Czech University of Life Sciences Prague

Faculty of Economics and Management

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Bachelor Thesis

Open Government Data and Electronic Public Services

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BACHELOR THESIS ASSIGNMENT

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Business Administration

Thesis title

Open government data and electronic public services

Objectives of thesis

The thesis investigates open government data in electronic public services in the Czech Republic. The main goal of the thesis is to evaluate current e-Government services and open data publishing in the Czech Republic.

Partial goals of thesis are such as:
- to make a literature review of the current state of e-Government open data,
- to characterize the current state of electronic public services, and
- to make a comparative analysis of e-Government electronic services and open data in the Czech Republic.

Methodology

Methodology of the thesis is based on analysis of open data in public e-services. The practical part is focused on comparison of e-Government open data in the Czech Republic with western countries. Both qualitative and quantitative methods will be used. Based on the theoretical part comparison, current problems related to publishing of e-Government open data will be defined.

The proposed extent of the thesis
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Keywords
Open government data, electronic public services, eGovernment, transparency, control of public services, effectiveness, linked data, open government data, OGD.

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Declaration

I declare that I have worked on my bachelor thesis titled "Open Government Data and Electronic Public Services" 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 3.3.2017   _____

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Otevřená data a elektronická veřejná správa

Souhrn

Tato bakalářská práce se zaměřuje na zhodnocení otevřených dat ve veřejné správě České republiky. Metodika práce je provedena na základě analýzy otevřených dat a elektronické veřejné správy. Teoretická část hodnotí současný stav otevřených dat, které používá státní správa. Posouzení stavu standardů otevřených dat je provedeno v praktické části. Praktická část také porovnává dvě aplikace, které jsou napojené na registry smluv. Jedná se o český Hlídač Smluv a londýnský London Contracts Register. Další sekce v praktické části analyzuje pozitiva i negativa, která jsou spojena s publikací otevřených dat. Hlavní cíl bakalářské práce je vytvořit ekonomickou studii proveditelnosti pro navrhovanou aplikaci. Funkce dané aplikace je vyhledávání důvodových zpráv v databázi Poslanecké sněmovny České republiky. Na základě finanční analýzy bude řečeno, zda-li je navrhovaná aplikace ekonomicky proveditelná.

Klíčová slova: otevřená data, veřejná správa, eGovernment, transparentnost, kontrola veřejné správy, efektivita, propojená data, Hlídač Smluv, London Contracts Register

Open Government Data and Electronic Public Services

Summary

The thesis is focused on evaluation of open government data in the Czech Republic. Methodology is based on analysis of open data in electronic public services. Theoretical part evaluates the current state of open government data and public e-services. Analysis of open data standards according to the Czech legislation is assessed in practical part. In the thesis, there is also comparison of two applications that use register of contracts database, Hlídač Smluv and London Contracts Register. Another section in practical part analyses risks and benefits connected with open government data. The main goal of the thesis is to perform an economic feasibility study of a proposed application. The purpose of the application is to search for explanatory reports in the database of the Chamber of Deputies. Financial analysis will be performed to determine whether the application will be economically feasible.

Keywords: open government data, OGD, electronic public services, linked data, transparency, effectiveness, e-Government, Hlídač Smluv, London Contracts Register

Table of content

List of pictures

List of tables

1 Introduction

Open Data is an opportunity for our society. Promoting effectiveness and transparency of government services is often discussed topic nowadays. According to Open Data Foundation (2012), Open Data has three key features of openness:

- *"**Availability and access:** the data must be available as a whole and at no more than a reasonable reproduction cost, preferably downloading over the internet. The data must also be available in a convenient and modifiable form."*

- *"**Reuse and redistribution:** the data must be provided under terms that permit reuse and redistribution including the intermixing with other datasets. The data must be machine-readable."*

- *"**Universal participation:** everyone must be able to use, reuse and redistribute – there should be no discrimination against fields of endeavour or against persons or groups. For example, 'non-commercial' restrictions that would prevent 'commercial' use, or restrictions of use for certain purposes are not allowed."*

Open Government Data (OGD) is data that are publishing according to Open Data principles. The Czech Republic has joined the Open Government Partnership in 2011 undertaking a promise to OGD. Since then, several OGD projects have been started at different levels of public sector as well as in private and academia domains.

Some of public institutions are not enthusiastic about open data due to no financial benefits. Some of them even don't know what is hidden in their data and whether the data is correct. We live in the 21st century though and technological development gives us opportunities which we didn't have 10 years ago. Public and private sectors have to learn how to use open data correctly and how to use them to communicate with each other. Analyses on open data often deal with very specific deficiencies in the functioning of public authorities and that they can offer completely new services or alternatives to existing ones. Open data creates a unique opportunity for development and improving the function of public administration from outside.

Support of open data is rising in the Czech Republic thanks to the activities of the Forum for Open Data which is an expert program of Otakar Motejl Foundation, Faculty of Mathematics and Physics (Charles Universtity in Prague) and The Faculty of Informatics and

Statistics (University of Economics). The main goal of this Forum is to enforce principles and standards of open data, particulary in the context of public administration.

2 Objectives and Methodology

2.1 Objectives

This thesis is focused on evaluation of electronic services and open government data publishing. The main goal of the thesis is to investigate current e-Government services in the Czech Republic. The thesis has three partial objectives. The first one is to make a literature review of the current state of OGD. The second one is to characterize electronic public services and the last one is to make a comparative analysis of e-Government services and OGD in the Czech Republic.

2.2 Methodology

Methodology of the thesis is based on analysis of open data in public e-services. The practical part is focused on comparison of e-Government open data in the Czech Republic with western countries. Both qualitative and quantitative methods will be used. Qualitative methods will be used to gain an understanding of current state of open data publishing. Quantitative research using measurable data will help with the electronic public services analysis. Based on the theoretical part comparison, current problems related to publishing of e-Government open data will be defined.

3　Literature Review

There are several institutions that opened their data in the Czech Republic. Public administration portal (13) collects open data sets published by various public authorities. Now there are cataloged data i.e. from Ministry of Finance, Ministry of the Interior, The Czech Trade Inspection, Czech Social Security Administration, Supreme Audit Office and others. The portal also works as a repository for small municipalities and institutions that do not have their own catalog. They can record data via a data box.

3.1　Open Government Data

At the beginning, we need to define what open government data is. We can find out several similar definitions of open data in the literature. The simplest and most accurate definition is from Joel Gurin (7). He describes open data in his book Open Data Now as follows:

"It's public data, from government or other source, that's available for anyone to access for personal or business use."

The Open Society Fund Praha, operating in the Czech Republic, expert program of Otakar Motejl Foundation has more detailed definition on its websites:

"Open data is an information and numbers that are free of charge and freely available on the Internet in a structured and machine-readable form and they are available in a way that does not place unnecessary technical or other obstacles."

