental department. Therefore the Citizen will have a relationship with all of the above mentioned use cases, while the City Officer does not necessarily interacts with all the activities provided by the system. For example, if the citizen wants to register and create a profile, it is an action that is completed within the application and it does not require the involvement of the government.

Finally, the admin of the application will be in charge of managing the users and their requests, as well as of making sure that the data provided by the government is always up to date.

5 Results and Discussion

After conducting the case study and designing the prototype of the open data application, in this chapter the main focus will be on summarizing the results of the research, evaluating the proposed application through the SWOT analysis, but also by comparing it to the existing one provided by Miami-Dade county in Florida. That way, the desired outcome will be shown, as well as the encountered issues and constraints that would prevent its achievement.

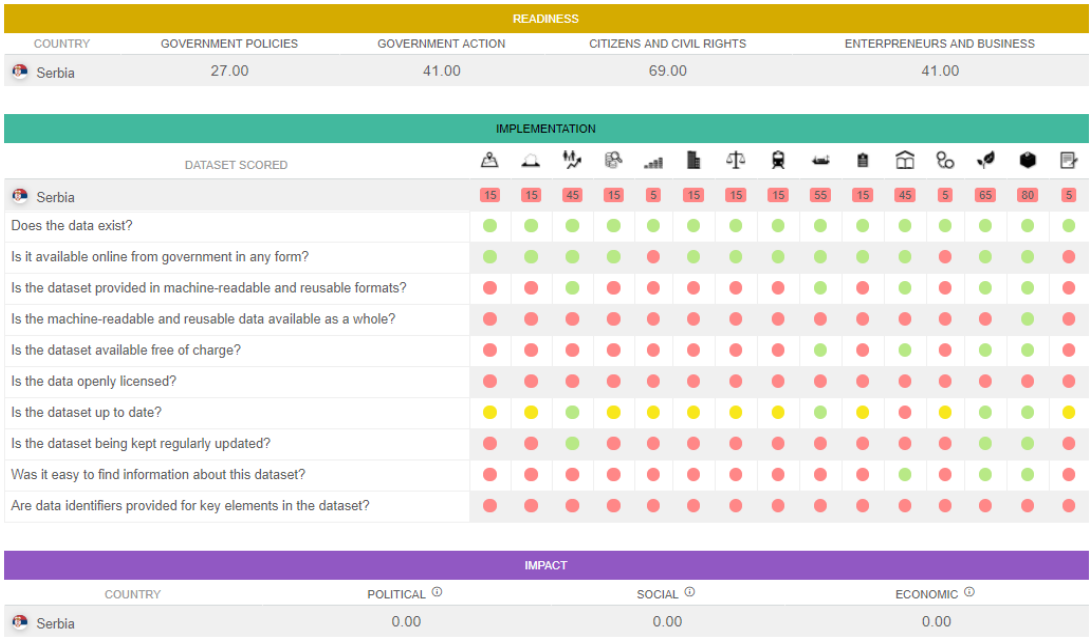
5.1 Results of Serbia's openness

When conducting this research and proposing the application that is based mainly on open data availability, one of the crucial parts was analyzing the achievements of the Action Plan that the government of Serbia has published in the 2014. Mainly because transparency, free access to information and e-government were stated as the top priorities of the plan and those are also the pre-requisites when it comes to designing an open data application.

In cooperation with United Nations Development Program, the Republic of Serbia has been working on implementing the principle of transparency in the administration of public services. For that purpose they have developed the National Open Data Portal that should provide citizens with large datasets and give them the possibility to be in touch with the government's activities and accomplishments. () Moreover, this portal should serve as a place where the citizens can interact with public authorities and directly participate in the management of the open data.

However,according to the Open Government Partnership (OGP, 2014) "*thecommitment had some marginal change, but was minor in terms of its impact on government openness."* The number of datasets is limited, 83 in total, and it mainly provides information about the education, environment or health services in the country. The API that is provided in order to help developers to access the content of the portal is not being very used, since the lack of the information is evident.

Furthermore, in order to get accurate information about the open data availability in Serbia and its progress in terms of e-government development, the author of this thesis used several tools and obtained following results.



READINESS

COUNTRY	GOVERNMENT POLICIES	GOVERNMENT ACTION	CITIZENS AND CIVIL RIGHTS	ENTERPRENEURS AND BUSINESS
Serbia	27.00	41.00	69.00	41.00

IMPLEMENTATION

DATASET SCORED															
Serbia	15	15	45	15	5	15	15	15	55	15	45	5	65	80	5
Does the data exist?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Is it available online from government in any form?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Is the dataset provided in machine-readable and reusable formats?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Is the machine-readable and reusable data available as a whole?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Is the dataset available free of charge?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Is the data openly licensed?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Is the dataset up to date?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Is the dataset being kept regularly updated?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Was it easy to find information about this dataset?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Are data identifiers provided for key elements in the dataset?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

IMPACT

COUNTRY	POLITICAL	SOCIAL	ECONOMIC
Serbia	0.00	0.00	0.00

Figure 11 Country details. Source: Open Data Barometer, 2016

Open Data Barometer measures the open data impact in the countries all around the world by taking into consideration three main principles:

1. Readiness
2. Implementation
3. Impact

On the Figure 10 the results show that in Serbia the readiness for open data initiative is rather low, at least when it comes to government policies, since it only measures 27 out of 100 points. The sector that is mostly prepared is the one that focuses on citizens' engagement and civil rights, which was also stated in the OGP report. This shows that most of the efforts were put into fighting the corruption, but the progress in the implementation of the open data was minor.

