

Czech University of Life Sciences Prague

Faculty of Economics and Management

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Bachelor Thesis

Open data in public administration: a web application

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Declaration

I declare that I have worked on my bachelor thesis titled “Open data in public administration: a web application” by myself and I have used only the sources mentioned at the end of the thesis.

In Prague on date 16th March, 2015

Mario Nivardo Villanueva Duran

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I would like to thank to my tutor Ing. Miloš Ulman, Ph.D. and all other persons, for their advice and support during my work on this thesis.

Otevřená data ve veřejné správě: webová aplikace

Open data in public administration: a web application

Souhrn

Tato práce se snaží prozkoumat a poskytnout přehled o veřejných datech ve veřejné správě a jejich aktuální aplikaci. Je hlavně zaměřena na veřejné data Ministerstva vnitra České Republiky. V tomto století "Open Data" jsou relativně nová, získávají na popularitě s nástupem internetu, protože zastávají úlohu v měnícím se vztahu mezi občany a vládou. V tomto století mnozí občané již nepřijímají pasivní přístup zastupitelské demokracie. Otevřenou Vládu je třeba vidět v kontextu práv občanů: právo, aby se aktivně podíleli na procesu stanovování agendy a rozhodování.

Klíčová slova: Veřejná Data, Veřejná Správa, Otevřený Přístup, Otevřený Znalosti, Snadno Přístupné, Veřejná Účast, Opětovné Využití a Redistribuce Dat.

Summary

This thesis attempts to explore and provide an overview of Open Data in a public administration and its current applications. Mainly focused on Open Data of Ministry of the Interior of The Czech Republic. In this new century Open Data is relative new, gaining popularity with the rise of the Internet, because stands for the changing relation between citizens and government. In this new century many citizens no longer accept the passive stance representative democracy held for them. Open Government is to be seen in the context of citizens' rights: the right to actively participate in the process of agenda-setting and decision-making.

Key words: Open Data, Public Administration, Open Access, Open Knowledge, Easily Accessible, Universal Participation, Reuse and Redistribution Data.

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1. Introduction

The Bachelor thesis is focused on Open Data of Ministry of the Interior of the Czech Republic. Foreigners living in Czech Republic must apply for a Biometric Residence Permit once a year. This tedious process, which takes between three and five months, is mandatory for all foreigners. During these months the Ministry of the Interior publishes, on its official website an updated Excel file once a week, which contains all approved applications for temporary, long-term and permanent residencies and employee cards in Czech Republic. After downloading and opening the attached Excel file, the application number must be found manually using the receipt number. This searching process is tedious work for those without experience in using this type of file format or just do not have enough time to search it.

This thesis is focused on this specific topic after talking with many foreign students and non-students who must apply annually to prolong their Biometric Residence Permits in Czech Republic. For this reason it is absolutely necessary to have an available web application, to make this search process faster and easier. Because this opens dataset needs to be available in a format understandable to everyone, the website must include a user-friendly interface that will make the search process simpler without downloading any file.

2. Objective and Methodology

2.1 Aim of thesis

This Bachelor thesis focuses on Open Data in public administration. The main goal of the thesis is analyze and design user-friendly web application to make the searching process faster and easier based on Open Data of Ministry of the Interior of The Czech Republic. Partial goals include:

- Making a literature review of the current state of Open Data use in public administration.
- Making an analysis and designing a user-friendly web application based on Open Data of Ministry of the Interior of the Czech Republic.
- Evaluating the developed application and formulating conclusions.

2.2 Methodology

Methodology is based on the study and analysis of literature on Open Data in the public administration, accounting for all advantages and disadvantages. The practical part is focused on analysis and design of a web application based on an open dataset from the Ministry of the Interior of the Czech Republic. Final conclusions will be constructed with a synthesis of theoretical knowledge and practical outcomes.

- Part I is an Introduction to the problem to be solved and why it was chosen to be worked on this open dataset of Ministry of the Interior of the Czech Republic.
- In Part II is the Objective and Methodology used to solve the problem.
- In Part III, literature review of the current state using Open Data in public administration.
- Part IV, is dedicated to evaluate the practical part with a general description of the problem, SWOT analysis, design and implementation.
- Part V, conclusion of the application developed titled “*status of my applications CZ*”.

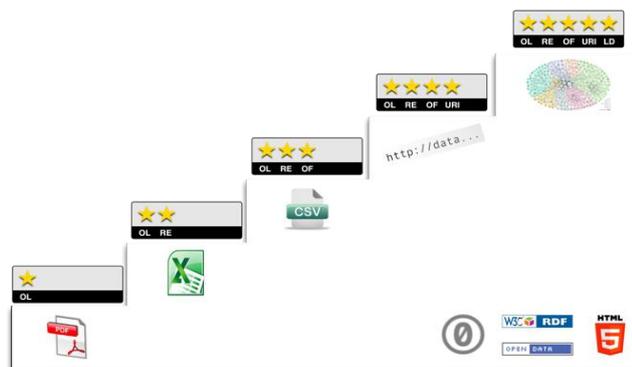
3. Literature review

3.1 Basic concepts

The principle of **Open Data** means that certain information must be available and easily accessible to everyone to use, modify and share as they wish, without restrictions from copyrights, patents or other mechanisms of control.

“Open Data and a change of mindset is the next step in the internet revolution” - Sir Tim Berners-Lee. He has suggested a 5 Star Open Data for Open Data.”^[1] Figure 1.

Figure 1. 5 Stars of Open Data



Source: Tim Berners-Lee, 2014

- ☆ Published data must be available on the Web, in any format but under an open license.
- ☆☆ Published data must be available as structured data (e.g., Excel instead of image scan of a table).
- ☆☆☆ Published data must use non-proprietary formats (e.g., CSV, Comma Separated Value instead of Excel).
- ☆☆☆☆ Published data must use URI's to denote things, so that people can point at the published data.
- ☆☆☆☆☆ Published data must be linked to other data to provide context.

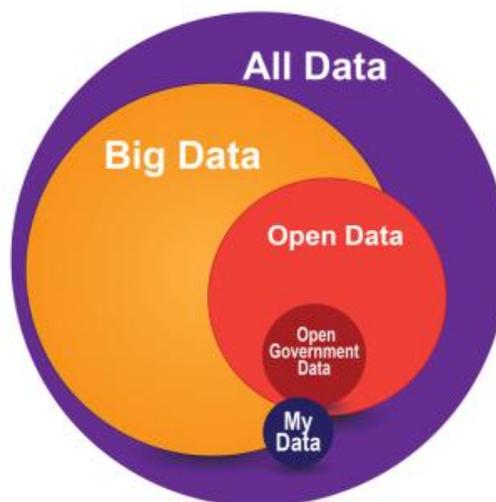
“A piece of data or content is open if anyone is free access, use, modify, and share it – subject, at most, to measures that preserve provenance and openness.” - opendefinition.org.^[2]

Open Data can be related to the word “interoperability” (the ability of making systems and organizations work together), which denotes the ability of diverse systems and organizations to work together. In this case, to interoperate different datasets.