Another definition and purpose of open data can be found in Marijn Janssen (11) research paper:

"Open data are also praised for their power to increase participation, interaction, self-empowerment and social inclusion of users of open data (e.g. citizens) and providers of open data."

According to a book Otevřená data ve státní správě (Open Government data) from Michal Berg (1), the first one who put the idea of open data into practice was the United States of America in May, 2009. The Barack Obama's government saw a huge political, social and economic potential in open data:

"Open data, generated in information networks, is today's world fuel. They are necessary for major decision at all levels of society – from government to business and

families. Simultaneously they are also a product of our activity. Harnessing the power of open data and information networks may help to:

- *Fight the corruption, enhance political responsibility and improve public services.*

- *Change the basic concept of a government to an open and transparent service which allow citizens to participate.*

- *Create new models of journalism that can separate signal from noise and provide meaningful information.*

- *Start the multi-billion-dollar business which is based on data from public sector."*

As we can see, all definitions have basically the same meaning. We can summarize that main purpose of open data is to provide efficiency and transparency of public services and to prevent corruption.

3.1.1 OGD publishing

The main medium in publishing open data, as it was already mentioned, is the Internet. Michal Berg (1) wrote that one of the most significant followers is Tim Berners Lee, the founder of the World Wide Web. In 2006 Berners Lee published an article called Linked Data. In this article, he describes ways how to make the web more synoptic and visually readable. This article became one of the pillars of the initiative for open data.

There are around 30 countries that run the open data catalogue. Even UN, OECD and World Bank have their own catalogue. The most dominating countries are developed countries like the United States of America, the United Kingdom of England and Northern Ireland and Germany. Nevertheless, third world countries like Brazil and Kenya belong to this group as well. Open Government Partnership initiative advocates the spread of ideas of open data. The countries that are involved to this initiative, include the Czech Republic.

The Czech Republic joins the Open Government Partnership (OGP) initiative in 2011. Document processing for joining the OGP was in charge of the government's Anticorruption Committee, led by Deputy Prime Minister Karolina Peake. One of the most important pillars, according to Anticorruption Committee, is to provide access to public data and information.

Most of the data produced by public services is web-accessible or they can be obtained in accordance with the law on free access to information. However, due to the way data are released the further use and processing of these data and the subsequent creation of useful application is time consuming and technically challenging, sometimes even impossible. Data are published in form and formats that prevent their further treatment and recovery.

Due to free share, open data infrastructure will lead to new innovations and discoveries, improving the spending of public resources, enhanced integrity and better control of public administration. Sharing the data enables bigger transparency. Some governments have created portals (e.g. data.gov) and catalogues to allow public easily find and use the data.

For easier data sharing, the W3C eGov Interest group (12) has developed useful guidelines. These guidelines are made from straightforward steps that highlight standards and methodologies to foster publication of open government data.

These steps include:

- Publishing the data on the Internet in its raw form. The data should be well-structured. Structure allows all users to successfully make automated application of the data. Widely-known formats include XML, RDF and CSV. Pictures of the data cannot be extracted – this format allow the data only to be seen. These formats are not useful and should be avoided.

- Produce an online catalogue of the raw data with complete documentation.

- Make the data machine and human readable.

One of the most important methods for publishing structured data is linked data. Many sources on the Internet define linked data as *"a term used to describe a recommended best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Semantic Web using URIs and RDF."*

Linked Open Data Cloud project created the following diagram which illustratively shows which linking open data datasets are connected.
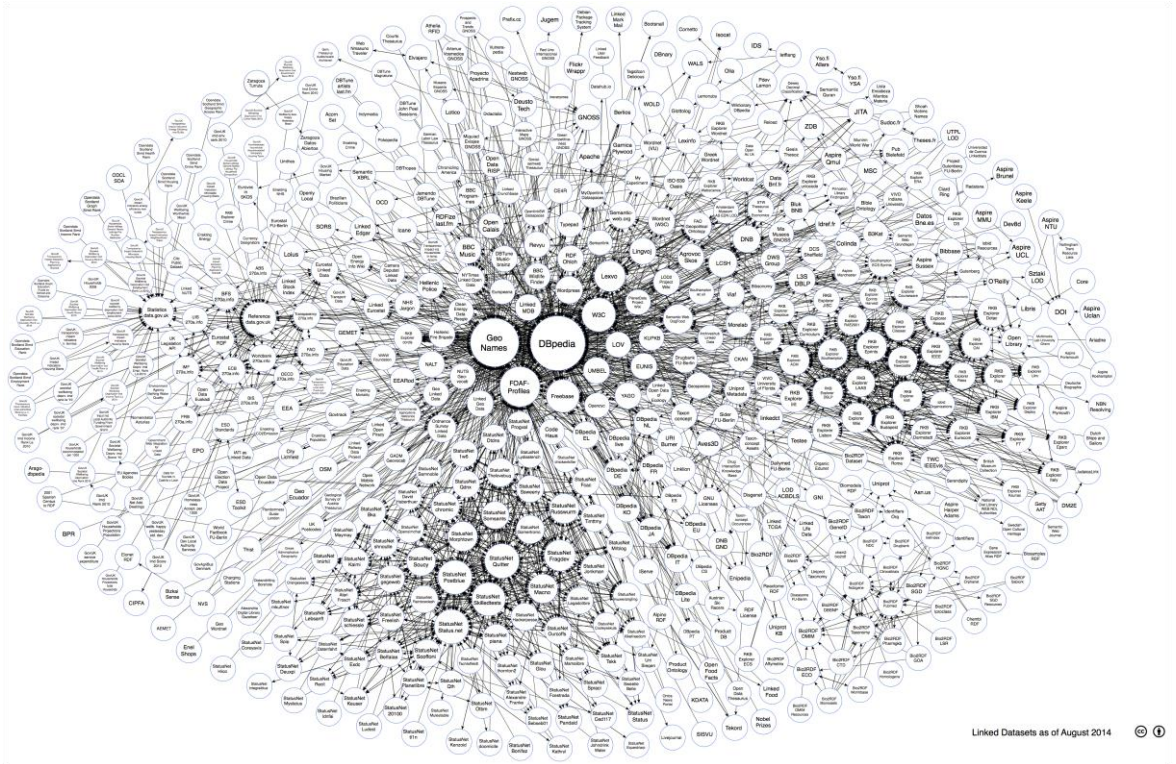
Figure 1 Linking Open Data cloud diagram 2014, by Max Schmachtenberg, Christian Bizer, Anja Jentzsch and Richard Cyganiak. Available from http://lod-cloud.net/

3.1.2   OGD benefits

Open Government Data has several benefits. The most significant benefits are described by Emmie Tran (10) in her open data literature review:

A. Effectiveness

Open data aims to foster effectiveness, efficiency and innovations in government services. It also supports cooperation within public and private sphere.

B. Economic development

Open data can stimulate innovation by reducing barriers to entry the market and increasing competition.

