Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technologies

BACHELOR THESIS
Analysis of the system of data boxes

Václav Pflanzer

Supervisor: Ing. Miloš Ulman Ph.D.

Study programme: Agriculture Economics and Management

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Department of Information Technologies

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Pflanzer Václav

Economics and Management

Thesis title

Analysis of the system of data boxes

Objectives of thesis

Aim of thesis is to make an evaluation of the Czech Information system of data boxes in comparison with other similar systems used in Europe. The partial goals of thesis are:

- to describe current state of main e-government applications in the Czech republic,
- to make a comparative analysis of Information system of data boxes with systems in other countries, and
- to make an overall evaluation of Information system of data boxes.

Methodology

The theoretical part of thesis is made of secondary research of relevant resources. The practical part is based on comparative analysis. Based on theoretical knowledge and analysis results, the final evaluation and conclusions will be done.

Schedule for processing

1) Preparation and study of specialized information resources, refinement of partial goals and selection of work process: 04-06/2013
2) Processing of literature overview according to information resources: 07 - 10/2013
3) Development of the own solution, discussion and evaluation of results: 11/2013 - 01/2014
4) Creation of the final document of the thesis: 02 - 03/2014
5) Submission of thesis and abstract: 03/2014

The proposed extent of the thesis

30-40 pages

Keywords

Information system of data boxes, comparative analysis, registered e-mail, e-government.

Recommended information sources

Česká pošta s.p. Datové schránky. Dostupné z: http://www.datoveschranky.info/

MATES, Pavel a Vladimír SMEJKAL. E-government v České republice: právní a technologické aspekty. 2., podstatně přeprac. a rozš. vyd. Praha: Leges, 2012, 464 s. Teoretik. ISBN 978-80-87576-36-6.

LECHNER, Tomáš a Vladimír SMEJKAL. Elektronické dokumenty v právní praxi /: Tomáš Lechner. 2., podstatně přeprac. a rozš. vyd. Praha: Leges, 2013, 255 s. Praktik. ISBN 978-80-87576-41-0.

RUGGIERI, Franco. Registered e-mail (REM) — Reliable e-mail for everybody. Datenschutz und Datensicherheit - DuD. May 2010, Volume 34, Issue 5, pp 314-317.

The Bachelor Thesis Supervisor

Ulman Miloš, Ing., Ph.D.

Last date for the submission

March 2014

ČESKÁ ZEMĚDĚLSKÁ UNIVERZITA V PRAZE
Provozně ekonomická fakulta

doc. Ing. Zdeněk Havlíček, CSc.
Head of the Department

prof. Ing. Jan Hron, DrSc., dr. h. c.
Dean

Prague November 6. 2013

Declaration

I hereby declare that I have worked on the bachelor thesis titled “Analysis of the system of data boxes” completely on my own under supervising of Ing. Miloš Ulman Ph.D. and that literature and other information sources I used or cited are listed in the References section and cited in the text.

In Prague 17.03.2014

_____

Václav Pflanzer

Čestné prohlášení

Prohlašuji, že svou bakalářskou práci "Analýza systému datových schránek“ jsem vypracoval samostatně a pod vedením vedoucího bakalářské práce Ing. Miloše Ulmana Ph.D. a že veškerá literatra a informační zdroje, které jsem použil jsou uvedeny ve zdrojích a citovány v textu.

In Prague 17.03.2014

_____

Václav Pflanzer

Acknowledgement

I would like to thank my supervisor Ing. Miloš Ulman, Ph.D. for his guidance, assistance, valuable advice and patience during the writing of this thesis. Also I cannot forget to express my thanks to my parents for supporting me during my studies and thus provide me access to knowledge I have gained.

Analysis of the system of data boxes

Summary

This thesis is focused on analysis of the Information system of data boxes. It describes advantages and disadvantages of e-government and e-government itself. Furthermore it focuses on history and legal statues of data boxes.

The goal of this thesis is to prove or disprove the economic effectiveness of this communication tool that is used by Czech government. For purposes of this paper to describe trends in lifetime of this project, indexes and modified net present value are used. It should enable the comparison of this project and previous meaning of delivering official notices (registered letters).

This work might be used to gain basic knowledge about Information system of data boxes. It should also give fundamental understanding of financial results and nonfinancial benefits.

Keywords

Information system of data boxes, registered e-mail, e-government, net present value, indexes, externalities

Analýza systému datových schránek

Souhrn

Tato práce je zaměřena na analýzu datových schránek. Na začátku popisuje výhody a nevýhody e-governmentu a e-government samotný. Dále se zaměřuje na historii a právní status datových schránek.

Snahou této analýzy je to potvrdit či vyvrátit ekonomickou efektivitu tohoto komunikačního nástroje, který využivá česká vláda. Za účelem popsat trendy v životním cyklu tohoto projektu, jsou v této práci použity indexy a metoda hodnocení pomocí modifikované čisté současné hodnoty. Tato analýza by měla umožnit porovnat tento projekt s předchozím způsobem doručování oficiálních zpráv (doporučené dopisy).

Tato práce by mohla sloužit k získání zákládních znalostí o systemu datových schránek. Také by měla poskytnout fundamentální porozumění jak finančních výsledků, tak nefinančních výhod.