The term *Open Data* is relatively new, gaining popularity with the rise of the Internet and World Wide Web, especially, with the launch of Open Data government and public entities initiatives such as: *Initiative for transparent data infrastructure*^[3] and *Czech Statistical Office (CZSO)*.^[4]

Open Data is seen to correlate with concepts like big data; a term referred to data sets that are voluminous, diverse, and timely.^[5] Open Data is also seen to be associated with concepts like “MyData” which involves sharing information collected about an individual or organization. Figure 2.

Figure 2. Open Data Relations to other Data Concepts



Source: Manyika, 2013

Open Data does not mean that government or public entities must open all their data to the public. There are concerns preventing this, for instance: copyrights, fear of loss of control, and lack of resources needed to Open Data. If the government made all personal information accessible, the privacy of everyone would be compromised. In

other words, *Open Data* means that whatever data is released should be released in a specific way to allow the public to access it without having to pay fees or be unfairly restricted in its use.

Open Data needs to be technically open as well as legally open. Specifically, the data needs to be available in bulk in a *machine-readable* format, and satisfy the following conditions: Access, Redistribution, Reuse, Absence of Technological Restriction, Attribution, Integrity, No Discrimination Against Persons or Groups, No Discrimination Against Fields of Endeavor, Distribution of License, License Must Not Be Specific to a Package, License Must Not Restrict the Distribution of Other Works. ^[6]

3.2 The key features of openness.

- **Availability and access:** data must be available as a whole in an easily accessible, modifiable and convenient form. This is preferably by downloading over the internet.
- **Reuse and redistribution:** data must be machine-readable and provided under terms that permit reuse, redistribution and intermixing with other datasets.
- **Universal participation:** everyone must be able to use, reuse and redistribute as they wish. without any discrimination to certain groups or persons.

3.3 The key reasons of openness.

The reason to be open depends on the type of data. However, there are common reasons such as:

- **Transparency:** This requires the material to be open, so citizens can freely use, reuse and share those data with other citizens and mainly, citizens need to know what their government is doing.
- **Releasing social and commercial value:** Data is becoming to be a key resource for social and commercial activities. The vast majority of useful data is created

by the government, so these data can help drive the creation of innovative business and services.

- **Participation and engagement.** With engagement, means that citizen must be able to be in contact with their government, not only at an election period. With participation, means that citizens need to be more informed, involved in decision-making and be able to contribute with their governance. ^[7]

3.4 Potential use of Open Data

There are many kinds of Open Data that have potential uses such as: ^[7]

- **Cultural:** Data about cultural works. For example: titles and authors that are generally collected and held by galleries, libraries, archives and museums.
- **Science:** Data that is produced as part of scientific research. For example: Life Sciences & Biomedicine, Physical Sciences, Technology, etc.
- **Finance:** Data such as government public accounts. For example: expenditure and revenue, and other information on financial markets.
- **Statistics:** Data produced by statistical offices. For example: The CZSO office provides statistics about Agriculture, Census, Culture, Education, etc. ^[37]
- **Weather:** Relevant data to understand and predict the weather and climate.
- **Environment:** Information related to the natural environment. For example: the quality of rivers and seas and level of pollutants in our atmosphere.
- **Transport:** Data on public transport. For example: timetables, routes and on-time statistics.

3.5 Open Data benefits

Open Data plays an important role in spurring innovation, growth, and job creation. From new business models to innovation in local governance, Open Data is

being quickly adopted as a valuable resource at many levels and can be used in innovative ways to create useful products and tools that could help citizens navigate more easily. These benefits can multiply as more businesses adopt Open Data practices modeled by government and share their own data with the public.

Making data more “liquid” (i.e., open, widely available, and in shareable formats) is largely argued to have the potential to unlock large amounts value.^[8] As governmental transparency increases, the Open Data is changing the business models and activities in many economic sectors, but it should be taken into consideration that costs, social challenges, and technical barriers also influence the economic impact of Open Data.

3.5.1 Benefits for citizens

The main advantage is that government will be in constant contact with the citizens. This makes the citizens’ participation and collaboration easy and gives them a clearer vision about administrative actions and services, as well as how it is investing the contribution and managing public resources.^[9]

The creation of new services and applications by private initiatives or by companies entails new job posts for the citizens.

3.5.2 Benefits for the public administration

The main advantage is that the administrations can significantly reduce the cost of expensive application, because they can now be designed by citizens or companies with their own ideas, creating new applications from these Open Dataset.^[9]

3.5.3 Benefits for companies

The main advantages are provided by the possibility that companies can produce economic value by using these data published by the Public Administration, and creating a new services and applications from these Open Data.^[9]

3.6 Applications using Open Data in Czech Republic

Below are some examples of applications that use Open Data developed by Opendata.cz such as: ^[10]

- **Results of inspections by Czech inspection authorities:** The app shows results of inspections made by Czech inspection authorities from 2012 and contains data linked to the business registry. ^[11]
- **Map of Public Contracts:** The app shows public contracts, contracting authorities and suppliers on a map and computes basic statistics for each contracting authority and supplier. ^[12]
- **Public Budgets:** The app shows budgets (financial incomes and outcomes) of Czech municipalities. It provides different statistics and comparisons. ^[13]
- **Linked Schools:** The app shows data about schools linked from different official registers of Czech Republic. ^[14]
- **Parliament elections results 2006 and 2010:** The app shows results of elections to the parliament in 2006 and 2010. ^[15]
- **Czech Crime:** A non-profit, non-governmental initiative of *Otevřená společnost, o.p.s.* Czechcrime.org was made by *Geographisc.cz* ^[16] and has been supported by *Think Tank Fund* ^[17] program Open Society Foundations.