C. Civic Engagement

With open data government can provide reliable and useful data that is open to individuals, research institutions and interest groups. They can use it to evaluate the effectiveness of government policies and develop alternative policies.

3.2 Division of OGD

The basic division of open government data is their level of openness. This level of data openness can be described as 5-degree openness which are shown in the following figure:
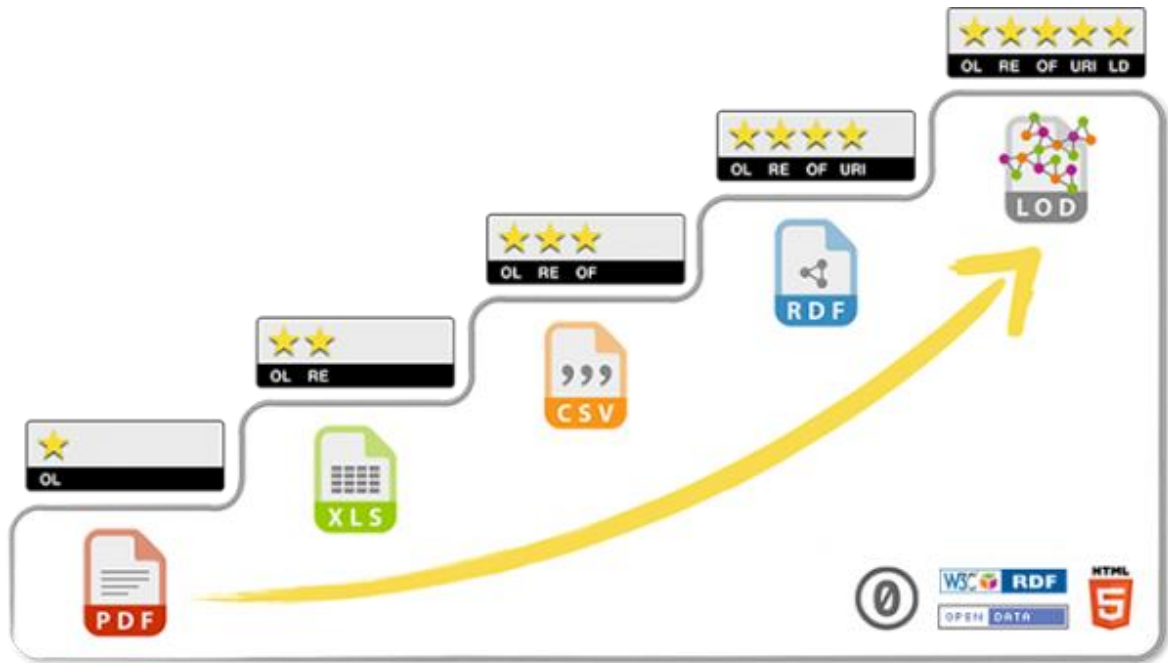
Figure 2 Level of openness. Available from http://5stardata.info

Level 1 – data are available on the Web under an open license; dataset has to be available online; conditions of use are defined; data format is not specified

Level 2 – data are structured (i.e. no images); dataset must be machine-readable; individual data are easily accessible

Level 3 – dataset is available in open format, i.e. with non-proprietary specification; dataset is available on web page – free of charge; programming tools for dataset processing are available

Level 4 – International Resource Identifier (IRI) is used to identify entities in a dataset

Level 5 – dataset meets the standard of linked data

3.3 Czech and British OGD

Since 2012, when Otakar Motejl Fundation is involved into open data events, the Czech Republic developed its free access to information. It has all begun with releasing of the study from Michal Berg (1) in February 2012. In April 4, 2012 government approved first Action Plan for open government which includes open data. From this year, many institutions and cities have published their data.

One of the most significant dates is September 6, 2016. An amendment to the Act no. 106/1999 Coll., on free access to information, that introduces the concept of open data in the Czech legal system, has become effective.

However, there is still expressive difference between open data in the Czech Republic and western Europe. One of the most advanced data openness is in the United Kingdom of England and Northern Ireland.

3.3.1 Sample Czech applications built on open data

There is a large amount of data that need to be processed in recent years. Technologies are more innovative. To be able to fully use the potential, web pages and applications have to be created. The best applications, based on open data, of 2016 were evaluated during the competition called Opening Data Together (Společně otevíráme data). This competition was organized by the Otakar Motejl Foundation. Within the award-winning projects belong applications that uncover i.e. government institution management, traffic intensity and searching in register.

Following applications uncover management of state institutions and administration of public assets. These web applications belong to the most developed in the Czech Republic:

1. **HlidacSmluv.cz** (17) – the application feature is to monitor state and local government trading. HlidacSmluv.cz is connected to the recently launched Register of Contracts. The application aims to open up the data from this register. The next feature of the application is to display links of current and former members of Parliament, senators and cabinet ministers to firms since 1993. The server identifies wasting money and misusing of power in government offices. It analyses and allow public to analyse data from the register. And last but not least the server increases control of public funds.

2. **Mapa Samosprávy** (18) – web application is used for tracking documents from town halls. On this website can be found any document that individuals, real estates and officials are interested in. There are documents such as information about construction projects, sales and rents of municipal properties. Data that are downloaded from edesky.cz are clearly arranged on a map.

3. **PODEJTO** (19) – portal that simplifies communication with authorities. All communication is solved through the information system of data boxes. The

application was made for individuals, tradesmen and firms. Individuals can use this portal when they need to i.e. pay social insurance, request a driving licence statement, or send other kinds of requests. Among the information that tradesmen can request belong VAT inspection reports, extract from the trade register, request of cancellation of registration for VAT and change registration data. There are only three steps that need to be done: select the person or entity, fill out the form and check, submit by signing into the data box account.

4. **Mapy bez bariér** (20) – allows people with reduced mobility to check accessibility of buildings. Several public areas were mapped out within the project during 2015 in the Czech Republic. Data include width of the door, the presence of an access ramp and its slope or toilet facilities. The project is implemented by Nadace Charta 77 – Konto bariéry.

5. **Real Reality** (21) – Chrome web browser plugin. Plugin displays side panel on real estate webpage with information about the area, where the real estate is located. There is information about clean air, noise or public transportation. The application can also display whether there are parking zones in the area or availability of restauration, schools and parks.

6. **Jak volili vaši sousedé** (22) – the results of 2016 regional elections on an interactive map. The map is divided to individual districts where is stated how many percent of votes political parties received.

7. **Vizualizace dopravy Plzeň** (23) – web application for traffic visualization in Pilsen. Data are updated once an hour. The application was created because of huge road reconstruction that is planned.

8. **GovData** (24) – interface between open data and applications. The web service provides selected open data from trade register for direct use in mobile or web applications. It works on commercial base.