Klíčová slova

Informační system datových schránek, registrovaný e-mail, e-government, čistá současná hodnota, indexy, externality

Abbreviation

CF – Cash flow

DB – Data box

ICT – Information and communications technology

ISDB – Information system of data boxes

IT – Information technologies

MMS – Multimedia message service

NPV – Net present value

OTP - One time password

SMS – Short message service

VAT – Value added tax

Table of content

Contents

1 Introduction 6

2 Objectives of bachelor thesis, methodology 7

3 Literature Review 9

3.1 What is e-government 9

3.1.1 Advantages of e-government 12

3.1.2 Disadvantages of e-government 14

3.2 Communication tools 16

3.3 Information system of data boxes 17

3.3.1 History and legal status of data boxes 17

3.3.2 Description of system 19

3.4 Chain Index, fixed base index 24

3.4.1 Chain index 24

3.4.2 Fixed base index 24

3.5 Net present Value 24

4 Practical 26

4.1 Chain index, fixed base index, time series 26

4.1.1 Created data boxes 26

4.1.2 Sent public data messages 28

4.2 Net present value 30

4.2.1 Net present value after 5 years 30

4.2.2 Net present value after 7 years 35

5 Results and discussion 40

6 Conclusion 41

7 Bibliography:..... 42
7.1 Books and Report Resources..... 42
7.2 Web Resources..... 43
List of Tables..... 45
List of Figures..... 46
List of Charts..... 46
Appendix..... 47

1 Introduction

E-government is something that we already use, or soon will have to. In all developed and even in many developing countries it is a branch of government which is rapidly growing. This is happening due to several reasons which are beneficial for governance.

Data boxes are part of basic tools which are used by the Czech government to communicate with citizens, companies or with other bodies of public authority and perhaps in future for communication with other countries**.**

The 21st .century is meant to be the century of modern infrastructure and constantly improving information technologies. The growth of information and communications technologies (ICT) is so significant and ground-breaking that every IT system should be replaced or upgraded approximately every 10 years. That fact puts great responsibility on every government which plans to implement e-government technology to ensure smooth and intelligent transition.

The aim of this thesis will be mainly focused on evaluating the effectiveness of e-government in the Czech Republic and weighing the pros and cons that come with it. The desired outcome would be to determine how economical e-government is and whether it is sustainable in the long run. This work can be divided into two major parts.

In the first part there will be emphasis on theoretical knowledge needed for this paper. It will summarise basic advantages and disadvantages of e-government and describe possible communication tools. The end of this part will be used to describe the information system of data boxes.

The second part will describe and use chain and fixed-base indexes to describe usage of e-government, its efficiency and will compare costs of e-government with previous forms of communication via registered letters. It will also be focused on the usage of data boxes.

2 Objectives of bachelor thesis, methodology

Aim of this thesis is to describe current state of main e-government applications in the Czech Republic using hard data provided by Czech Post and Ministry of Interior Affairs and to evaluate its effectiveness using net present value. Partial aim is to make overall evaluation of the Information system of data boxes and suggest improvements.

Another partial goal was to make comparative analysis of Information system of data boxes with other countries in Europe. Comparative analysis could not be done due to incomparability with other similar systems. No other similar systems such as data boxes were found abroad, therefore it is impossible to compare. Instead, the author decided to change method of evaluation from comparative analysis to net present value of money which was invested by public administration.

Theoretical part of thesis will consist of definitions, descriptions and examples of advantages and disadvantages of e-government. As well as from detailed description of Information system of data boxes includes various links to Czech law system that allows the existence of this communication tool that is designed for interaction between state, businesses, and individuals.

The theoretical part is necessary for having basic knowledge about functioning of e-government in the Czech Republic and the role of Information system of data boxes due to its complexity.

On these foundations from the theoretical part is created the practical part where this information will be used. This part is dedicated to chain indexes, fixed base (basic) indexes and Net present value which are focused on 5 year analysis and 7 year analysis.

Methodology

The theoretical part of thesis is made of secondary research of relevant resources and it is also made of relevant literature.

The practical part is based on data analysis from Czech Post and Ministry of Interior Affairs. These data is projected into graphs and tables. These data is used to evaluate Information system of data boxes to fulfil the aim of this thesis.

3 Literature Review

3.1 What is e-government

E-government stands for a combination of two words - electronic and government, started to be widely used mainly in 21st century due to the progress and spreading of modern communication technologies among population. E-government is also process of modernization of public administration with the use of the new possibilities of information and communication technologies. Widely use terms such as computerization, informatics, rationalization or de-bureaucratization of public administration.

The term e-government is so widely used that in many languages it is not even translated, therefore it became almost naturalized but could be understood differently across the world. The Organization for Economic Co-operation and Development says *"The term "e-government" focuses on the use of new information and communication technologies (ICTs) by governments as applied to the full range of government functions. In particular, the networking potential offered by the Internet and related technologies has the potential to transform the structures and operation of government.*"[1]

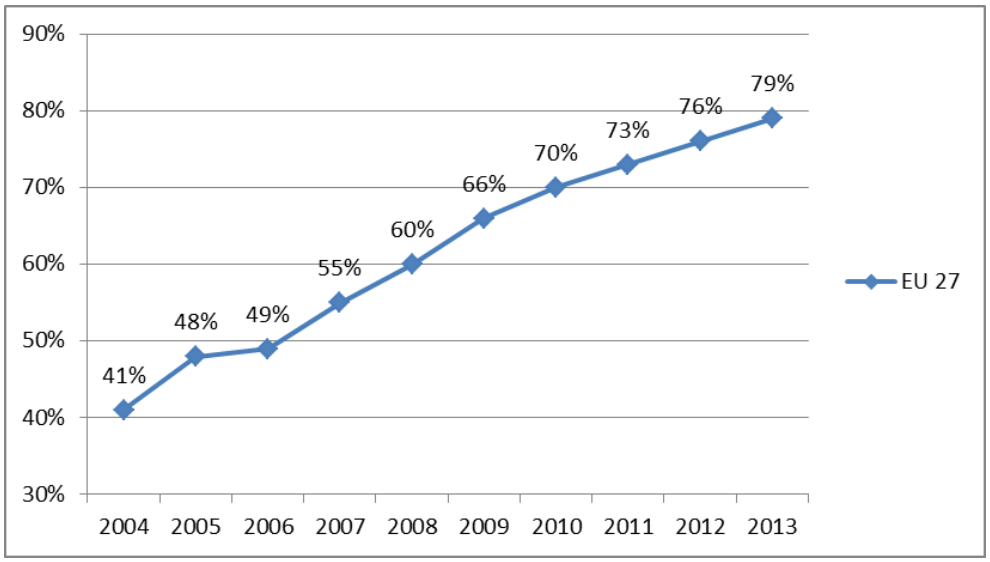
The World Bank states that, "*E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.*"[2]