The overall implementation of the open data is low in all segments, but for the purpose of this case study the emphasis was put on the results concerning public transport. The table shows that the quality of the dataset is marked with 15 out of 100 points which is explained by the fact that the data cannot be found in the machine-readable and reusable format, that the datasets are only partially up-to-date, since they are not being regularly updated, and finally, finding the information about these datasets is rather complicated and challenging.

All this makes it obvious that open data has zero impact on business, politics and civil society.

Moreover, it shows one of the main barriers when it comes to developing an open data application that would improve the public transport services, since not only this sector has poor results, but also the one related to the map data. And the two are mutually dependent.

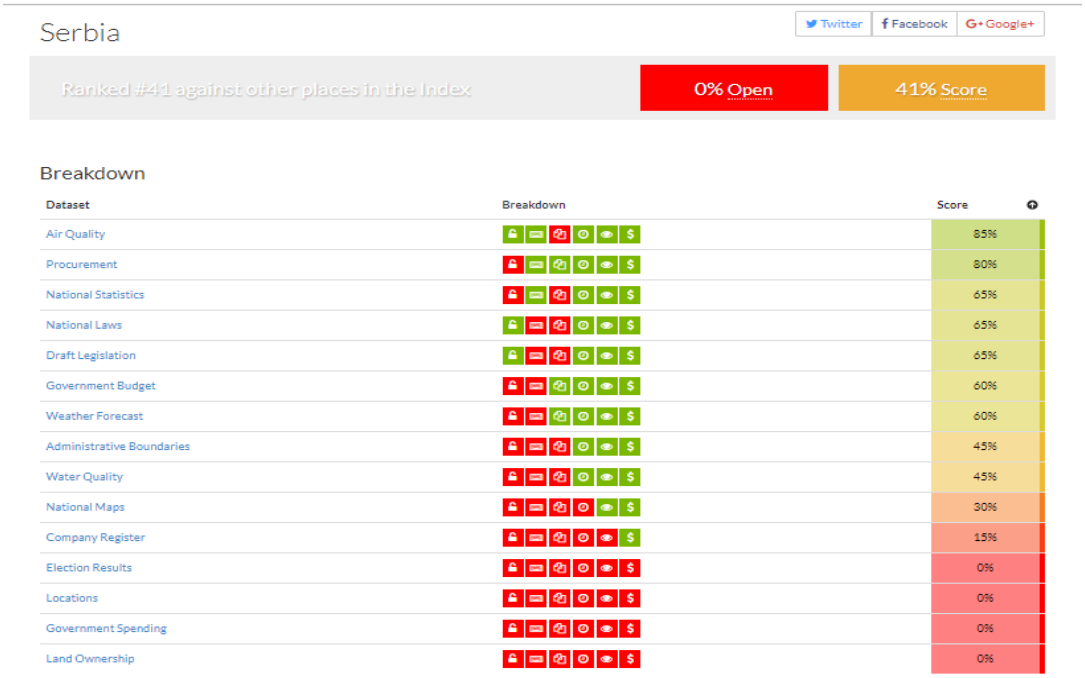


Figure 12 Serbia's rank against other places in the index. Source: Global Open Data Index, 2015/2016

Another tool is the one that is mainly run by the civil society and it is called **Global Open Data Index** (GODI). The criteria used to measure the openness of the government is based on the Open Definition, which means that the available content should be freely used, modified and shared by anyone for different purposes. All this is done through a survey

where civil society has a great impact on informing the government about the missing data and how it could be improved.

In case of Serbia, even though some of the categories are different than the ones shown in the OGP measurements, the overall result is mostly the same. The openness of the country is shown again to be zero percent, and when compared to other countries it ranked 41. Here public transport and map data fall under the category “Locations” which is one of the least developed. In addition to not being openly licensed, up-to-date and accessiblein an open and machine-readable format, it is also determined that the data is neither publicly available, nor downloadable at once free of charge.

After conducting this research and getting these results it became clear why there is still no available application that would facilitate the usage of the public transport.

5.2 Comparison of applications

In order to show what the constraints are when it comes to developing a public transport application based on the usage of the open data in Serbia, the author of this research decided to compare it with the available application provided by Miami-Dade County that works on the same principle. Through this comparison it will be discussed what are the pre-requisites for creating a fully functional application, as well as what could be possible improvements in order to achieve the same for the city of Belgrade.

Miami-Dade Transit Tracker application is a tool provided by Miami-Dade County with purpose of helping its users to track their ride, plan a trip and get real-time information about transit services in the Greater Miami area. The application has many features that are being constantly updated and improved. Apart from providing the estimated arrival time of buses and trains or enabling to see the current location of your desired transport through Live Tracking, this tool also provides the Current Service Updates that allow commuters to see whether the bus routes are being detoured or have different schedule due to a holiday. Moreover it has Nearby option that shows popular destinations in the County which could be explored using transit, which makes this application convenient not only for the citizens of Miami, but also for the tourists. The Feedback Zone section is intended for customers to submit complaints, concerns, comments and suggestions that could lead to a better performance of these services. This

shows that the application is fully developed with the intention of providing open, transparent information from Miami-Dade County to its citizens, while encouraging them to interact with public authorities and directly participating in shaping the services that are meant to be used by them.