9. **a12map** (25) – on an interactive map can be found how long does it take to get from one place around the Prague. The application uses data from Prague Transportation Company. The map is using colours to demonstrate to which zones it takes 10, 20, 30, 40, 50 or 60 minutes to get there.

10. **Můžu dýchat?** (26) – the application collects data about air pollution in Brno and shows whether is a good time for outdoor sport or else. The application aim

is to provide an information about actual and future air condition. Data are provided by Czech Hydrometeorological Institute.

Web applications based on open data contribute to transparency and to better functioning of the state administration. The applications help to develop services for public and aim to unhide the potential that open data have for both society and business.

3.3.2 British open data

According to the Open Data Barometer (14) the UK is ranked number one in the world for its leadership in open data. Political parties encouraged open data to be released and reused across government. Under the Brown government in 2009 open data portal data.gov.uk was implemented. There is more than 15,000 government datasets as open data on this portal.

Portal data.gov.uk helps to find data published by government departments, public bodies and local authorities. There are open data sorted by theme, i.e. government, health, education, defence, crime and justice, mapping and transport. For illustration there is a list of some applications:

- **Crime Statistics** – web application demonstrates the most recent crime statistics from the Crime Survey for England and Wales and police record crime.

- **Walkonomics** – analyses how walkable are the streets

- **Indices of Deprivation for UK Countries** – interactiv maps of indices of deprivation for England, Scotland, and Wales.

3.3.3 Open Data Barometer

The Open Data Barometer (14), produced by World Wide Web Foundation, aims to analyse global trends and provides comparative data on whole countries and regions to analyse three section of open data: readiness, implementation and impact (15).

- *"Readiness - identifies how far a country has in place the political, social and economic foundations for realising the potential benefits of open data. The Barometer covers the readiness of government, entrepreneurs and business, and citizen and civil society."*

- *"Implementation - identifies the extent to which government has published a range of key datasets to support innovation, accountability and more improved social policy. The barometer covers 14 datasets split across three clusters to*

capture datasets commonly used for: securing government accountability; improving social policy; and enabling innovation and economic activity."

- *"**Impact -** identifies the extent to which open data has been seen to lead to positive political, social and environment, and economic change. The Barometer looks for political impacts – including transparency & accountability, and improved government efficiency and effectiveness; economic impacts – through supporting start-up entrepreneurs and existing businesses; and social impacts – including environmental impacts, and contributing to greater inclusion for marginalised groups in society."*

Data from 2015 shows how far are individual countries in terms of readiness, implementation and impact of open data. The order is as follows:

Position	Country	Score	Readiness	Implementation	Impacts
1	UK	100	100	100	100
2	USA	81,89	97	76	76
3	France	81,65	97	76	74
4	Canada	80,35	89	84	67
5	Denmark	76,62	77	77	78
26	CZE	49,15	59	43	50

Table 1 Open Data Barometer (2015) Ranking. Available from http://opendatabarometer.org/data-explorer/?_year=2015&indicator=ODB

The Open Data Barometer only assess readiness, implementation and impact of existing datasets. Unfortunately, the value of open data that is used in some web or mobile application is not taken under consideration. Forwardness of the web applications that use open data would significantly change the Open Data Barometer rankings.

3.4 Electronic public services

Electronic public services are utilizing the use of information and communication technologies. E-service is simply a business concept where the World Wide Web is moving beyond e-business and e-commerce into a new phase where many services can be provided to business or consumers using Web. The term which is closely connected with electronic public services is e-Government. According to simple definition that we can find on many websites, e-Government uses digital tools and systems to provide better public services to citizens and businesses.

There are e-Government tools such as information system of data boxes and the CZECH Point tool in the Czech Republic. Within CZECH Point project Czech municipal offices, regional offices, notaries and other legal entities such as Czech Post can issue extract from the cadastre, criminal records and extracts from the commercial register.

Despite existence of these e-Government tools, the Czech Republic is still behind most of the European countries in terms of electronic public services availability. Services of the Czech e-Government are one of the least sophisticated in the EU and their offer is inadequate. Since there is insignificant digitalization of public services, citizens cannot solve their matters on the internet and have to stay in lines in the state offices. According to the 2017 Digital Economy and Society Index (DESI), that shows progress in digitalization in Europe, the Czech Republic is on 19th place.

4 Practical Part

The practical part is focused on characterization of open data publication according to the Czech legislation. Involved steps will be analysed. Czech e-Government web application Hlidac Smluv will be compared with a relevant application in Western countries, and a feasibility study concerning a web application will be elaborated.

4.1 Open Data Publication Standards

Methods of publication and cataloguing standards of public administration open data in the Czech Republic are described in portal opendata.gov.cz (16). The portal was created by the Ministry of the Interior for public administration authorities who want to publish their datasets. There are recommended steps for open data publication and also information about trainings for open data topic.

There are three steps in data opening process:

1. The first one is to analyse datasets. In this phase, there has to be given what datasets can be published and when. This has to be covered in a Publication Plan that is basically a list of datasets (30).

2. In the second one, datasets are published in a web page or web application. This step includes defining of datasets format (31).

3. The last step contains launching of local open data catalogue. The catalogue must be registered in the Open Data National Catalogue (32).

4.1.1 Publication Plan creating

Features of a data provider within the formation of the Publication Plan are characterized by several immanent functions (30). These functions include decision to open data, casting of the coordinator role, approval of internal legislation, casting of other roles, approval of the Publication plan, preparation of internal legislation, preparation of the Publication Plan, decision on how to make cataloguing, publishing of the Publication Plan, periodic performance evaluation of the Publication Plan, suggesting datasets for publication, cooperation on the datasets proposals and cooperation to determine how to do cataloguing.

Essential role, accentuating the importance of the smooth provision of other data provider roles, consist in **data provider management** itself. Data provider management is responsible for launching the process of opening data, casting of the coordinator and other

roles and also it is responsible for approval of internal legislation and approval of the Publication Plan.

As a **data opening coordinator**, the provider performs several functions, which individual attributes consist of managing of the entire process of opening data; preparation of internal legislation, preparation of the Publication plan, periodic performance evaluation of the Publication Plan and decision on how to make cataloguing.

Among responsibilities that belong to **data curator** can be stated a function of designing datasets for publication.

Administrator of open data catalogue has authority to prepare a local open data catalogue. Administrator is responsible for content of the open data catalogue.

Within the IT specialization, provider has to cooperate on datasets proposals and cooperation to determine how to make cataloguing. **IT specialist** helps with installation and operation of local catalogues. The next responsibility is to assist to data curators during preparation of datasets that are ready for publication.

4.1.2   Publication of datasets in open form

There is a second step in the data opening process after creation of the Publication plan (31). Datasets has to be published on web page or application according to defined schedule. This step includes creating technical form of the Publication plan and publication and cataloguing of datasets.

In contrast with publication plan creating, **data provider management** does not have any special role in publication of datasets.