[1] OECD Glossary of Statistical Terms - E-government Definition. *OECD* [online]. 2002 [cit. 2014-02-19]. Available at: https://stats.oecd.org/glossary/detail.asp?ID=4752

[2] E-Government - Definition of E-Government. *The World Bank* [online]. © 2011 [cit. 2014-02-19]. Available at: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEGOVERNMENT/0,,contentMDK:20507153~menuPK:702592~pagePK:148956~piPK:216618~theSitePK:702586,00.html

According to the United Nations "*E-government defined as the use of ICT and its application by the government for the provision of information and public services to the people. The aim of e-government therefore is to provide efficient government management of information to the citizen; better service delivery to citizens; and empowerment of the people through access to information and participation in public policy decision-making.*"[3] Those definitions are in principal suitable. Purpose of e-government is to provide to all private subjects greater comfort in the realization of contacts with the state and other bodies of public power by speeding up and simplifying communication with them, streamline internal processes of public authorities will lead to greater transparency in their activities to the public. It is also possible to say that e-government contributes to the creation of what is known as "good governance," that is the process of governance and its monitoring by citizen's participation on the process and is associated with the transition from a bureaucratic, lordly management approach to the public administration and public service to citizens, as customers.[4]

Chart 1 Households having access to the Internet at home (% of all households)



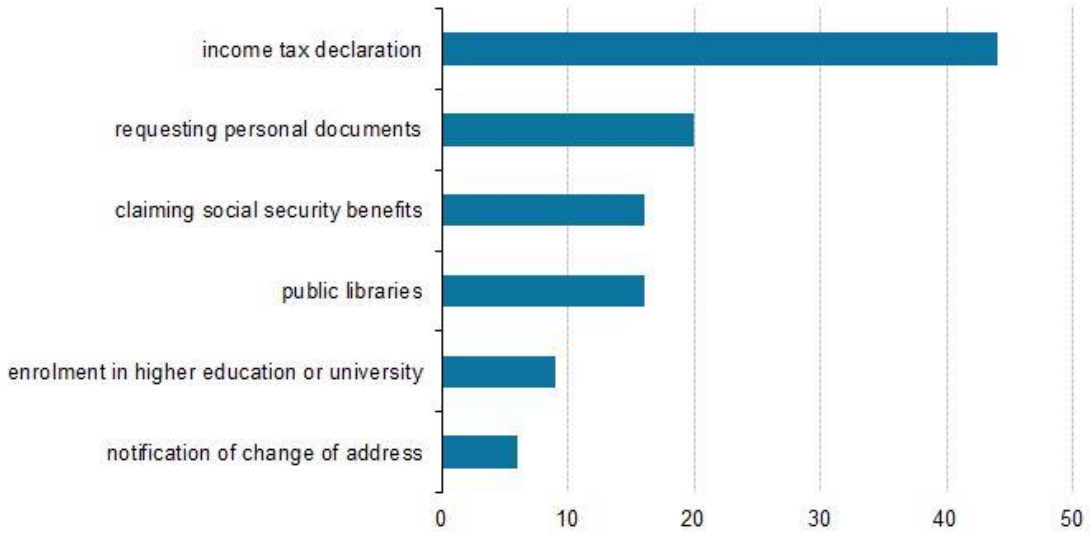
Source: Eurostat, Author's work

[3] United Nations E-Government Development Database: Overview - United Nation E-Government Database. *The United Nations* [online]. © 2010 [cit. 2014-02-19].
Available at: http://unpan3.un.org/egovkb/egovernment_overview/ereadiness.htm
[4] BOVAIRD, A a Elke LÖFFLER. *Public management and governance: re-booting the state*. 2nd ed. New York: Routledge, 2009, xxviii, 220 p. ISBN 02-038-8409-4.

Requirements desired by public should increase due to higher coverage of the Internet in the population and subsequent increase of speed of connection to the World Wide Web. In 2004, 41% of Europeans had the Internet at home and by 2011, the amount had almost doubled. By this time, 79% had access to Internet. See Chart 1, above. Stated findings testify that e-government is a fact which is already anchored in majority of society. As the availability of the Internet in Europe has increased, equally the demand for e-government services has increased.

At present, probably the most common reason for using websites of e-government is the sole purpose of income tax declaration. To prove that fact, Chart 2, EU-28, 2013 (% of e-government users), is listed below. It was created by Eurostat. It is mutually beneficial for both sides. Both tax payers and government save at least time.[5]

Chart 2 Reasons for using e-government websites, EU-28, 2013 (% of e-government users)



Note: EU-28 without Croatia.

Source: Eurostat

[5] NIXON, Paul a Vassiliki N KOUTRAKOU. *E-government in Europe: re-booting the state*. New York: SAGE, 2007, xxviii, 220 p. ISBN 02-039-6238-9.