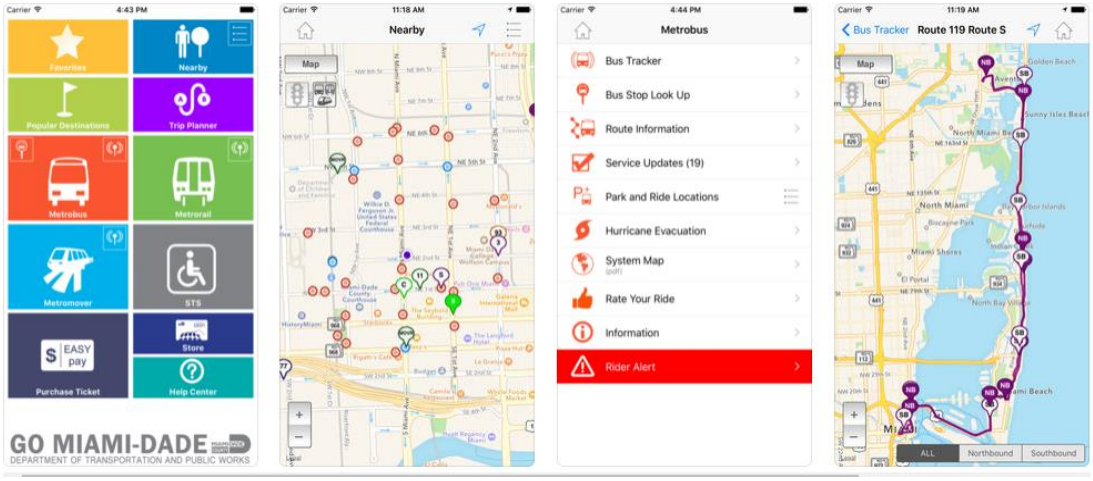


Figure 13 MDT Tracker. Source: https://itunes.apple.com/us/app/miami-dade-transit-tracker/id464426407?ls=1&mt=8 , 2018

BelTran application that was proposed in this research as an online service that would help Belgrade citizens to get most out of the public transit is meant to be developed in the similar style as the Miami-Dade Transit Tracker, but with some additional features that will allow buying a ticket for different fares or accessing city cameras, which means that will work on improving the overall traffic condition in the city. Moreover, the feedback zone was designed as a chat where users are interacting with public authorities, but also between themselves.

But, the main concern when developing this kind of application is getting the data. Miami-Dade County has a fully functioning open data portal that provides all the necessary information for citizens and the application developers. The data is accessible and downloadable in multiple formats, but most importantly it has an API. Developers of the Miami-Date Transit Tracker are using the Socrata Open Data API which allows them to programmatically access the open data resources provided by the government. It offers the Getting Started guide where everything can be learned about finding the API endpoint or

building filters and queries. Furthermore it allows them to add, update, or delete data within the dataset which makes it possible to maintain and improve this transit application.

As it was presented earlier through the results obtained about Serbia's openness, this kind of information provision by the government of Serbia is clearly missing and that is a major constraint when it comes to developing an application of this type. In order to be able to develop the one that has been proposed in this thesis, it is necessary to first overcome several barriers and fill the existing gap in the field of open data provision, as well as to make the existing API at the National Open Data Portal fully functional. The corner stone could be cooperating with the independent open platform in Serbia called Data Center. The platform that was created with a purpose of helping activists, journalists and researchers to easily access datasets containing public information for more accurate stories, analysis or campaigns, came to releasing data about economic classification, list of municipalities, results of elections or information about budget revenues. Along with its users, Data Center works on getting the government to offer useful and valuable data that would allow citizens to be well informed, as well as to be able to participate in the decision making process. Therefore, the idea is to make the information about the public transport open and available through the existing API provided by the government. This implies being able to access the map and location-related data so that developers can work on creating an application such as the one proposed in this case study. Furthermore, not only the performance of the public transport would be improved, but also the performance of the city of Belgrade in general including its citizens.

5.3 SWOT Analysis

Through the SWOT analysis, the main issues that could have an impact on the application will be considered. In order to successfully develop the proposed service, it is important to be aware of its strengths and weaknesses which are directly related to application's features and characteristics. Alongside, the opportunities and threats will show the external factors, such as competition, market or technological development.

Strengths	**Weaknesses**
• First open data application in Serbia • Free of charge • More efficient and effective public transportation • Direct interaction between citizens and government • Real-time information • Available on iPhone and Android platform • User-friendly design	• Not available on Windows desktop • At the beginning, provided only for the city of Belgrade
Opportunities	**Threats**
• Making it available for others cities in Serbia • Providing a web platform as well • Adding more services,such as special transportation service that provides information about available services for disabled citizens	• Similar applications that have been or are planned to be developed by competitors • Difficulties in open data provision by the government

Table 1 SWOT analysis of the mobile application "BelTran". Source: own, 2018

6 Conclusion

The main objective of the thesis was to understand the process of analysis and design of open data application based on the case study conducted on the city of Belgrade, Serbia. The main focus was put on the current state of the public transport services, as well as the online services that are provided for the citizens in this field. After doing an extensive business analysis and comparing the available applications, the author of this thesis came to a conclusion that there is a large gap on the market that could be filled by making governmental data public and designing a new application. This led to achieving the objective and successfully creating a prototype that shows the main features of an open data based application.