Police publishes monthly statistics in complicated and unfriendly Excel tables. With Czechcrime.org, data become available and understandable to anybody who is interested. The data can be used under BY-NC-SA Creative Commons license. ^[18]

3.7 Applications using Open Data around the world

Another examples of projects using Open Data around the world such as:

- The British *where does my money go*, show how the tax money is being spent by the government. ^[19]
- The Danish website *Folkets ting*, track activity in parliament and the law making processes, so everyone can see what exactly is happening, and which parliamentarians are involved. ^[20]
- The Denmark website *Find naermeste offentlige toilet*, show all the information and location about the Danish public toilets. ^[21]
- The New York website *NYC Dog Walking Advice*, helps to easily find where it possible to walk with dogs, as well as find other people who use the same parks. ^[22]
- Services like *Mapumental*, ^[23] in the UK and *Mapnificent*, ^[24] in Germany aid in finding homes, taking into account the duration of commute to work, housing prices, and how beautiful an area is.
- The Danish *Husets web*, helps to find ways to improve the energy efficiency at home, including financial planning and finding builders who can do the work. It is based on reusing cadastral information and information about government subsidies, as well as the local trade register. ^[25]

3.8 Legal openness

In most jurisdictions, there are intellectual property rights in data that prevent third-parties from using, reusing and redistributing data without explicit permission. In order to make a data available it should have a license on it. For Open Data is recommended to use one of the licenses conformant with Open Definition and marked as suitable for data. ^[26]

Table 1. Recommended conformant licenses

License	Domain	By	SA	Comments
<u>Creative Commons CCZero (CC0)</u>	Content, Data	N	N	Dedicate to the Public Domain (all rights waived)
<u>Open Data Commons Public Domain Dedication and License (PDDL)</u>	Data	N	N	Dedicate to the Public Domain (all rights waived)
<u>Creative Commons Attribution 4.0 (CC-BY-4.0)</u>	Content, Data	Y	N	
<u>Open Data Commons Attribution License (ODC-BY)</u>	Data	Y	N	Attribution for data (bases)
<u>Creative Commons Attribution Share-Alike 4.0 (CC-BY-SA-4.0)</u>	Content, Data	Y	Y	
<u>Open Data Commons Open Database License (ODbL)</u>	Content, Data	Y	Y	Attribution-ShareAlike for data(bases)

Source: Conformant Licenses – Open definition

3.9 Open standards

Generally understood as technical standards which are free from licensing restrictions, Open Data is free from legal or technical clauses that limit its utilization allowing people to share it freely and, with perfect fidelity, are developed in a vendor neutral manner.^[27]

3.10 Technical openness

Data needs to be available as a complete set in a machine-readable format. This means data must be extracted easily and displayed nicely by computer programs, preferably by downloading freely over the internet.^[28]

The most used data formats are:

- **JSON** (JavaScript Object Notation) it is a simple file format that is very easy for any programming language to read. ^[29]
- **XML** (Extendible Markup Language) it is a simple meta language permitting the data interpretation for different language and is a widely used format for data exchange because it gives good opportunities to keep the structure in the data. ^[30]
- **RDF** (Resource Description Framework) it is an XML-based universal model. Permitting the exchange and connection of data and resources through different applications, without losing their meaning, is what simplifies the reuse and the enrichment of web resources. ^[31]
- **RSS** (Really Simple Syndication) it is an XML-based format that arranges frequently updated web content, like news, blogs or podcasts, and it is a commonly used format on the web. ^[32]
- **CSV** (Comma Separated Values) it is a type of plain text document that represents tabulated data in separated columns by using commas and separated lines by using the enter key. Extensions that use this are end in 'csv' or 'txt'. It is very easy to use it and it is often trivial to export the data from an Excel sheet to a CSV. ^[33]
- **ODATA** (Open Data Protocol) is an open protocol that grants queries and selections to be made directly in the provided datasets, and later downloads the resulting result sets. ^[34]
- **Spreadsheets** Microsoft Excel can often be used immediately with the correct descriptions of what the different columns mean and it is easily accessible for users to read.

- **Text Document** Classic documents in formats such as: Word, ODF, OOXML, or PDF may be sufficient to show certain kinds of data, but PDF files are not structured.

There are many other formats more or less structured, like SHP, ODS, and others aimed to wards geographic information in order to be represented in maps, such as KML, WMS, WCS or WFS.

Other formats hinder the data to be opened, like picture data (JPEG, GIF, TIFF, etc.) because machines cannot interpret its content automatically.

3.11 Terms of use

Polices are intended to protect, control and ensure an appropriate use of the published datasets. Before using any datasheet, the user must agree and read carefully a list of terms and conditions.

The following two examples gives a clear idea about the policies of use Open Data in Czech Republic:

a) Declaration of Accessibility of Ministry of the Interior of the CZ:

Information on the website of the Ministry of the Interior is published in a form accordant with the intimation No. 64/ 2008 Col. (the intimation about the accessibility of web pages of public administration for disabled persons) and fulfils all articles of the appendix of the intimation No.64/2008 Col.

The website of the Ministry of the Interior is composed according to the Blind Friendly Web methodic and instructions resulting from the intimation No. 64/2008 Col. ^[35]

b) Conditions for use and further dissemination of the CZSO statistical data:

Can be:

- Disseminated: copied, distributed and communicated to the public.
- Used and quoted in other publications.

- Used commercially.

Under the following conditions:

- The Czech Statistical Office will be indicated as the data source (however, this must not give the impression that the CZSO supports the data user or the way the information is used).
- Statistical data and information will be used only in a way, which does not alter or modify their meaning.

Other conditions for use of CZSO data:

- Statistical data is published according to the Act No. 89/1995 Sb., on the State Statistical Service, as amended.
- Provided that CZSO data are disseminated there is an obligation to mention the terms of this license, preferably by a direct link to this web page.
- Rules regulating the reuse of CZSO documents do not apply to documents covered by intellectual property rights of third parties.
- The CZSO accepts no responsibility or liability whatsoever with regard to the use of data from the CZSO website or any linked external sites.
- The CZSO reserves the right to temporarily restrict access, without notice, to this information for operational or technical reason.

3.12 Open Data in Czech Republic

3.12.1 Ministry of the Interior of the Czech Republic:

The Ministry provides an updated Excel file once a week, which contains all approved applications for *temporary*, *long-term* and *permanent* residencies and *employee cards* in Czech Republic in three basic languages English, Czech and Russian.^[36]

3.12.2 Czech Statistical Office (CZSO)

CZSO is a central body of the state administration of the Czech Republic. It was established on 8 January 1969 by the Act No 2/1969 Sb., passed by the Czech National Council, on establishment of ministries and other institutions of central government of the Czech Republic.

CZSO have divided statistical data for citizens into clearly arranged topics. In each topic it is possible to find at least one of the following types of data:^[37]

- **Data:** Current data as well as long-term development of indicators in time series, are provided in tables and graphs. For example: The population of foreigners in the Czech Republic are published in Excel and PDF formats.
- **Methodology:** Information on data collection and processing. For example: Tourism methodology; capacity of collective accommodation establishments (Number of establishments, rooms, beds, carvans etc).
- **Analyses and commentaries:** Commented development of the given statistical area. For example: Agriculture, there are analyses and commentaries from 2003 till 2015 are published in Word and PDF formats.
- **Related information:** Other useful information and links to the topic.