E-government is often perceived as an ”online government” or "Internet-based government," it also consists of many non-internet technologies. Those technologies might include:[6]

- Electronic Identification Document (ID)
- Fax, PDA, SMS text messaging
- MMS
- wireless networks and services
- Tracking systems
- Biometric identification
- Road traffic management and regulatory enforcement
- Smart cards and other Near Field Communication applications

3.1.1 Advantages of e-government

There are several conditions or circumstances that put e-government in a favourable position in the eyes of the state, business organizations or citizens which are enabled to use it for economic or any other advantage.

Governments try to save money by cutting unnecessary working places, which indirectly allows public servants to be more productive and more effective at their work such as searching basic information in information systems. This information is available promptly and mainly in 24hours mode, every day of the week, thus permanently.

Because of implementation of e-government, it is possible to make system changes in organizations and managing public authority and thus eliminating duplication, occasionally multiplication of activities, which results in improvement of the flow of information and preparation of data for decision making.

It also enables continuity and predictability of procedures inside of administration which is also desirable at least for other sections of administration which have to cooperate with each other. Continuity and predictability cause further increase in efficiency.

[6] HEEKS, Richard. *Implementing and managing eGovernment: an international text*. Thousand Oaks, Calif.: SAGE, 2006. ISBN 07-619-6792-3.

Another valid point of interest is that e-government creates qualified jobs for highly educated people who are IT architects or who maintain these information systems which serve as public power and it also brings back money which is returned into state budget through the income tax and other taxes which are paid by those people.

Furthermore the use of electronic communication saves tons of CO2 because paper manufacturing is third largest fuel user worldwide and thus saving uncountable number of trees.[7]

Increased competitiveness of countries in international field might also be one of the reasons for implementing solid, functional and transparent communication system. In general, predictable and continuous behaviour of public administration is one of the good signs for foreign investors.

Functional e-government makes life easier for the normal inhabitant due to decrease of bureaucracy. Extraordinary advantage of e-government is material and time saving for citizens. In well-set conditions, people may not travel anywhere and therefore not waste time standing around in queues before office. If their personal involvement is necessary, they can use various way of electronic communication to determine the exact time, when to come.

All electronic communication can be easily archived and due to the openness of government it also increases transparency of all processes running inside of state offices. This should lead to improvement of perception in the public eye. As well as the internal conversation, external one can be also archived. It indirectly leads to setting relationship similar to private sphere, thus the public authority takes the role of a seller and the citizen or business entities are customers. This relationship is nowadays part of what we understand as "good governance."

Properly working e-government is also not negligible improvement of the level of civil society, through the transparency. If the access to all information for all citizens is easy to reach, they can have also better control of the activities of the state. This reduces, but not

[7] MADDEN, Ned. Sustainability Software, Part 2: Cutting the Paper Chase. TechNewsWorld [online]. 12/08/09 [cit. 2014-02-17]. Available at: http://www.technewsworld.com/story/68834.html

completely eliminates, negative phenomena such as corruption, nepotism, wasting of public funds or other undesirable phenomena. Hardly anyone will offer or ask for a bribe when communication is done by electronic tools.

3.1.2 Disadvantages of e-government

There are also some unfavourable circumstances or conditions that reduce chances of having a successful e-government system.

Cyber attacks are a threat to security especially from hackers. Hackers are usually motivated by an ideology or profit for themselves or third parties. Hackers could be divided into two groups - Individuals or organized groups. Individuals are usually not so dangerous unless they are not partly building or maintaining e-government or they have working knowledge of loopholes or backdoors. Usually they are very rare and if they are not part of e-government structures they are not big a threat. If they are part of infrastructure and know backdoors or loophole then they can be called "big threat." Organized groups are in basics, more dangerous because there are more of them then individuals. Again they could be divided into two groups according to their roots. It could be a group consisting of individual hackers. Or a group of employees from non-governmental organizations for purpose of industrial espionage, stealing of personal data or by governments for the purpose of industrial espionage, security and competition for power[8] in the international field etc. This might be one of the reasons why the application of e-government is so hard and slow.

Security makes a lot of problems in implementing tools which are necessary for correct running of e-government. The state has to be customarily guarantor of security, credibility, legal integrity and proper functionality of systems and registers, which are supporting activities of public authorities. Those factors cause massiveness of systems and relatively frequent squandering of financial and technological resources in order to ensure security and guarantee the system function that still can occasionally fail from extraordinary reasons that include natural disasters.

[8] Signals Intelligence - NSA/CSS. SHEA, Teresa H. [online]. [cit. 2014-03-01]. Available at: http://www.nsa.gov/sigint/index.shtml

Obsoleteness and abrasion of electronic infrastructure in relatively short period of time, force the owner of this basic physical and organizational structures and facilities, therefore government at comparatively regular intervals at least change hardware, according to Moore´s law[9] how overall processing power for computers will double every two years or reform some part of e-government in order to effectively manage administration.

Cost is significantly influenced by factors mentioned above, namely security, obsolescence and abrasion. Costs are due to these reasons higher than similar projects in private sectors. Therefore it is not possible to evaluate the effectiveness of e-government just from an economical point of view whether your imaginary revenues and expenses reach break-even point or not. These financial costs are compensated by being available to citizens and private sector anytime, anywhere to communicate with public authorities, at the same time saving time and material on side of voters and employers. Saving money enables the cabinet's political visions to be recognized.