The first partial objective was to review the main concepts of e-government in order to understand open data and from where it emerged. These concepts mainly include communication and exchange of information between citizens and the government through the use of the latest technologies. It has been shown how this kind of governmental provision of services leads to a more effective handling of administration, while encouraging citizens to take part in the decision making process. But, not only the collaboration and participation is the core feature of this service. It has been determined that the third pillar of the e-government is the transparency, and in order to fulfill it, it is necessary to introduce and embrace open data. Through this, the connection between these two terms has been made.

The second partial objectivewas to examine the current state of open government in general, but also to obtain the information especially focused on Serbia. The overall conclusion is that the open government is considered to be a next level of the e-government, but both are dependent on each other and connected by the open data with the end goal of reinventing the way the government provides its services. When it comes to Serbia, it was determined that there is a certain tendency towards the open government. But, even though they published the Action Plan in cooperation with Open Government Partnership that contains several commitments, only the one concerning Public Administration Website Harmonization and the Law to Free Access to Information of Public Importance has been marked as a starred commitment. The government is still

working on it, but so far the overall changes and results had minor impact on government openness.

The third partial objective was focused mainly on determining what the currently available electronic services in Serbia are and how they serve the public transport sector. Through the comparison of currently available applications on the market, it has been determined what is missing and how it can be improved. The conclusion was that the existing services are too expensive despite the fact that the quality and the quantity of the available features are rather poor. Also, they have not been changed or updated since 2012, mainly because what is missing is the access to open map and data location. It is safe to say that, until the government of Serbia does not fulfill the commitments regarding the open government in general, it will not be possible to work on the improvement of the public services in particular.

The fourth and final objective was to propose an application as the possible solution based on all the collected information relevant to the topic. The prototype was successfully designed using justinmind tool and the main features that an open data public transit application should have were shown.

As previously mentioned, some limitations for the development of this kind of service were encountered. The lack of open data and the API that should be provided by the National Open Data Portal of Serbia is the stepping stone that is necessary to overcome in order to proceed with the creation of the application. However, the author considers that this research can contribute the efforts that are constantly being made by the Data Center in Serbia to get the government to release the datasets that are meant to be public and that would eventually lead to Belgrade becoming a smart-city. Moreover it could help citizens to become aware of the importance of the data and the power of the information. This way they could see that it is their civil right to access it, but also to feed into it by interacting with each other, and with public authorities.

The UN advocate for the value of open data, Shaide Bodiee, said: *"Open data is a tremendous enabler to improve life and democratize societies."* (2017)And that is the idea that the author of this thesis tried to show, hoping to be a part of this road towards the next level of democracy, which is the openness.

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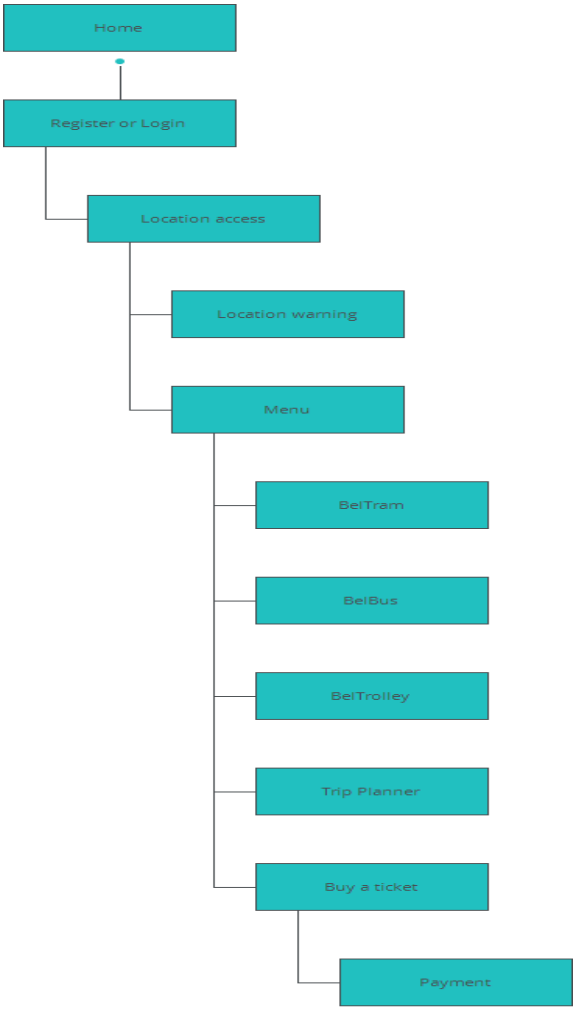
8 Appendix