About the following topics:

- [Agriculture](#)
- [Business Cycle Surveys](#)
- [Census](#)
- [Construction, Dwellings](#)
- [Crime, Accidents](#)
- [Culture](#)
- [Education](#)
- [Elections](#)

- Employment, Unemployment
- Environment
- External Trade
- Financial Data
- Forestry
- GDP, National Accounts
- Health Care, Incapacity for Work
- Industry, Energy
- Information Technologies
- Labour and Earnings
- Living conditions, Household Income and Expenditure
- Population
- Prices, Inflation
- Retail Trade, Hotels and Restaurants
- Science, Technology and Innovation
- Services
- Social Security
- Tourism
- Transportation, Inf. and Communication
- Cross-sectional statistics
- Foreigners
- Gender Statistics
- Senior citizens
- Summary data on the Czech Republic
- Regional statistics
- Macroeconomic Indicators
- European data - ESDS
- International data

3.12.3 Otevrenedata.cz

This website reports on current trends and possibilities of working with the data. Its aim is to promote wider use of Open Data in the Czech Republic. It manages the Open Data of *Fond Otakara Motejla*, of which its aim is it be an effective public administration, supported by an active civil society.^[38]

3.12.4 NADACE Open society fund

The Open Society Fund of Prague supports the development of an open society and promotes systemic changes that will help to strengthen democracy in the Czech Republic. It is a part of the international network called the Open Society Foundations, which was founded by American investor and philanthropist George Soros and today is active in more than 70 countries around the world.

OSF Prague encourages non-governmental and non-profit organizations, civic initiatives, and individuals to actively influence conditions in their region and in their country. The foundation conducts open calls, for proposals through which it distributes grants for promoting human rights, transparency, education, and other areas that help to develop an open and democratic society. Between 1992 and 2011, OSF distributed more than 1.2 billion czk for more than 9,200 projects.^[39]

3.12.5 Open Government Partnership (OGP)

OGP is an international initiative supporting openness, transparency and anti-corruption. The goal of this initiative is to make the governments more open, accountable, and responsive to citizens. Government and civil society are working together to develop and implement ambitious open government reforms. OGP was launched in 2011, starting with 8 countries, and currently has 65 participating countries including Czech Republic indicated on the figure 3.^[40]

Figure 3. Participating Countries



Source: Open Government Partnership

3.12.6 Data blog Cz

Data blog CZ is a platform for creative work with information. It monitors journalism, Open Data, e-democracy, and openness of public administration and online activism.^[41]

3.13 Open Government Data

This is the data produced by government. Data shall be considered open if it is made public in a way that complies with the principles of transparency, releasing social and commercial value and participatory governance as mentioned above in the key reasons of openness.

Governments exist “by and for the people”. The data they collect (or fund others to collect) in the course of carrying out their statutory duties also belongs to the people, and in the 21st century it is fast becoming one of the most valuable public goods we have – yet it often remains inaccessible or unaffordable to the vast majority.^[42]

Open government data can also help us to make better decisions in our own life, and enable us to be more active in society.

3.13.1 Principles of OGD

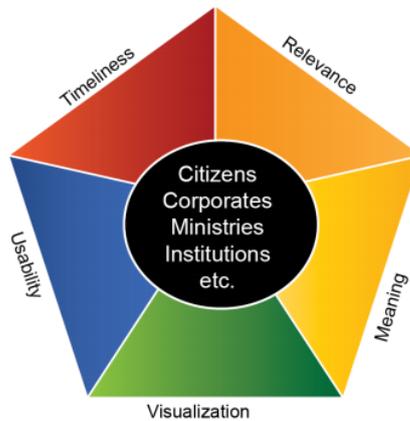
On 7.12.2007, thirty open government advocates gathered in Sebastopol, California and wrote a set of eight principles of open government data.^[42]

- **Complete:** All public data is made available. Public data is data that is not subject to valid privacy, security or privilege limitations.
- **Primary:** Data is as collected at the source, with the highest possible level of granularity, not in aggregate or modified forms.
- **Accessible:** Data is available to the widest range of users for the widest range of purposes.
- **Timely:** Data is made available as quickly as possible to preserve the value of the data.
- **Machine processable:** Data is reasonably structured to allow automated processing.
- **Non-discriminatory:** Data is available to anyone, with no requirement of registration.
- **Non-proprietary:** Data is available in a format over which no entity has exclusive control.
- **License-free:** Data is not subject to any copyright, patent or trademark regulation. Reasonable privacy, security and privilege restrictions may be allowed.
- **Online and Free:** Data must be available on the Internet at no charge or at no more than the marginal cost of reproduction.

- **Permanent:** Data should be made available at a stable Internet location indefinitely and in a stable data format for as long as possible.
- **Trusted:** Published content should be digitally signed or include attestation of publication date, authenticity, and integrity.
- **A presumption of openness:** The presumption of openness rests on laws like the Freedom of Information Act, procedures including records management, and tools such as data catalogs.
- **Documented:** Documentation about the format and meaning of data goes a long way to making the data useful, because it is as important for users to know the data is current as for the data itself to be current.
- **Safe to Open:** Published data online should always seek to publish using data formats that do not include executable content, because otherwise it may be malware.
- **Designed with Public Input:** The public is in the best position to determine what information technologies will be best suited for the applications the public intends to create for itself.

The drive towards Open Data is further driven by the internet access, connectivity, lack of full interoperability, issues of cyber security and other such factors as defined in the Digital Agenda of Europe.^[43] A common assumption when opening government data is that simply supplying more freely and in more formats will lead to more use.^[44] In general, government data that provides value to citizens is characterized by five dimensions. Figure 4.

Figure 4. Dimensions of Government Data Characteristics



Source: Open Data: A paradigm Shift in the Heart of Government. ^[45]

Governments are realizing the need to incorporate their online presence to the interactions of the growing social networks. The growing numbers of users on social networks platforms represent substantial opportunities for governments. Table 2. Social media has opened up unprecedented new possibilities of disseminating information and connecting citizens with governments.^[45] The interactive and instant capabilities and the increasingly pervasive nature of social media technologies can create new ways of democratic participation, pressures for new institutional structures, and processes and frameworks for open and transparency government on an unprecedented scale.^[46]

Table 2. Social media users

1.23	645 750	300	300	70
Billions,	Millions,	Millions,	Millions,	Millions,
2014	2014	2014	2014	2014
On Facebook	On Twitter	On Linked in	On Instagram	On Pinterest
				

Source: Open Data: A paradigm Shift in the Heart of Government. ^[45]

4. Practical Part

In this part will be explained in detail step by step whole precess of the web application developed.

4.1 Description of the problem

After applying for Biometric Residence Permits and fulfilling all requirements according to the type of visa application, the Ministry of the Interior of The Czech Republic publishes an Excel file onto its official website weekly. This file contains all approved applications for *temporary*, *long-term* and *permanent* residencies and *employee cards* in Czech Republic. Everyone students and non-students, who have applied for the Biometric Residence Permits must download this Excel file and search for their receipt number manually.

There are many more disadvantages than advantages of this searching process.