There might be some cases of social exclusion. Especially those with no internet access and therefore the ones not being able to access online information and online communication might have a problem with e-government. This might be the biggest concern of e-government. According to the data of Eurostat, 79 % of households in European union (28 countries) had internet access in 2013.[10]

Another problem is connected to the lack of education in usage of modern technologies by public bodies and their efficient use in order to achieve more effective operating processes. Various information systems used by ministries and subordinate organizations do not enable exchange of information and if they do, they do not enable data exchange.

Generally people are getting used to some style of living and as they get older people become more and more reluctant to learn to use new technologies and accept change.

Realization of e-government is a never ending process. There will always be new functions, where it can be applied and also devices by which it is implemented.

[9] Moore's Law. GORDON E. MOORE. *Moore's Law* [online]. 1965 [cit. 2014-03-08]. Available at: http://www.mooreslaw.org/

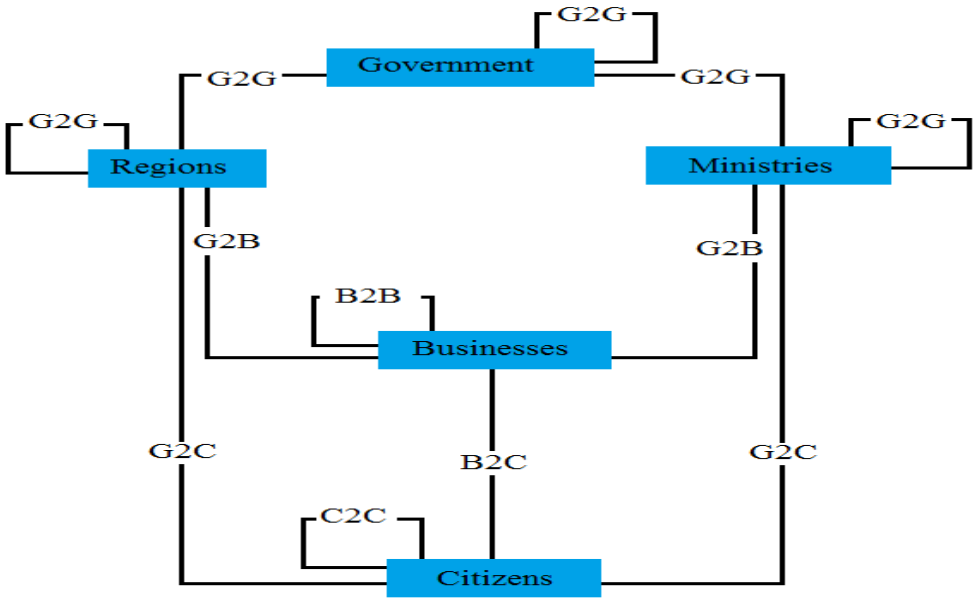
[10] Households - level of Internet access. [online]. [cit. 2014-03-01]. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ci_in_h&lang=en

3.2 Communication tools

Communication tools can be in general comprehended as means for transmission and sharing of information. For example: dialogue between two or more people, letter or postcard which is nowadays, with expansion of modern technologies such as smartphones, more often replaced by short message service (SMS), multimedia message service (MMS), and with increasing coverage of mobile internet, by e-mail or social network services, represented mainly by facebook.com, Google+, VKontakte, twitter.com. Even these communication tools are slowly replaced by instant messengers such as WhatsApp or Viber.

In our case we will talk mainly about electronic communication made formally, with the evidence about sending, delivering and proving of identity on both sides of communication. This correspondence can be run between all parts of government (G2G), government and citizen (G2C), government and business (G2B), between citizens (C2C), citizen and business (C2B), between businesses (B2B) as you can see in diagram below.

Figure 1 G2G, C2C, B2B, G2C, G2B, C2B communication diagram



Source: adapted[11]

[11] E-Governance Software Solutions | e-Governance Website Development Services. VERVE SYSTEMS PVT. LTD. *Verve Systems Pvt. Ltd.* [online]. 2011 [cit. 2014-03-10]. Available at: http://vervesys.com/wp-content/uploads/2011/10/e-governance.jpg

3.3 Information system of data boxes

At the time of writing this bachelor thesis there has been more than 4 years of operation of information system of data boxes in the Czech Republic - a unique method of electronic delivery, which led to e-government in the Czech Republic institute, which has no parallel in the world. This chapter is therefore devoted to a detailed description of the issue of data boxes.

3.3.1 History and legal status of data boxes

Since the beginning of the 21st century in the Czech Republic the number of regulations that allowed electronic communication in the field of public authorities has steadily increased, i.e. the transmission of data messages each other and between these authorities and other bodies, but did so quite unsystematic, sometimes even chaotic.[12]

Some of the legislation introduced the possibility of alternate paper and electronic communication. However, in this case there was no unified, systematic and trouble-free usage of electronic communications means, especially the Internet, in contact with public authorities.

In the year 2000, there was introduced act 227/2000[13] on electronic signature, to the Czech legislation. From this year, there are continuing efforts to make communication with public authorities and between these authorities not only in paper but also in electronic form. Unfortunately, due to the different interests of ministries, but also many others, often more psychological factors (redundancy to change), the issue of administering and delivering information electronically or even the "classical" paper form, was adjusted in many different ways, not only consistently and comprehensively.

At the same time Czech state or more precisely justice faced the problem with delivering notification to the participants of procedures, especially in cases where one or more of them had no interest to actually have it delivered. In 2006 reforming the delivery and administration in the Czech legal framework, that would remove the criticized non uniformity and fragmentation of previous legal forms, was started.

[12] MATES, Pavel a Vladimír SMEJKAL. *E-government v České republice: právní a technologické aspekty*. 2., podstatně přeprac. a rozš. vyd. Praha: Leges, 2012, 464 s. Teoretik. ISBN 978-80-87576-36-6.
[13] Act No. 227/2000 Coll.