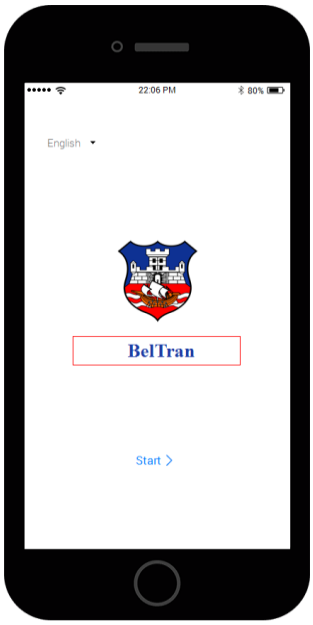
8.1 Prototype of the application

8.1.1 Site Map/BelTran



8.1.2 Screens

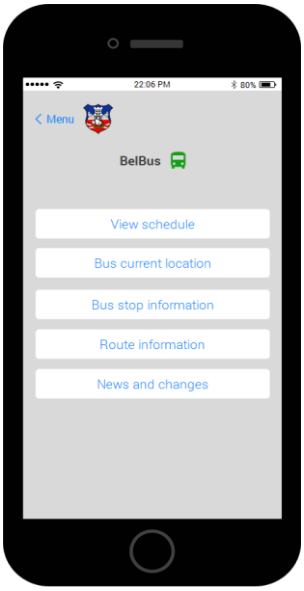
Home screen

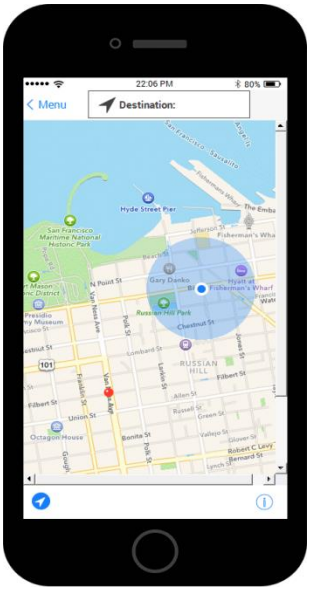


BelBus

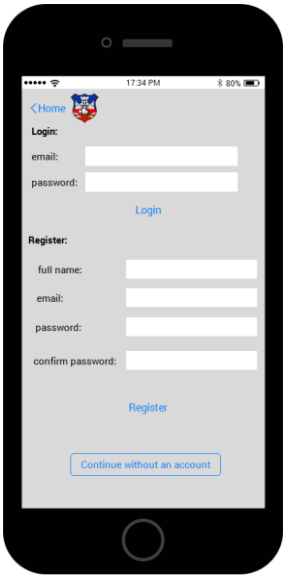
Menu

Trip Planner

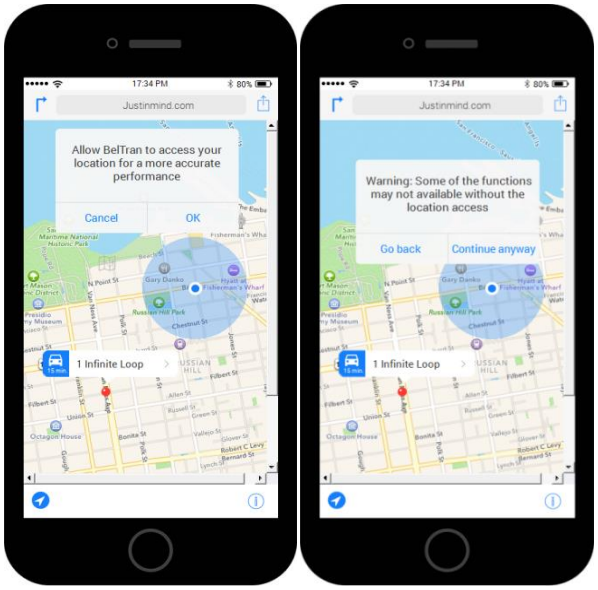

22:06 PM
80%
Menu
BelBus
View schedule
Bus current location
Bus stop information
Route information
News and changes


22:06 PM
80%
Menu
Destination:

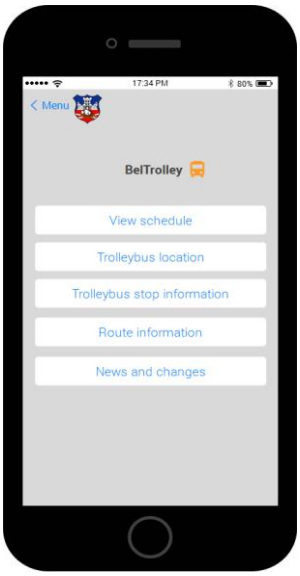
Login or register



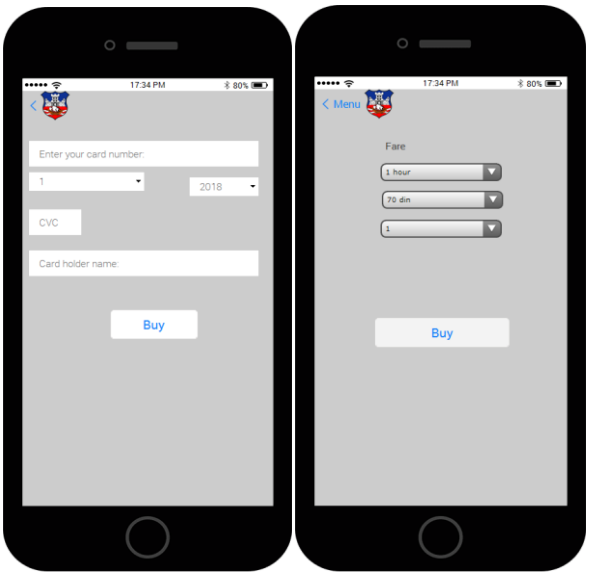
Location access



Trolleybus menu



Payment option



8.2 Technical report

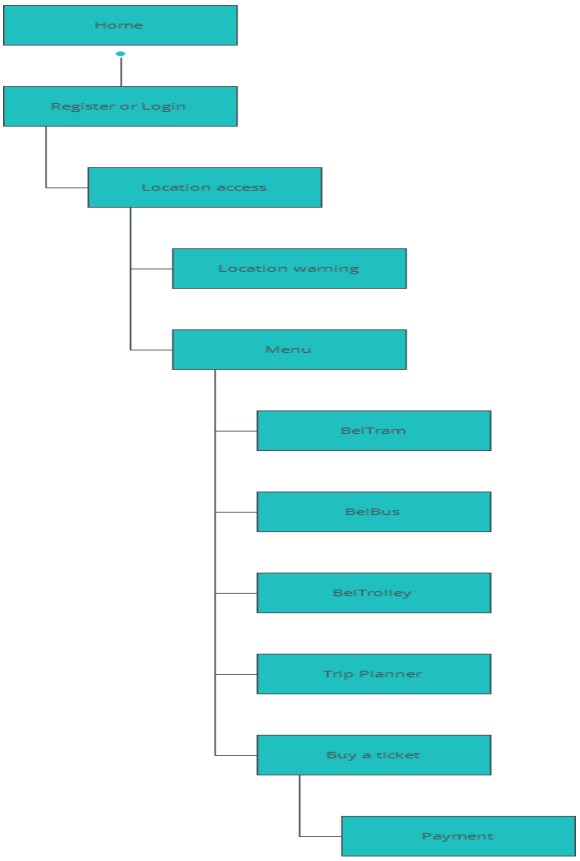
BelTran

05/03/18 17:53

Author: Jovana Milivojevic

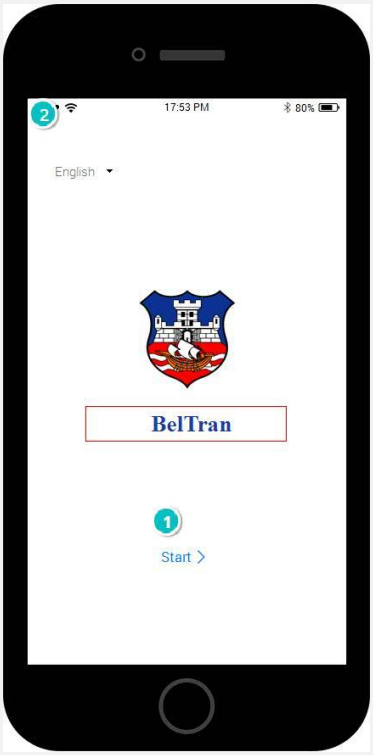
File name: BelTran.vp

Site Map


Home
Register or Login
Location access
Location warning
Menu
BelTram
BelBus
BelTrolley
Trip Planner
Buy a ticket
Payment

Screens

Home

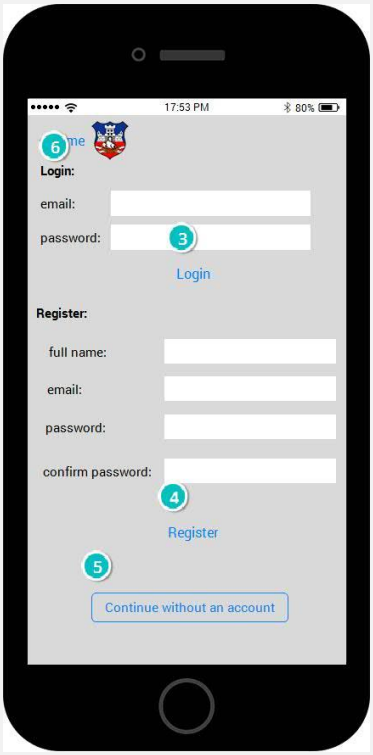


Interactions

on Click: goes to 'Register or Login' with effect: slide left →

on Click: goes to 'Register or Login' with effect: slide left →

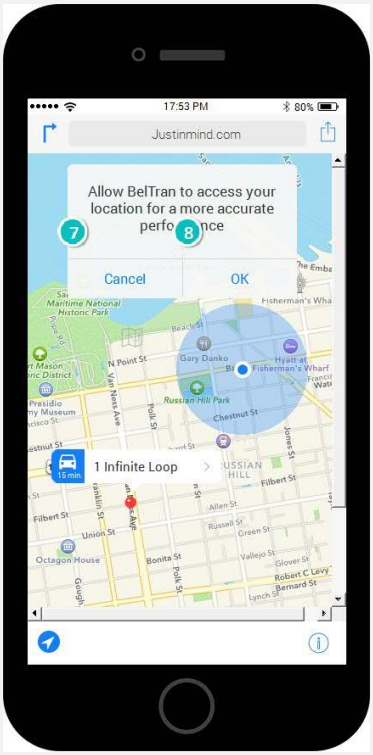
Register or Login



Interactions

1. **on Click:** goes to 'Register or Login' with effect: slide left → goes to 'Location access' with effect: slide left →
2. **on Click:** goes to 'Location access' with effect: slide left →
3. **on Click:** goes to 'Location access' with effect: slide left →
4. **on Click:** goes to 'Home' with effect: slide right →