- This is a tedious process because takes between three and five months it means every single week the Excel file must be downloaded until the receipt number is found in the file.
- To perform the search, it is necessary to have Microsoft Office installed on the computer, without it, it will not be possible to open the file, because the file is in Excel format.
- To understand Czech language or at least know the translation for “temporary residency, long-term residency and employee cards” to search the receipt number in the correct sheet because all the titles and sheets names are in the Czech language.
- To have a basic knowledge of Excel, otherwise the search process will take a very long time, since each sheet contains thousands of receipt numbers.

4.2 Analysis of requirements

Because the requirements affect the users, it was necessary to interview many foreign students and non-students who are applying every single year to prolong the Biometric Residence Permits to stay legally in Czech Republic. In the end, they have coincided with the following points:

- They expect a quick search process as easy as possible without downloading an Excel file from the official website of the Ministry of the Interior of the Czech Republic.
- A friendly user interface where it is just necessary to enter the receipt number in a field and then obtain the result of search..
- In Czech Republic are many foreigners from different countries, so it is necessary a multiple languages service.

4.3 Design and prototype of the application

The main goal of this application is to save time in the searching process and make the process easy. For that reason a website has been developed with a friendly user interface, which contains a simple menu called “Search”. Figure 5.

- On the right side the users will be allowed to enter the receipt number.
- On the left side are useful links, linked to the official website of Ministry of the Interior of the Czech Republic.

Figure 5. Web application: with a simple menu SEARCH

The screenshot shows a web application titled "Information for Foreigners" with the subtitle "Status of your application". A blue navigation bar contains a "SEARCH" button. Below the navigation bar, there is a search form with the following elements:

- An example text: "Example: If receipt number of your application is OAM-1234-5/PP-2014 You have just to fill the EMPTY Fields."
- A label "Receipt number" above the input fields.
- Input fields for "OAM-", a slash "/", "-201", and a final empty field.
- A blue "submit" button.
- A verification instruction: "Verify twice your entered receipt number".

On the right side of the form, there is a "Useful Links" section with two links:

- [Ministry of the Interior of The CZ](#)
- [Immigration contacts](#)

At the bottom of the page, there is a blue footer bar with the text "COPYRIGHT".

Source: author: Mario Nivardo Villanueva Duran, 2015.

For the search process it is unnecessary to download any Excel file. It is only necessary to enter the receipt number in the empty fields.

For example, if the receipt number is **OAM-12696/TP-2015**, it will be simply required to enter the highlighted letters in red as is shown in the following figure 6.

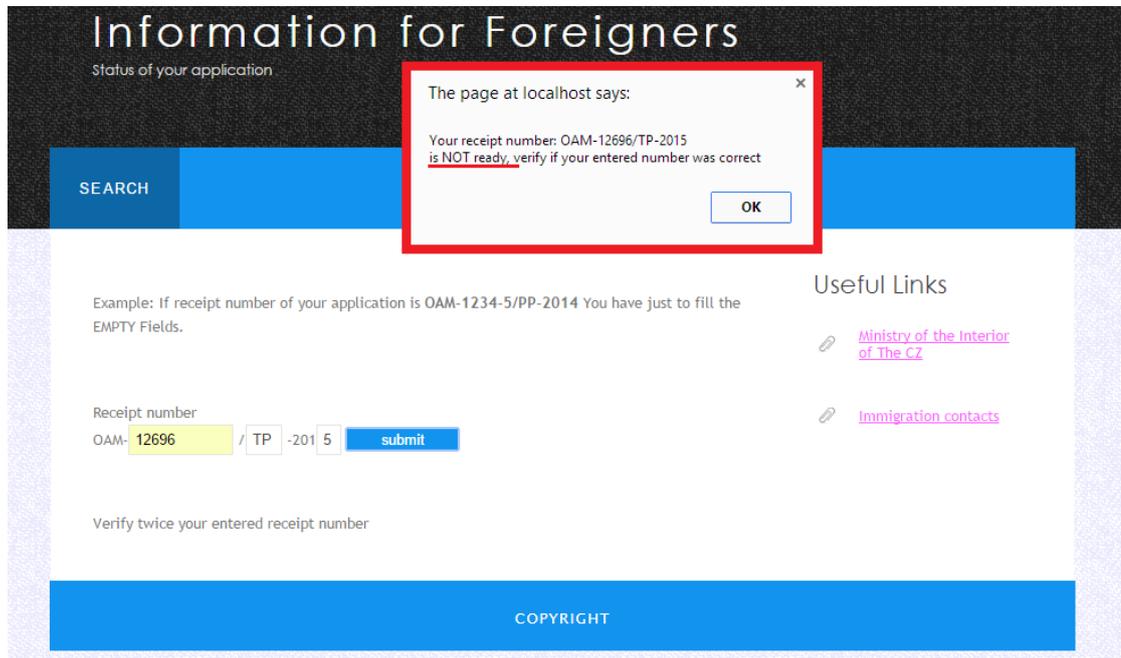
Figure 6. Web application: entering the receipt number

The screenshot shows a web application interface with a dark header containing the text "Information for Foreigners" and "Status of your application". Below the header is a blue search bar with the word "SEARCH" on the left. The main content area is white and contains an example of a receipt number: "Example: If receipt number of your application is OAM-1234-5/PP-2014 You have just to fill the EMPTY Fields." Below this, there is a form for entering a receipt number. The form consists of several input fields: "OAM", "12696", "TP", "-201", and "5". The "12696" field is highlighted in yellow, and the "TP", "-201", and "5" fields are highlighted in red. A blue "submit" button is located to the right of the "5" field. Below the form, there is a text prompt: "Verify twice your entered receipt number". To the right of the form, there is a "Useful Links" section with two links: "Ministry of the Interior of The CZ" and "Immigration contacts". At the bottom of the page, there is a blue footer with the word "COPYRIGHT".

Source: author: Mario Nivardo Villanueva Duran, 2015.