In 2008, thanks to the cooperation between the Ministry of the Interior affairs of the Czech Republic and Ministry of Justice prepared draft of law, which was based on solving the above mentioned problems, but it was not delivered via normal e-mail, but through the new channel of electronic communication – Data box. This Act No. 300/2008 Coll. about electronic acts and authorized conversion of documents was adopted and came into force 1st of July 2009. Before it went into effect, it was amended.

This amendment of law was not just legislative and technical, as expected. Amendment contained 33 amended points, which were in some cases of essential character. Problematic point became especially amendment No. 18a, allowing usage of Data box for the delivery of private documents.

Amendment of civil procedure code No. 7/2009[14] introduce priority of delivering by data message to data box, which came into force also 1st of July 2009. With this act the new legal the new legal term "fictitious delivery" was introduced to the Czech legal framework. This term solved the problem of Czech justice with delivering notification to the participants of procedure. "Fictitious delivery" means that, a document is considered to be delivered, 10 days after delivering to the data box or by registered letter, even though recipient actually did not see those documents. This consideration has all law consequences (there are some exceptions which have to be proven such as hospitalization, extended business trip or holidays). This legal term leads to the increase in enforceability of law in the Czech Republic.

Another, probably unintended benefit for government following from working of information system of data boxes, was purifying register of companies. Because those companies with addresses which were undeliverable were deleted from the register.

Information system of data boxes was originally planned to be co-financed from structural funds of European Union (85% of all initially costs)[15], but unfortunately due to the changes in project, the funding could not be realized because the project´s purpose was changed from investment to creating ISDB as a property of government to buying service from

[14] Act No. 99/1963 Coll.
[15] Vládní návrh zákona o elektronických úkonech, osobních číslech a autorizované konverzi dokumentů. PARLAMENT ČESKÉ REPUBLIKY. *Parlament České republiky, Poslanecká sněmovna* [online]. 2008 [cit. 2014-03-08]. Available at: http://www.psp.cz/sqw/text/orig2.sqw?idd=26163

Czech Post. This, according to rules of structural funds, could not be co-financed. All initial investments were transferred to Czech Post.

For further information it is recommended to study Act on electronic legal acts and authorized document conversion No. 300/2008 Coll. or books[16] ,[17],[18] and [19]or official webpages http://www.datoveschranky.info/ .

3.3.2 Description of system

Information System of Data Boxes (abbreviation ISDB) is proprietary information system owned by public administration, which contains information about data boxes and their users. System also keeps information about logs into system for legal purposes. ISDB is operated continuously in 24/7 mode with the exception of planned shutdown due to maintenance. Network administrator of ISDB is Ministry of the Interior affairs. Operator of information system of data boxes is according to Act 300/2008 holder of postal license, thus Czech Post, state owned enterprise.

Data Boxes (abbreviation DB) serve mainly in area of public administration. Through the data boxes it is possible to make official requests or notifications to any public authorities that have data boxes, these requests or notifications have the same legal validity as a physically sent registered letter. Data boxes can be divided:

- The data box of a public authority – this kind of data box is created automatically, by the administrator, as soon as possible. For a notary or distrainor data boxes are created as soon as possible, after getting information about registration into the given register. The list of data boxes owned by public authorities is available on http://seznam.gov.cz/ovm/welcome.do
- The data box of individual – this one is created free of charge at the request of an individual who is fully qualified to perform legal acts. It depends on the will of the

[16] SMEJKAL, Vladimír. *Datové schránky v právním řádu ČR*. 1. vyd. Praha: ABF, 2009, 176 s. ISBN 978-80-86284-78-1.
[17] SMEJKAL, Vladimír. *Datové schránky v právním řádu ČR: zákon č. 300/2008 Sb., o elektronických úkonech a autorizované konverzi dokumentů, s komentářem*. 1. vyd. Praha: ABF, 2009, 176 s. ISBN 978-80-86284-78-1
[18] SMEJKAL, Vladimír a Michal Altair VALÁŠEK. *Jak na datové schránky: praktický manuál pro každého*. 1. vyd. Praha: Linde, 2009, 197 s. ISBN 978-808-6131-801.
[19] MINISTRY OF THE INTERIOR OF THE CZECH REPUBLIC. Home Page - Ministry of the Interior of the Czech Republic [online]. 2014 [cit. 2014-03-08]. Available at: http://www.mvcr.cz/mvcren/

individual. An individual is not obliged to own a data box. The request should be sent or done to any contact place of administrator or operator. Data box is crated within 3 working days.

- The data box of a self-employed person – data box is created similarly to individuals, free of charge, within 3 working days since the request and as well is not obligatory. However since 2015 self-employed persons will be indirectly obliged to own and use data boxes.
- The data box of legal person – is created by Ministry of the Interior affairs which is also acting as an administrator, free of charge, immediately after receiving information about registration into register of companies. It is obligatory to use it in communication with public authorities since the beginning of implementation of ISDB, therefore since 1st of November 2009 or since a new company is registered into the register of companies.

Data box is not a tool for replacing data storage or archive or even backup of information system. Messages are stored in the Data box but not in a permanent fashion, but only in the short term (90 days) for the purposes of secure communication. This means that each user can archive contents of his/her data messages personally (manually), or use application or system or paid services provided by the Czech Post.

An identifier is used for identification of data boxes. The identifier is similar to name and address in classical post. The identifier is not interchangeable with any other identifier used by the public authorities. A method of forming an identifier is established by the regulation of Ministry of the Interior affairs No. 194/2009[20].