Within publication of particular dataset, **data opening coordinator** role includes responsibilities such as controlling of datasets prepared for publication and ensure publication of datasets.

Data curator cooperates with data opening coordinator on placing of datasets to the Publication plan. Data curator ensures functions such as dataset analysis and preparation of dataset for publication.

Optional feature of **administrator of open data catalogue** is to create and manage cataloguing record in a local catalogue. Local catalogue has to be created only if stated. Among mandatory features belong i.e. creating and managing dataset record in the Open Data

National Catalogue. Integral part of local catalogue opening is its registration in the Open Data National Catalogue.

Last role involved in publication of datasets in the open form is the **IT specialist**. Features of the IT specialist includes tasks such as: cooperation on datasets analysis, cooperation on datasets preparation and publication of datasets on the Internet.

4.1.3 Launching of local open data catalogue and its registration in Open Data National Catalogue

As it was already mentioned, local open data catalogue has to be created only if stated. However, local catalogue must be registered in Open Data National catalogue at any time (32). In those cases, when a provider does not want or do not have resources to open own local catalogue, he may catalogue his datasets directly in Open Data National Catalogue.

Only two roles are active in this step (administrator of open data catalogue, IT specialist). Data provider management, data opening coordinator and data curator do not have any particular functions.

Among fundamental responsibility of **administrator of open data catalogue** belongs managing of dataset record. Administrator is responsible for content of dataset, preparation of a local catalogue and registration of the local catalogue in the Open Data National Catalogue.

IT specialist ensures following functions: responsibility for installation and operation of the local catalogue. Both functions can be stated as optional.

4.2 Risks and Benefits of OGD

Open Government Data represents great promises to government, businesses and citizens. Significant reuse potential is associated with data that are held by public sector bodies. Despite of a great benefit connected with open government data there are also risks with possible negative impact that need to be taken under consideration. When risks are identified, a mitigation plan has to be adopted.

4.2.1 Benefits of Open Government Data

According to several studies (27), there are six main motivations for opening up data. These motivations also represent possible open government data benefits. The mentioned motivations are as follows:

- Transparency increase

- Reuse encouragement

- Government services improvement

- Economic growth stimulation

- Public relations and attitudes toward government improvement

- Government data improvement

Even though these motivations represent the most significant benefits, there are also incremental benefits that are essential for opening up data. Some of the benefits are not important for every web application that uses open data. It always depends on which kind of open data the applications use. Main and incremental benefits and their description are described in the following paragraphs:

- **Increased transparency** – accessibility and availability of data is essential in public sector performance.

- **Public relations and attitudes toward government improvement** – open government data are used when public sector bodies need to inform citizens about planned actions that will be taken. When citizens are informed about actions, it builds understanding and trust towards the public sector bodies.

- **Increase reputation of a public sector bodies** – government became more transparent by publication of open data. In all cases it helps to increase a reputation not only among citizens but also among organizations.

- **Transparent way of informing citizens and organizations about violation of legislation** – administrative supervision is performed in many public sector bodies. When the results of supervision are published as open government data, public sector can be informed about these results and it helps to improve transparency as well as to compliance with legislation.

- **Government services improvement** - accessibility and availability of data is essential for proper utilization. It helps with identification of ineffective services and follow-up improvement.

- **Government data improvement** – when the users are able to provide feedback about the datasets they used they might identify possible gaps in data and notify

27

data curator about them. This feedback can be used to improve open data quality.

- **Better understanding and management of data within public sector bodies** – development of lists of published and maintained datasets and cataloguing open government data helps government to what data they opened and how to manage them.

- **Supporting reuse** – availability of metadata and machine readability makes public sector bodies data easier to re-use. As a result, applications that use provided open government data might be developed by private sector.

- **Increasing value of the data** – applications based on linked open data principles allows interlinking of separated datasets.

- **Economic growth stimulation** – developing new technologies, innovative products and services is essential in developed countries. Therefore, open data that allow to gain necessary information for innovation are important.

- **Easier translation** – Since manual translation is demanding when translates into other languages, machine readable data are of a great importance.

4.2.2 Risks of Open Government Data

When public sector bodies publish new datasets, risks regarding to open government data have to be taken into account (27). Risks of open data can be divided into three groups according to their impact. Among risks with high severity belong for example trade secret protection breach, publication of data against the law, privacy risk and risk to the security of infrastructure. There are also risks with medium and low severity. Publication of inaccurate data and information, misinterpretation of the data and absence of data consumers belong to group with medium impact. Overlapping of data and increased number of requests for data are example of risks where impact is low. Above mentioned risks are described in following paragraphs:

- **Trade secret protection breach** – data that include know-how and trade secrets should be protected.

- **Publication of data against the law** – some data might contain sensitive personal information. Therefore, it is crucial to obey the law because publication of this data might violate some legislation. In the Czech Republic, a

consultation with the Office for Personal Data Protection is recommended to all open data publishers prior opening a dataset.

- **Privacy risk** – sensitive personal information and strictly confidential information should be protected or rather not published.

- **Risk to the security of infrastructure** – data about important engineering structures like dams and power plant contain information that might be misused and cause significant damage to infrastructure.

- **Publication of inaccurate data or information** – even though publication of inaccurate data does not violate legislation it does lead to a negative feedback towards public sector bodies.

- **Misinterpretation of the data** – data can be interpreted in several ways and users of this data might misinterpret them. Intention can be either on purpose or by mistake. Use of misinterpreted data can result in getting an unwanted competitive advantage or causing a scandal.

- **Absence of data consumers** – if published open data is not interesting, there will be no data consumers. Absence of data consumers may also appear when location of dataset is missing.

- **Overlapping of data** – there can be several web applications that use the same datasets. When datasets contain overlapping collections of data, datasets are contradictory and data consumers might get confused.

- **Increased number of requests for data** – by reducing the number of published datasets number of requests for data increase as well.

Mitigations of above listed vulnerabilities risks should be implemented during the open data publication process. Each kind of the risk has different type of mitigation (27). Among mitigation plan we can include proper specification of datasets, compliance assessment, monitoring of the demand for data, anonymization of data when needed, quality assurance (QA) of the data being controlled and linking to already published datasets.

4.3 Comparison of Czech web application that use data from the Register of Contracts with a similar application from Western countries

On July 1, 2016, the amendments to the Act no. 106/1999 Coll., on free access to information, that implement the concept of open data in the Czech legal system, came into effect. On that date, the Czech Register of Contracts made its data box available and also the Register of Contracts information system was launched. Assuming that the contracts meet the conditions for mandatory public disclosure, it is necessary to publish the contracts concluded from July 1, 2016, included. Contracts must be disclosed in the Register without undue delay, but not later than 30 days after their closure.