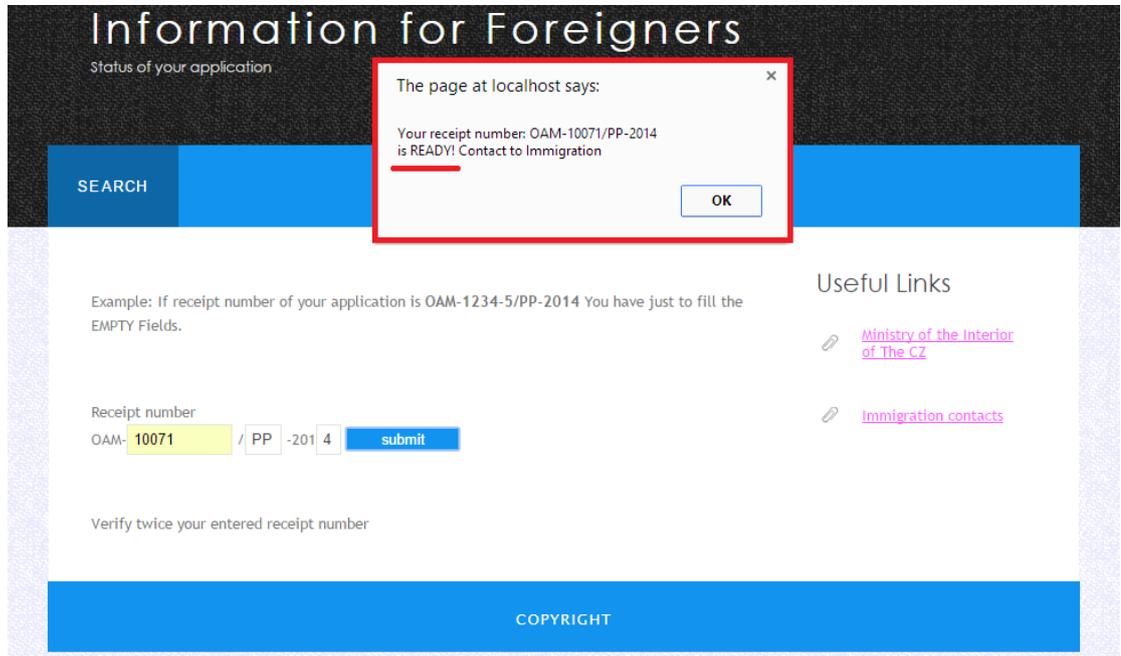
After entering the receipt number and clicked on the “submit” button, the system will search the receipt number entered in the updated Excel file. The file is located on the server. When the system finds the receipt number, the application was APPROVED. Otherwise it has still not been approved. These cases are shown in the following two figures 7 and figure 8.

Figure 7. Successful result of search



Source: author: Mario Nivardo Villanueva Duran, 2015.

Figure 8. Unsuccessful result of search



Source: author: Mario Nivardo Villanueva Duran, 2015.

4.4 Implementation

For the implementation, the programming languages JavaScript, PHP, HTML, CSS, PHPEXCEL open source and XAMP for testing the code were used.

- **JAVASCRIPT:** is a programming language commonly used in web development. It was originally developed by Netscape as a means to add dynamic and interactive elements to websites and is classified as a prototype-based scripting language with dynamic typing and first-class functions. This mix of features makes it a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles.^[47]
- **PHP:** (Hypertext Preprocessor) is a server-side scripting language designed for web development, but also used as a general-purpose programming language and can be embedded into HTML.^[48]
- **HTML:** (Hypertext Markup Language) is the standard markup language used to create web pages. It is written in the form of HTML elements consisting of tags enclosed in angle brackets like <html> and </html>, allowing images and objects to be embedded. It can be used to create interactive forms.^[49]
- **CSS:** (Cascading Style Sheets) is a style sheet language used for describing the look and formatting of a document written in a markup language. In other words, it defines how HTML elements are to be displayed.^[50]
- **PHPExcel:** It is an Open Source Software, It provides a set of classes for the PHP programming language, which allows reading/writing in different spreadsheet file formats like Excel.^[51]

Requirements

- PHP version 5.2.0 or higher
- PHP extension php_zip enabled
- PHP extension php_xml enabled
- PHP extension php_gd2 enabled
- **XAMP:** is a free and open source cross-platform web server solution stack package, consisting mainly of the Apache HTTP Server, MySQL database, and interpreters for scripts written in the PHP and Perl programming languages.^[52]

4.5 Overview of the application

In order to use the system correctly, there are three specific fields to be filled before sending the request to the system.

If the receipt number is **OAM-10071/PP-2014**, there is needed to fill only three fields as is shown on the following figure 9.

Figure 9. Fields to be filled

Receipt number

OAM- / -201

1 2 3

Source: author: Mario Nivardo Villanueva Duran, 2015.

When the user fills out the form above and clicks the submit button, the form data is sent for processing to a PHP file named “search.php”. The form data is sent with HTTP POST method “\$_POST”.

Then the **PHPEXcel** library is used to read the Excel file, which contains all approved applications stored in three sheets: *temporary*, *long-term*, *permanent* residencies and *employee cards*. The titles are in Czech as shown in the following Figure 10.

Figure 10. Excel file containing all approved applications

TRVALÉ POBYTY PERMANENT RESIDENCE	
Období vydání rozhodnutí/decisions issued during:	
1.1. 2014 - 23.2. 2015	
Benešov	
1.	OAM-27296/TP-2012
2.	OAM-29059/TP-2012
3.	OAM-4910/TP-2013
4.	OAM-6947/TP-2014
5.	OAM-6950/TP-2014
6.	OAM-9369/TP-2014
7.	OAM-17474/TP-2014

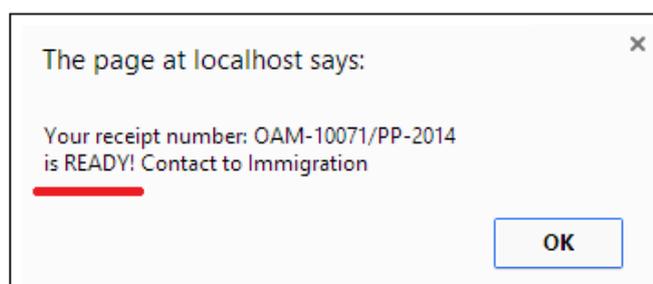
Dlouhodobé a přechodné pobyty	Zaměstnanecká karta	Trvalé pobyty
1	2	3

Source: Ministry of the Interior of the Czech Republic

In order to verify if the receipt number is on the Excel file, the function **booleanApplication**(\$receiptNumber, \$objPHPExcel), is used. This uses two input parameters. The first parameter is the receipt number and the second parameter is the Excel file. If the search is successful, the function returns TRUE. Otherwise returns FALSE.