The website "https://www.mojedatovaschranka.cz/" is mainly used by private users to access data boxes. There are other means to access the data box, such as apps from various companies that are capable of storing information or corporate purposes, but they are not used so frequently by most of the private users and are not significant for the purpose of this thesis. On the other hand almost whole public sector uses applications which are specially designed for specific problematic given branch of government and application for

[20] Regulation No. 194/2009

communication via data boxes is implemented in. Data box can have more users, but each of them should have unique login information that consists of user name and password therefore it is clear and the system is able to determine who and when the data box was used.

User name and password are generated by Ministry of the Interior affairs. Username is unique, at least six and no more than 12 characters long for each user of data box. Password must not be identical with user name, it supposed to be at minimum 8 and at maximum 32. It should be a combination of latters, numbers and special symbols. Security during login can be increased by short message service (SMS) authorization or via One Time Password (OTP).

Login with SMS authorization requires, except user name and password, additional one-time authorization password which is sent to registered mobile telephone number. This service is paid.

Login with OTP (One Time Password) again requires (except user name and password) one-time authorization password, which is generated by special tool – OTP generator. This service is free but user have to own compatible hardware or software generator and this is not trivial, as it seems to be, even though it sounds like it (system operator does not distribute this tool).

We can say that the data box is a credible short time data storage of data messages excess the safety and credibility of most current delivery path. The fundamental difference in comparing with conventional e-mail is in usage of encrypted connection between the user of the information system of data boxes and ISDB. For protected communication there is probably no preferable universally applicable tool, than the data box.

Ministry of the Interior affairs in case of individual persons or self-employed persons is able to deny access to data box due to the death, loosing ability to perform legal acts or loosing freedom of movement (detention, prison, protective treatment) or after receiving a request from those persons, because they own data box voluntary. Data box access will be

denied for self-employed person also at the day of deletion from register, similar to a legal person. Access to data boxes of public authorities should be denied at the day of extinction.

Cancellation of data box is carried out by administrator (Ministry of the Interior affairs) in case of death of individual after 3 years, in case of self-employed person after 3 years since it was deleted from registers. In case of legal person after 3 years after deletion from registers and finally in case of public authority after 3 years since the authority was cancelled.

A data message includes an envelope and content or attachment to the envelopes. The envelopes as well as the content, have a timestamp. Electronic timestamp is a service which joins trustworthy way data in electronic form with exact time moment. Timestamp guarantees that stated electronic data exist in given point of time. The validity of timestamp is temporary but can be prolonged by paid services of Czech Post or by user of data box personally in application of DB for free. Content is electronic document or created document designed to electronically send data to data boxes. Documents can be transmitted by electronic ways of communication and keep on recording media used in the processing and transmission of data in electronic form[21]. The data message is deleted from data box after 90 days if it is not archived as is mentioned above.

User of data box can be notified about fact that he/she has incoming data message by e-mail (free of charge) or SMS which is a paid service.

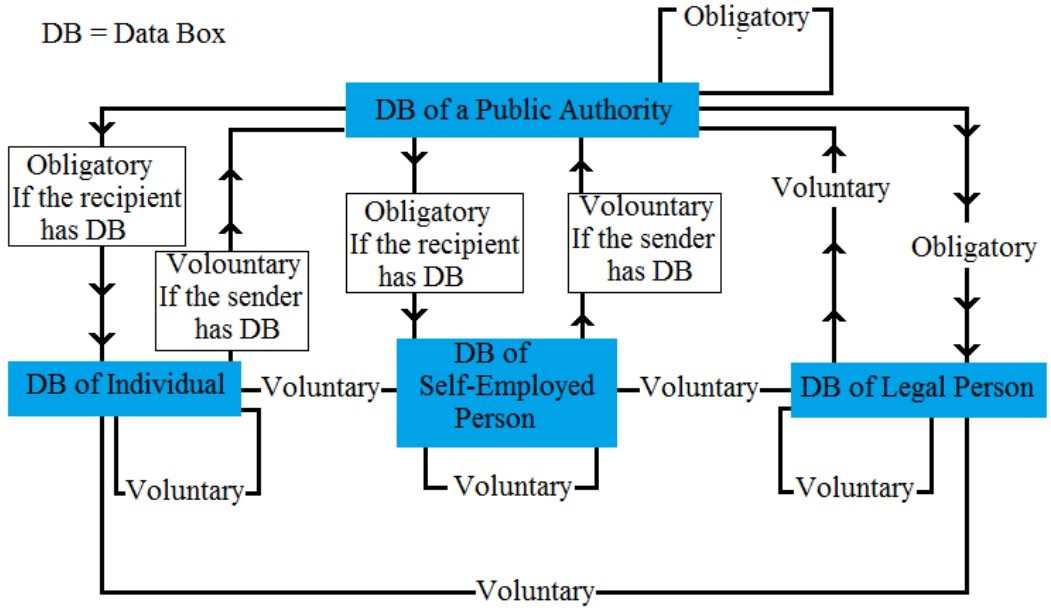
Data messages are sent from particular data box of public authority through the information system of data boxes into above mentioned kinds of data boxes and vice versa or between each other. ISDB allows sending data message with maximal size of 10MB which is at present sufficient.