The crucial web application that uses data from the Register of Contracts is Hlidac Smluv. The application feature is to monitor state and local government trading. There is also the London Contracts Register operating in the United Kingdom on similar principles as Hlidac Smluv. The website is maintained on behalf of London Councils and Local Authorities who provide the contract information. The site displays contracts that are held by most of the Local Authorities in the Greater London Area. Hlidac Smluv and London Contracts Register will be described and compared in the following sections.

4.3.1 Hlidac Smluv

The application (17) was put into operation shortly after the Register of Contracts was launched. The server has five aims. The most essential aim is to open up previously mentioned Register of Contracts. The second one is to enrich the information from the Register with information from related databases. The third aim is to identify wasting and malfeasance of state power. The next important aim is to allow the public to analyse the data from the Register. And the last one is to increase control of public funds by citizens.

Data from the Register of Contracts are processed in the following way. The application uses monthly XML dumps. From the dumps the Register metadata are downloaded. When all necessary metadata is available, the server downloads all relevant attachments to new contracts in the Register. Attachments mostly consist of the contract text in PDF, doc or xls formats. Text is downloaded to the system so that contracts can be searched in full-text. At this point the primary treatment is done. The next step is to analyse several aspects of each contract.

1. Each contract consists of formal data that has to be verified.

2. Listed prices with VAT and without VAT have to be recalculated again to find out if the prices were counted correctly.

3. In the next step has to be reviewed completeness of data, including validation and verification in the Trade and other registers.

4. Illegal steps analysis.

5. Analysis of the relationship of politicians with suppliers in the contract and finding a conflict of interest.

6. Statistical calculations.

7. Searching for suspicious circumstances, such as splitting of contracts.
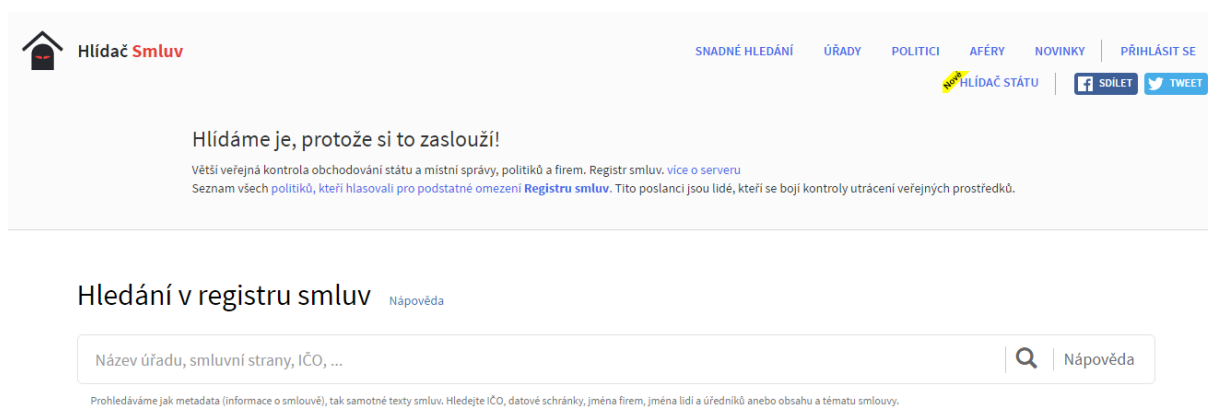

Figure 3 Hlidac Smluv. Available from https://www.hlidacsmluv.cz/

Links in the header on Hlidac smluv website consists of searching tool where is possible to search for contracts specifying different parameters. Then there is a link called Offices enabling searches according to the type of the government office such as the Ministry of Transportation, Ministry of Interior, Ministry of Finance, Ministry of Culture, Ministry of Regional Development CZ, Ministry of Labour and Social Affairs, Ministry of Agriculture and other ministries. There are also regional authorities, central offices and organisations, Czech cities and Prague districts represented in the overview of major offices. After clicking on link to any office, there is a brief information about contracts and several column charts displaying the number of published contracts in current month, number of concluded contracts in current month and the most successful suppliers by the number of contracts.

The next link is Politicians. There is a search bar and a list with all Czech politicians. Right next to the name of politician, there are private companies where politicians are engaged.

The last link is Affairs. The Electronic Registration of Sales is one of the affairs which is described here. Each one of the affairs has link to a newspaper article describing the topic.

4.3.2 London Contracts Register

This web based online service (29), requiring only a browser and internet connection, was designed to enable local authorities to search, update and maintain their own authorities contract data. Data from contracts can be easily downloaded into spreadsheets that are available. Consumers and businesses across the Greater London Area can search for any contracts held by local authority. London Contracts Register is a good example of cooperation between public sector organizations and the ongoing development of the shared services agenda. The service is user-friendly and has built-in data standards that encourage the active exchange of the information across all local authorities of London. The London Contracts Register supports the local government procurement classification (ProClass) and standard contract definitions.

Figure 4 London Contracts Register. Available from http://www.londoncontractsregister.co.uk/

The header of the page consists of four links. Home, Contracts, Categories and Organisations. The Home page displays an interactive map of London. London is divided into districts (authorities) like City of London, City of Westminster, LB Tower Hamlets, LB Newham, RB Greenwich, LB Camden, LB Lambeth and others. After pointing on a district there is shown number of contracts. Right next to the interactive map, there is a bubble diagram that displays the proportion of contracts in each category.

Link Contracts enables searching and filtering all the contracts that are available on the site. Each contract has its own unique reference ID. After clicking on reference ID there is a brief information about the project; description, contract type, category, start date and expiry date, total and annual value, supplier name and organisation type, supplier site, and contact information. Whereas value and duration of the contract is always stated, contact information is usually not disclosed.

The next link that is possible to find on the header of the page is Categories. The Categories page displays the top level ProClass categories allowing to filter and download data from each Authority. Procurement classification categories consist of construction, repair and maintenance, social community care supplies and services, environmental services, building construction materials, information communication technology, facilities and management services, housing management, healthcare, financial services, highway equipment and materials, human resources, education, public transport, arts and leisure services, consultancy, street and traffic management, legal services, cleaning and janitorial, catering, public bodies, mail services, and not disclosed contracts that have significant overall proportion. Right next to each category headline is a sum of total value that was spent on contracts in each category. Substantial part of contracts in London is construction, repair and maintenance category. The total value of all contracts in this category is £15.237M, followed by the social community care supplies and services category with total value of £6.617M.

The last link on this web application is Organisations. This link shows a list of regional partnerships and individual local authorities who have contracts on this site. There is a chart diagram that shows how much money was spent by each authority and the total number of contracts.

4.3.3 Comparison of Hlidac Smluv and London Contracts Register

The most significant visual difference between Hlidac Smluv and London Contracts Register is design of the web service. There is a search bar and a list of offices, politicians and

contracts nn the home page of the Czech service. There is the outline of the most important political affairs, the most important offices and offices that cover its suppliers, basic statistics from the Czech Register of Contract, and the latest contracts. On the other hand, on the London Contracts Register home page, there is an interactive map that allows filtering and downloading data from any London district. As a result, London Contracts Register web service can be evaluated as more user-friendly.