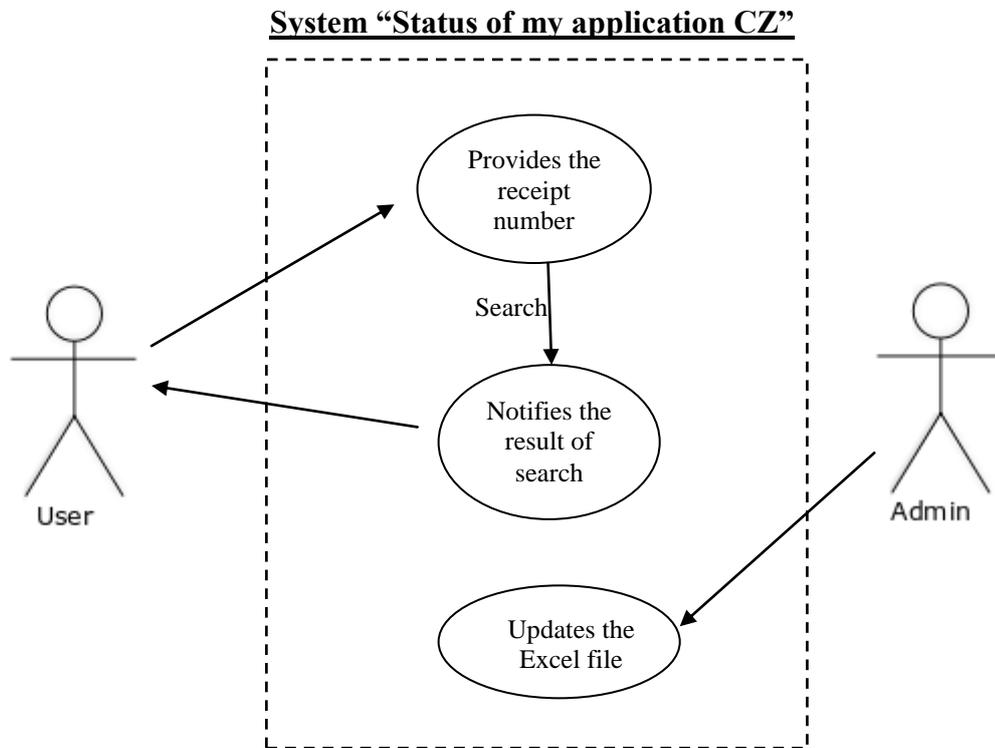
Finally, JavaScript is used to show the result of a search, as it is shown on the following Figure 11.

Figure 11. The result of the search using JavaScript



Source: author: Mario Nivardo Villanueva Duran, 2015.

4.5.1 User Case Diagram



Purpose: To Show if the visa application was processed or not by Ministry of the Interior of the Czech Republic.

Summary: This web application is not providing any other services. User and Admin are only the actors.

User: A person who will use the system to search the receipt number.

Administrator: A person who will be constantly updating the Excel file. Because the Ministry of Interior updates the Excel file weekly.

5. Results

5.1 Evaluation of Application

Unfortunately, there currently does not exist an application providing this kind of services to the foreign in the Czech Republic. As was mentioned above, the foreigners must search their receipt number manually over thousands of applications numbers provided by the Ministry of the Interior of the Czech Republic in Excel format.

This kind of service would help all foreigners, saving them time and making the search process easier. This would assist many people, because there are many foreigners applying to prolong the Biometric Residence Permits every day in the Czech Republic.

The following two tables and graph show the total approved applications from 1st January 2014 to 31st January 2015. There are 8 906 approved applications.

Table 3. Total number of approved applications by each city or district

Decision issued from 1st January 2014 to 31st January 2015			
	Residencies		Employee cards cards
	Temporary and Long-term	Permanent	
Benešov	41	29	7
Brno	465	124	135
Chomutov	102	24	40
České Budějovice	2	0	12
Frýdek-Místek	39	14	14
Hradec Králové	95	39	28
Jablonec nad Nisou	173	78	73
Jihlava	31	20	12
Jindřichův Hradec	24	8	0
Karlovy Vary	126	18	11
Kladruby	156	140	22
Klatovy	61	21	6
Kutná Hora	104	35	31

Decision issued from 1st January 2014 to 31st January 2015			
	Residencies		
	Temporary and Long-term	Permanent	Employee cards cards
Mladá Boleslav	56	25	29
Ostrava	88	50	31
Pardubice	72	34	25
Písek	60	40	23
Plzeň	149	65	40
Praha - Nad Vršovskou horou	0	1102	0
Praha - Cigánkova	923	2	289
Praha - Koněvova	1311	0	289
Praha - Nad Štolou	137	2	45
Praha - Zborovská	134	0	74
Přerov	85	36	22
Příbram	59	13	32
Trunov	41	18	0
Ústí nad Labem	186	29	27
Zlín	65	21	7

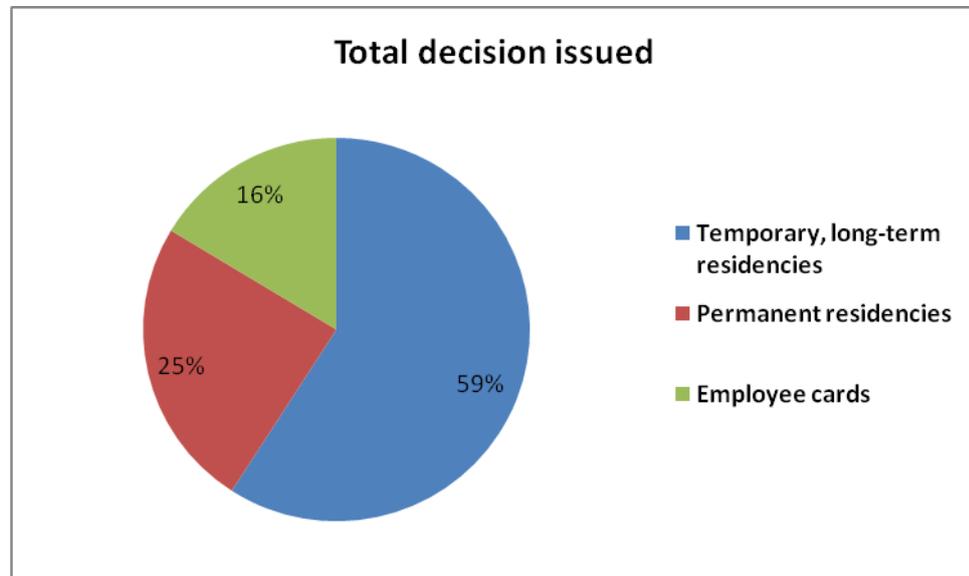
Source: Ministry of the Interior of the Czech Republic

Table 4. Total of approved applications

Decision issued from 1 st January 2014 to 31 st January 2015	
Temporary, long-term residencies	4785
Permanent residencies	1987
Employee cards	1324
TOTAL	8096

Source: Ministry of the Interior of the Czech Republic

Graph 1. Total approved applications from 1st January 2014 to 31st January 2015



Source: Ministry of the Interior of the Czech Republic

5.2 Comparing with other similar European Applications

5.2.1 Italian application

Italian state police offer a simple user interface where the applicant has to enter the file number consisting of 10 characters or the registered mail code, consisting of 12 characters, relating to the application for the residence permit as shown on the following Figure 12.

Applicants can also be informed by SMS with the day, time and place where they can collect the residence permit, but this is only available in specific cities.^[53]

Figure 12. Italian application

The screenshot shows the website of the Italian Polizia di Stato. At the top, there is a navigation menu with links: "Chi siamo", "Le questure", "Per il cittadino", "Multimedia", and "Comunicazione". Below the menu is a search bar with the text "cerca nelle questure". The main content area is titled "Residence permit" and includes a language selection dropdown set to "English". Below this are buttons for "Italiano", "English", "Español", "Français", "Русский", and "العربية". A red box highlights a text input field labeled "File number or registered mail code". Below the input field is a note: "Note: Enter the file number (10 characters) or the registered mail code (12 characters) relating to the application for your residence permit. In addition to the notice displayed by this system on the status of your application, you will be informed via SMS about the day, time and place where you can collect your residence permit. SMS service will not be provided by the Questura in Bologna, Naples, Modena, Padua, Caserta and Genoa, which will continue to use their own systems." A "Submit" button is located at the bottom of the form. The footer of the page includes the Polizia di Stato logo and the text "Ti trovi qui: Home > Le Questure sul web > Stranieri".