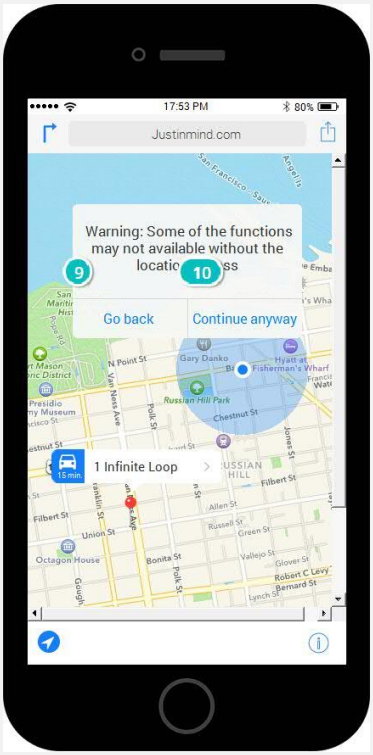
Location access



Interactions

on Click: goes to 'Location warning' with**on Click:** goes to 'Menu' → effect: slide left →

Location warning



Interactions

on Click: goes to 'Location access' with effect: slide right →

on Click: goes to 'Menu' → goes to 'Location access' with effect: slide right →

Menu

Interactions

on Click: goes to 'BelTram' with effect: slide left →

on Click: goes to 'BelBus' →

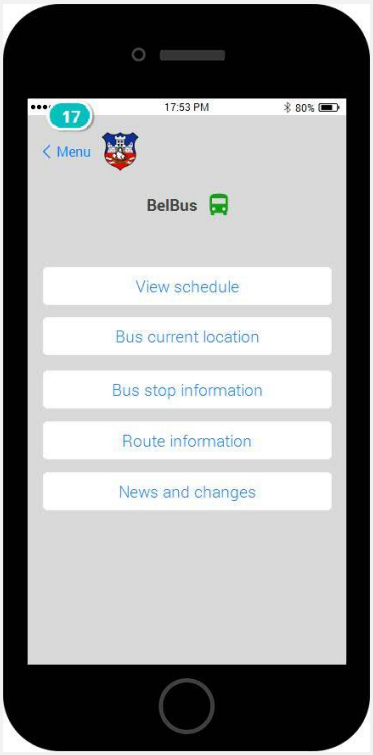
on Click: goes to 'BelTrolley' with effect: slide left →