However, content of the web service is more sophisticated within the Czech Hlidac Smluv. The Czech service contains more relevant and valuable information. Any contract detail consists of contract ID, contract description, suppliers, contract value, payer, the date of signing the contract and the date of contract publication. After clicking on contract details, there are also attachments to the contract and found deficiencies, often referred to failure to fulfil legal requirements of publication. Compared with Hlidac Smluv, the London Contracts register contains data about contract ID, authority involved, contract name, department responsible, start date, expiry date and total value of the contract. After clicking on contract details, data such as contract description and contact information is often not disclosed.

4.4 Feasibility study of an open data application

The feasibility study in this thesis examines the feasibility of an application that uses data from the Parliament of the Czech Republic. Documents of the Chamber contain machine-readable data that are available as whole and anyone can use them. Therefore, this data can be classified as open government data. There is no similar web application in the Czech market so far.

There is always the so-called explanatory memorandum (or explanatory report) for any bill of an act that is adopted by the Parliament of the Czech Republic explaining various provisions of the bill (on the level of individual provisions of each paragraph). The explanatory report provides a better understanding of the provisions of the bill and therefore, it is commonly used for interpretation of the enacted act.

A change in the existing act is realized by a new act. Certain provisions of some act can be amended several times during the validity of the entire act. For every amendment, therefore, there is an explanatory memorandum.

From publicly available sources it is possible to obtain an explanatory memorandum as well as the bill and enacted act itself, however, tracing the explanatory memorandum relating to a

particular provision that was effective in a certain period, is very challenging. It is necessary to examine which amendment leads to introducing of the provision and then on the psp.cz website, after entering the election period of the deputies, search for the explanatory report for the bill, and then compare whether effective provision of the act corresponds with the bill. Only after this comparison, it can be stated that is possible to use the explanatory memorandum of the prospected provision, which is a very complex process. However, due to digitalization of the underlying documents, it could be substantially simplified by the fact that there would be a link to the specific provision of the act (effective at certain times) with an appropriate explanatory report. Even the most specialized companies on legal systems (ASPI, Codexis) do not have this link because their databases do not set links between provision of the act and relevant explanatory reports.

4.4.1   Definition of the explanatory report

The explanatory report, or explanatory memorandum, is a mandatory part of the bill. The report is basically an explanation of the law that is to be proposed or amended. This report can be divided into two parts; the general part and the special part. The general part of the memorandum contains:

- Evaluation of the current legal status, including evaluation of the current situation in relation to discrimination.

- Justification of the main principles of the proposed legislation, including the impacts of the proposed solution to the prohibition of discrimination.

- Explanation of the necessity of the proposed legislation.

- Assessment of a compliance of proposed legislation with the constitutional order in the Czech Republic.

- Assessment of the compatibility of proposed legislation with legislation of the European Union.

- The presumed economic and financial impact of the proposed legislation on the state budget and other public budgets, including impacts on specific groups of people (socially weak, minorities, disabled people) and environmental impact.

- Evaluation of the impacts of the proposed solutions for the protection of privacy and personal data.

Special part of the explanatory memorandum is divided according to individual sections of the proposed law. It contains a justification for the proposed legislation, an explanation of its purpose, principles and necessity, and it contains a comparison with the legal status.

4.4.2 Feasibility of an application

There are six steps in a web application development procedure. This procedure copies the basic scheme of the software development. Following steps represent the essential expenditures that have to be taken into account during economic type of feasibility study.

- Specification of requirements

- Analysis

- Design

- Implementation

- Testing

- Placing into production and maintenance

Documentation of the reasoning for making a business investment, used to support a business decision on whether to proceed or not with the investment is called business case. According to Val IT, The Business Case (28) development of a business case consists of the following steps:

1. Building a fact sheet with all the relevant data

2. Alignment analysis

3. Financial benefits analysis

4. Non-financial benefits analysis

5. Risk analysis

The business case is basically a tool that is available for business management in guiding the creation of business value. Business cases consist of expectations of future events. When performing a business case, there are questions that must be considered (28):

"Are we doing the right things?" What is proposed, for what business outcome and how do the projects within the programme contribute?

"Are we doing the things right?" How will it be done, and what is being done to ensure that it will fit with other current or future capabilities?

4.4.2.1 Costs

One of the way of creation of the IT budget for an application is a TCO methodology (Total Costs of Ownership). Building a simple active web application can be quite cheap, if it is done by a student of programming study programme. Regular costs of web application would be around 100 000 – 140 000 CZK, if it is done by specialized company. TCO will be analysed in following paragraphs.

The main components of Total Costs of Ownership generally consist of three parts. Implementation costs, operation costs and retirement costs. The feasibility study in this thesis is focused on the first two costs: implementation and operation.

Implementation costs are costs connected with setting the application into production. It includes graphic design, programming (architecture), language proofreading and testing. Hourly rates were estimated based on price lists of several software development companies in the Czech Republic.

Maintenance fee are costs that are connected with operation. Here belongs webhosting, patching services, domain registration and innovations.

Creating an application that uses existing datasets from one database (available from http://www.psp.cz/sqw/sntisk.sqw) will not be so expensive. Since Implementation and operation costs differ depending on service provider, approximately cost will be given in the following table.

Implementation

Graphic design	500 CZK/hour	35 hours	17,500 Kč
Programming	400 CZK/hour	150 hours	60,000 Kč
Language proofreading			840 Kč
Testing			12,500 Kč

Total implementation costs	**90,840 Kč**

Operation

Webhosting	320 CZK/month		3,840 Kč
Patching services	300 CZK/hour	35 hours/year	10,500 Kč
Innovations	300 CZK/hour	20 hours/year	6,000 Kč
Domain registration	180 CZK/year		180 Kč

Total annual operation costs	20,520 Kč

4.4.2.2 Benefits

In this case, benefits can be divided into financial and nonfinancial benefits. Among nonfinancial benefits belong the time saved when searching for explanatory reports. As it was already mentioned, finding an explanatory memorandum is very time demanding and users must have general knowledge about the law and the legislation system. In the proposed application, user will have to know only the particular provision and certain period of time when the provision was effective. This simple task can save in some cases up to three hours. If we consider that a lawyer has the rate of 400 CZK per hour, it represents a savings of 1200 CZK. For purpose of this feasibility study, nonfinancial benefits will not be considered.

Since this application would be popular among lawyers, they would be willing to pay a fee for using the application. According to the Czech Bar Association, there were 7,687 attorneys in the Czech Republic in 2016 and approximately the same number of lawyers. In total, that is about 15,000 potential users. Realistically, it can be talked about 5 % from 15,000 users in the initial period of the application, which is 750 users. Proposed profitable fee for this number of users would be 50 CZK annually. The application can also gain a profit from advertisement. However, this benefit will not be included in calculation.