Source: Polizia di Stato, Italy

5.2.2 Spanish application

The Spanish government, through the Ministry of Justice, allows to the applicants to check the state of their applications procedures at any time online. For example, to check how the procedures are going, applicants must fill a form in the format as indicated in the following Figures 13 and 14.^[54]

Figure 13. Spanish application “how are my procedures going?”

The screenshot shows the website of the Spanish Sede electrónica (Ministerio de Justicia). At the top, there is a navigation menu with links: "Formalities", "General information", and "Services". Below the menu is a search bar with the text "Search". The main content area is titled "Status of my application" and includes a "View all services" link. Below this is a text block: "You can check the state of your application procedure at any time, provided this information is available. To do so, go straight to the specific application file and select the 'Check the state of your application [...]'" option. If you wish to do this now, you may go to the [electronic procedures](#) page for this office and search for the procedure of your interest. For example: If you would like to check the status of your application for Spanish nationality through residency, go to the [list of procedures](#) and look for [Spanish nationality through residency](#). There, you will find a section called [Online status check](#)". Below the text block are links for "Share", "Print", and "Send by e-mail". A red box highlights a section titled "Status of my application" which contains a pencil icon and the text "And how are my procedures going?". Below this is a section titled "Verification of documents by means of the CSV" and a section titled "Frequently used formalities" which includes a list of items: "Spanish citizenship by residence", "Marriage Certificate/Certification", and "Birth Certificate/Certification". The footer of the page includes the text "© Ministry of Justice", "Site Map", "Accessibility W3C WAI-RR", "Legal notice", "Contact", and "Navigation Guide".

Source: Ministry of Justice, Spain

Figure 14. Form of the Spanish application

Application details

*N.I.E.:

File Number

* Application Type:

* Number:

* Year of Application:

* Order No.:

* Introduzca la palabra que aparece en la imagen:

Cambiar palabra



Source: Ministry of Justice, Spain

5.3 SWOT Analysis

This is analysis of the proposed application to evaluate its internal strengths and weaknesses, as well as its external opportunities and threats

5.3.1 Internal Strengths

- User-friendly interface.
- Provides only obligatory information.
- Quick and easy search process.
- Useful and relevant content.
- Uses new format of Excel files “xlsx”
- Uses a sophisticated PHPEXcel library to read the Excel file.

5.3.2 Internal weaknesses

- Manual downloading of the Excel file from the official website of Ministry of the Interior of the Czech Republic and uploading the Excel file to the server.

5.3.3 External opportunities

- New technologies to improve user experience.
- New design to make the search process easy.
- Updating the time consuming technology used by Ministry of the Interior of the Czech Republic, which would provide a more efficient means on information retrieval for citizens.

5.3.4 External threats

- Upgraded browser software
- Even though there are no similar web services yet, there is a possibility that it will be on the market one day.
- If Ministry of the Interior of the Czech Republic will stop providing the information openly, the workflow of the data will change causing the service to have no information to work with.

6. Conclusion

The main goal of the thesis was to analyze and design a user-friendly web application to make the searching process faster and easier based on Open Data of Ministry of the Interior of the Czech Republic. The application was developed successfully with a simple user-friendly interface, covering the requirements proposed by the interviewed users. Hoping all foreigners who are daily applying to prolong the Biometric Residence Permits can use the new proposed system in the very near future.

Partial goal of this thesis was a literature review of current state of Open Data use in public administration. There was made a brief analysis of public entities such as: Ministry of the Interior of The Czech Republic, Czech Statistical Office, Otevrenadata.cz, Nadace Open Society Fund, Data blog and Open Government Partnership (OPG). OPG is an international initiative supporting openness and transparency with 65 countries around the world including Czech Republic. The current applications using Open Data in Czech Republic developed by Opendata.cz was also mentioned.

The goal of this web application “*Status of my application CZ*” as any other systems is to be updated according to the new users requirements. The next closest target is to develop a multiple languages platform, because in Czech Republic are many foreigners from different countries, so it is necessary a multiple languages service.

In order to make users able to use this new proposed system, it has been engaged in a conversation with the Ministry of the Interior, specifically with the department that provides and updates the results of approved applications.

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8. Appendix

8.1 PHP source code

```
<?php
if(isset($_POST['submit'])) {
//getting the values of only three fields: Example: OAM-10071/PP-2014
$receiptnum1 = $_POST['receipt1']; //value 10071
$receiptnum2 = $_POST['receipt2']; // value PP
$receiptnum3 = $_POST['receipt3']; // value 4

$receiptnum = "OAM-".$receiptnum1."/". $receiptnum2."-201".$receiptnum3;

date_default_timezone_set('Europe/Prague');
include 'Classes/PHPExcel/IOFactory.php';
$inputFileName = 'updated file.xlsx'; // Reading Excel file

//Using try-catch blocks to prevent unexpected errors
try {
    $inputFileType = PHPExcel_IOFactory::identify($inputFileName);
    $objReader = PHPExcel_IOFactory::createReader($inputFileType);
    $objPHPExcel = $objReader->load($inputFileName);
} catch (Exception $e) {
    die('Error loading file "'. pathinfo($inputFileName, PATHINFO_BASENAME). '". ' . $e-
->getMessage());
}
// MAIN function to search the receipt number.
function booleanApplication($receiptNumber,$objPHPExcel){
$result = false;
$sheetCount = $objPHPExcel->getSheetCount();

//loop through sheet 1, sheet 2 and sheet 3;
for($sheetN=0; $sheetN <=$sheetCount-1; $sheetN++){
$sheet = $objPHPExcel->getSheet($sheetN);
$highestRow = $sheet->getHighestRow();

// Loop through each row of the working worksheet
for ($row = 7; $row <= $highestRow; $row++) {
    $actualValue = trim(utf8_decode($sheet->getCell('B'.$row )->getValue()), "\t\n\r\0\x0B\xA0");
    if($actualValue==$receiptNumber) $result = true;
}
}
return $result; // returns the result TRUE or FALSE
}
// JavaScript code to display the result of search
echo "<script type='text/javascript'>\n";
if((bool)booleanApplication($receiptnum,$objPHPExcel)== true)
    echo "var testVar = \"Your receipt number: $receiptnum is READY! Contact to Immigration
\n\";\n";
else
    echo "var testVar = \"Your receipt number: $receiptnum is NOT ready, verify if your entered
number was correct \";\n";
echo "window.alert(testVar)";
echo "</script>";
} ?>
```