on Click: goes to 'Trip Planner' with effect: slide left →

on Click: goes to 'Home' with effect: slide right → goes to 'Home' →

on Click: goes to 'Buy a ticket' with effect: slide left →

BelBus

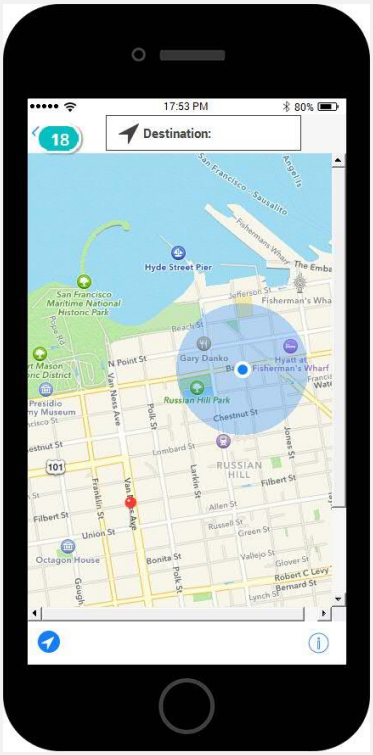


Interactions

on Click: goes to 'Menu' with effect: slide right

→

Trip Planner

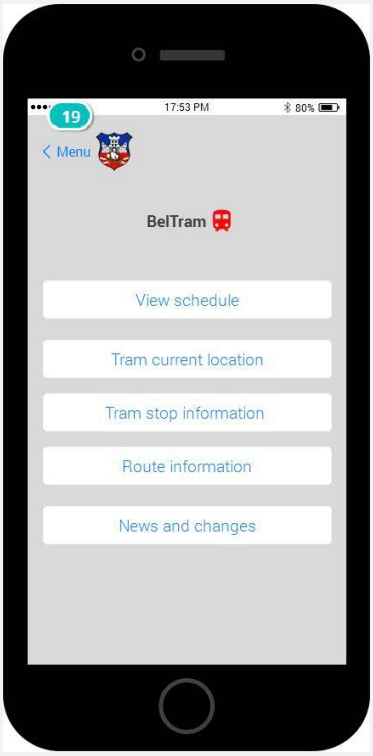


Interactions

on Click: goes to 'Menu' with effect: slide right

→

BelTram

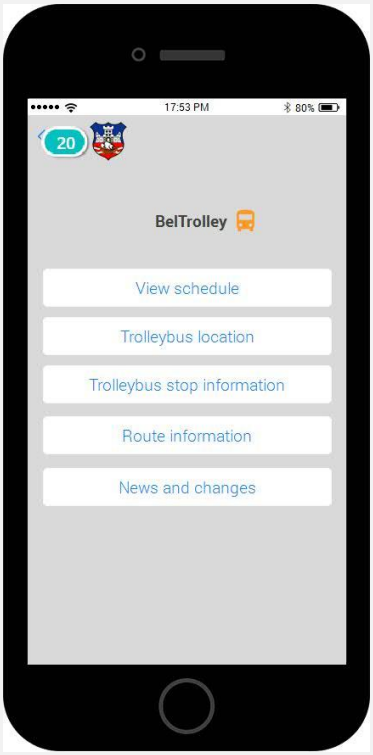


Interactions

on Click: goes to 'Menu' with effect: slide right

→ goes to 'Menu' with effect: slide right →

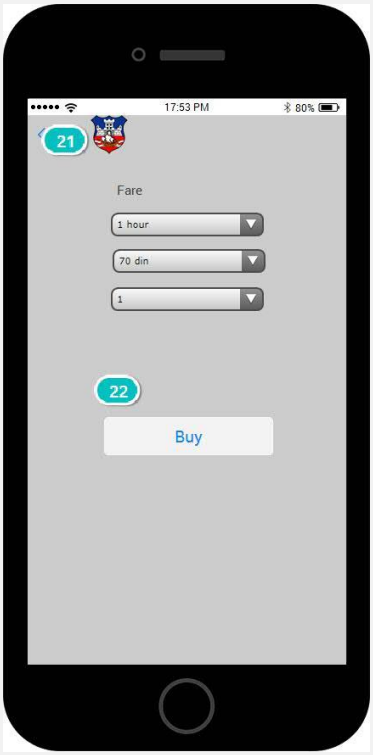
BelTrolley



Interactions

on Click: goes to 'Menu' with effect: slide right → goes to 'Menu' with effect: slide right → goes to 'Menu' with effect: slide right →

Buy a ticket

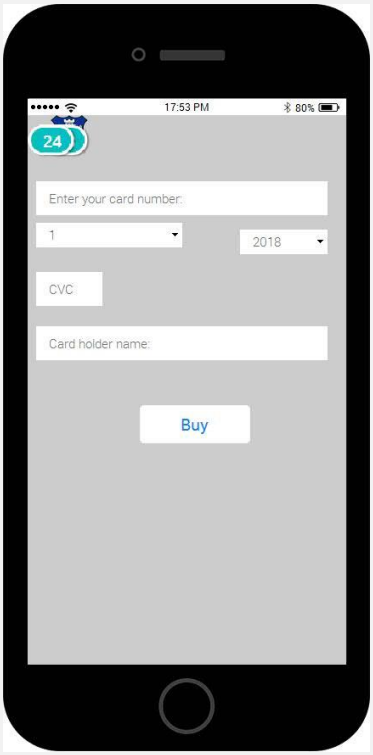


Interactions

on Click: goes to 'Menu' with effect: slide right → goes to 'Menu' with effect: slide right → goes to 'Menu' with effect: slide right → goes to 'Menu' with effect: slide right → goes to 'Menu' →

on Click: goes to 'Payment' with effect: slide right →

Payment



Interactions

on Click: goes to 'Menu' with effect: slide right effect: slide right → → goes to 'Menu' with effect:

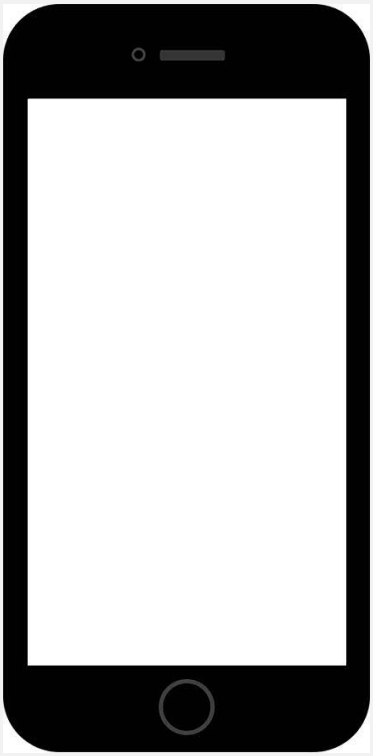
slide right → goes to 'Menu'

with effect: slide right → goes to 'Menu' with effect: slide right →

on Click: goes to 'Buy a ticket' with

Templates

Template 1



Scenarios

default

8.3 UN e-government top countries

E–Government Development Index - Top 10 Countries	
Country	*Index*
United Kingdom	0.9193
Australia	0.9143
Republic of Korea	0.8915
Singapore	0.8828
Finland	0.8817
Sweden	0.8704
Netherlands	0.8659
New Zealand	0.8653
Denmark	0.8510
France	0.8456

E–Participation Index Top 11 Countries	
Country	*Index*
United Kingdom	1.0000
Japan	0.9831
Australia	0.9831
Republic of Korea	0.9661
Netherlands	0.9492
New Zealand	0.9492
Spain	0.9322
Singapore	0.9153
Canada	0.9153
Italy	0.9153
Finland	0.9153

Figure 14UN E-government Survey 2016. Source: E-Government Knowledge DataBase, https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2016

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