Financial benefits

Annual fee	50 CZK/year	750 users	37,500 Kč

5 Results and Discussion

The Results and Discussion chapter summarizes feasibility of the proposed application. Used data are approximated since the exact amount cannot be given due to a large variety of options for creating the application. Moreover, the given number of potential users is based on a statistical assumption.

5.1 Feasibility of the application

Economic feasibility of the proposed application is performed based on cost-benefit analysis (CBA). The partial steps of CBA consist of construction of Cash Flow Statement, and analysis of payback period, discounted payback period, net present value and internal rate of return.

5.1.1 Cash Flow

Cash Flow Statement is a fundamental part of any financial analysis. Essentially, this statement shows the flow of cash in and out of the business. In this thesis, Cash Flow Statement represents implementation costs that were necessary to run the project, operation costs used for the application maintenance, and finally financial benefit that is gain through annual fee. The statement is in the table below. C_0 represents the initial cost. $C_1 - C_6$ shows the flow of money in the following six years. Operation cost of the application is fixed. As a result, sum of total costs and benefits is constant over the period, when the application is in production (assuming constant number of users as well).

Cash flow	C_0	C_1	C_2
Implementation cost	-90,840 Kč		
Operation cost		-20,520 Kč	-20,520 Kč
Financial benefit		37,500 Kč	37,500 Kč
Costs + Benefit	-90,840 Kč	16,980 Kč	16,980 Kč

C_3	C_4	C_5	C_6
-20,520 Kč	-20,520 Kč	-20,520 Kč	-20,520 Kč
37,500 Kč	37,500 Kč	37,500 Kč	37,500 Kč
16,980 Kč	16,980 Kč	16,980 Kč	16,980 Kč

5.1.2 Payback period

Simple definition of payback period is the length of time required to recover the cost of a given project. This analysis is important for decision makers, showing when the invested money will be returned. With help of the cash flow statement, the amount of money received can be determined by using a simple formula $C=C_n+C_{n+1}$. The table below shows that the payback period for purpose of the feasibility study is six years. With every initiated year, the revenues will increase linearly.

Payback period	C_0	C_1	C_2
Cash flow	-90,840 Kč	16,980 Kč	16,980 Kč
Money received	0	16,980 Kč	33,960 Kč

C_3	C_4	C_5	C_6
16,980 Kč	16,980 Kč	16,980 Kč	16,980 Kč
50,940 Kč	67,920 Kč	84,900 Kč	101,880 Kč

5.1.3 Discounted payback period

Discounted payback period is based on the same calculation as payback period. However, the discount rate is included. According to Czech National Bank, discount rate is set on a level of 0,05%. Following table represents payback period with included discount rate. Since the discount rate is very low, there is an insignificant difference in money received and the payback period is the same, six years.

Discounted payback period	C_0	C_1	C_2
Cash flow	-90,840 Kč	16,980 Kč	16,980 Kč
Discount rate r=0,05%	0	16,972 Kč	16,963 Kč
Discounted money received	0	16,972 Kč	33,935 Kč

C_3	C_4	C_5	C_6
16,980 Kč	16,980 Kč	16,980 Kč	16,980 Kč
16,955 Kč	16,946 Kč	16,938 Kč	16,929 Kč
50,889 Kč	67,835 Kč	84,773 Kč	101,702 Kč

5.1.4 Net Present Value

Net Present Value (NPV) is the difference between the present values of cash inflows and outflows. NPV is one of the most used financial criteria. NPV is obtained by discounting the cash flow. It is the sum of discounted cash flow. When the value is positive, it is

considered as a good investment. Hence, a negative net present value is a bad investment. The sum of discounted cash flow after six years is as follows:

$$NPV = -90840 + 16972 + 16963 + 16955 + 16946 + 16938 + 16929 = 10862 \; CZK$$

Net Present Value is a positive number, therefore, the proposed project could be considered as a good investment. However, if the NPV would be calculated over the period of five years or less, a negative number would be obtained and an investment would not be considered as good.

Net Present Value with discounted cash flow is in the following table.

Net Present Value	C_0	C_1	C_2
Cash flow	-90,840 Kč	16,980 Kč	16,980 Kč
Discount rate r=0,05%	0	16,972 Kč	16,963 Kč
Discounted Cash Flow	-90,840 Kč	16,972 Kč	16,963 Kč

C_3	C_4	C_5	C_6
16,980 Kč	16,980 Kč	16,980 Kč	16,980 Kč
16,955 Kč	16,946 Kč	16,938 Kč	16,929 Kč
16,955 Kč	16,946 Kč	16,938 Kč	16,929 Kč

5.1.5 Internal Rate of Return

Another tool to compare the investments is the Internal Rate of Return. IRR measures the profitability of an investment. Internal Rate of Return can be calculated by setting NPV equal to zero, or by using a financial calculator. IRR was calculated using the financial calculator, the rate is 3,379%. The higher internal rate is, the more desirable is the project.

5.1.6 Risk analysis

Uncertainty is an element of any investment. Therefore, risk analysis is essential when deciding whether to make a project. Operational risks, that are linked with the investment process itself, have to be taken into account. Among operational risks belong:

- Execution risk – risk linked to the execution of the investment process;

- Management risk – represent the hazard that portfolio managers might make unprofitable investments;

- Systematic risk – the portion of risk of an investment that cannot be diversified away.

However, for the purposes of the feasibility study of this thesis, risks can be distinctly simplified. The study requires basic calculation and the investment is in the order of tens of thousands. Also, the application is an intangible asset, therefore, no physical damage can occur. Among potential economic risks belong e.g. inability to pay the operation cost in the first six years, a competitive application, or unsatisfactory number of users. According to Czech constitution, explanatory reports have to be available at all times. Therefore, no data in database is not considered as a risk.

6 Conclusion

The main goal of the thesis was to analyse open government data in electronic public services in the Czech Republic and evaluate current state of e-Government services. For the purposes of analysis, a feasibility study was performed. With the given data it was concluded that six years would be necessary as a payback period.

The partial goal of this thesis was to make a literature review of the current state of open government data. The Czech Republic made a big step forward since it has joined the Open Government Partnership in 2011. According to the Open Data Barometer, the Czech Republic was in 2015 on 26th place in terms of readiness, implementation and impact of open data. That might seem as a good result, however, there is still a much room for improvement. As it was previously mentioned, the Czech Republic is on 19th place in DESI ranking.

In recent years, many applications that support e-Government services, were developed. The applications help with electronization of electronic public services. Unfortunately, the general public of the Czech Republic have never heard the concept of open data, even some of the IT personnel. A subsequent problem related to publishing of open government data is also resistance and unwillingness of some clerks and politicians. Encouraging awareness of open data would help with the process of electronization of public e-services. Not only the government should supply electronic services, but also individuals or companies can build new valuable e-services (applications) if the government provides them with right data.

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