The usage of data messages for communication between public authorities is obligatory. Data messages have to be used by public authorities and individuals only if a individual owns a data box, otherwise government have to use of registered letter. An individual is not obliged to use data box in communication with anyone else. Data messages have to be used similarly as with individuals in interchange between government and self-employed

[21] Appendix 1 (page 47)

person. This fact should be changed by 2015. Owning of a data box will be obligatory. Since then, they will use data boxes same as legal persons. Interaction between state and legal persons has to be done by data boxes obligatory, according to act.[22] Above described ways of using data messages can be called Public data message. This kind of data message is paid from the state budget to the Czech Post. The price per one message was changeable trough time with the amount of sent public data messages[23], nowadays flat rate is paid together with all maintenance services[24]. Data message can be voluntarily used in interaction between self-employed persons as well as legal persons or individuals or between each other. Those who want to use it for this purpose have to sign a contract with Czech Post and pay for sending data messages according to the price list[25]. Those entities, in addition, have to ask the system administrator for allowance of receipt the data message from others than public body authority. This way of interchange is called Postal data message and it is equivalent to registered letter.

Figure 2 Diagram of communication with data boxes



Source: Author's work, 2014

[22] Act No. 300/2008 Coll.
[23] Appendix 2 (page 48)
[24] Table 1 (page 30)
[25] Appendix 3 (page 48)

3.4 Chain Index, fixed base index

3.4.1 Chain index

Glossary of European Union says that *"A chain index is an index number in which the value of any given period is related to the value of its immediately preceding period (resulting in an index for the given period expressed against the preceding period = 100); this is distinct from the fixed-base index, where the value of every period in a time series is directly related to the same value of one fixed base period.*

This index type is called a chain index because individual indices with previous period = 100 can be chained together by multiplying (and dividing by 100) all consecutive indices, thus converting them into a series of indices with the first reference period = 100. This way, the consecutive values of the index numbers form a chain, as it were, from the first (reference) to the last period."[26]

3.4.2 Fixed base index

This index is based on the value in the initial time period. This initial value does not change and remains the same for the whole period. Therefore any time period is based on the first period of time.[27]

3.5 Net present Value

Net present value is a pointer that counts only and only with the future cash flow. In fact, it tells us how much money will the selected project bring or take away for the chosen lifetime of the project.

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} - CF_0$$

[26] Glossary:Chain index: Statistics Explained. EUROSTAT. [online]. 2013 [cit. 2014-03-15]. Available at: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Chain_index#

[27] NEWBOLD Paul, William L. Statistics for business and economics. 7th ed. Upper Saddle River, N.J: Pearson Education. ISBN 978-013-5072-486.

Net present value consists of sum of inflows and outflows (including initial investment) which are represented by CF (cash flow) in equation above. The "t" represents considered life time of project and "k" represents value of money in time. [28]

[28] GITMAN, Lawrence J. *Principles of managerial finance*. 11. ed., internat. ed. Boston, Mass. [u.a.]: Pearson/Addison-Wesley. ISBN 03-213-1150-7.

4 Practical

The practical part of thesis is focused on firstly describing changes and trends of data boxes usage and its traffic by data message in given time period by different indexes and time series. The second part will consist of computation and evaluation current net present value regarding to information system of data boxes and its estimated prognosis for the 2015, when implementation of a new law will cause significant increase of number of total created data boxes as well as number of sent public data messages every year.

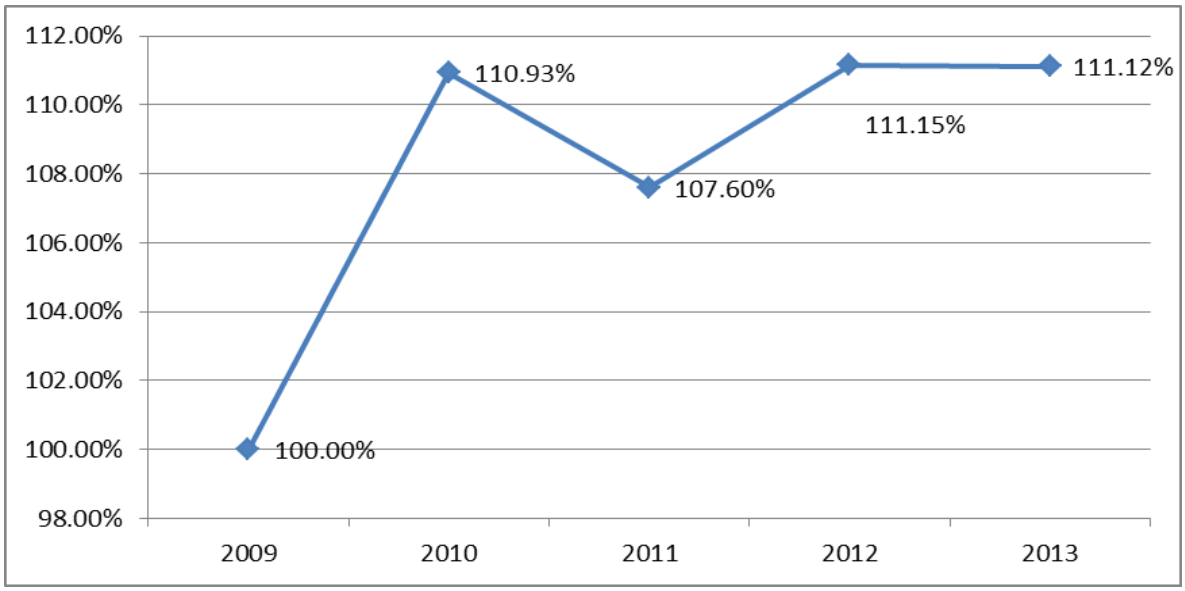
4.1 Chain index, fixed base index, time series

Chain and fixed base indexes serve as an indicator of changes observed data from different perspectives. Time series provide overview of development in time.

4.1.1 Created data boxes

One of the factors that might sufficiently give us elemental information about the use of information system of data boxes is accumulated number of created data boxes.

Chart 3 Chain index of total created data boxes (%)

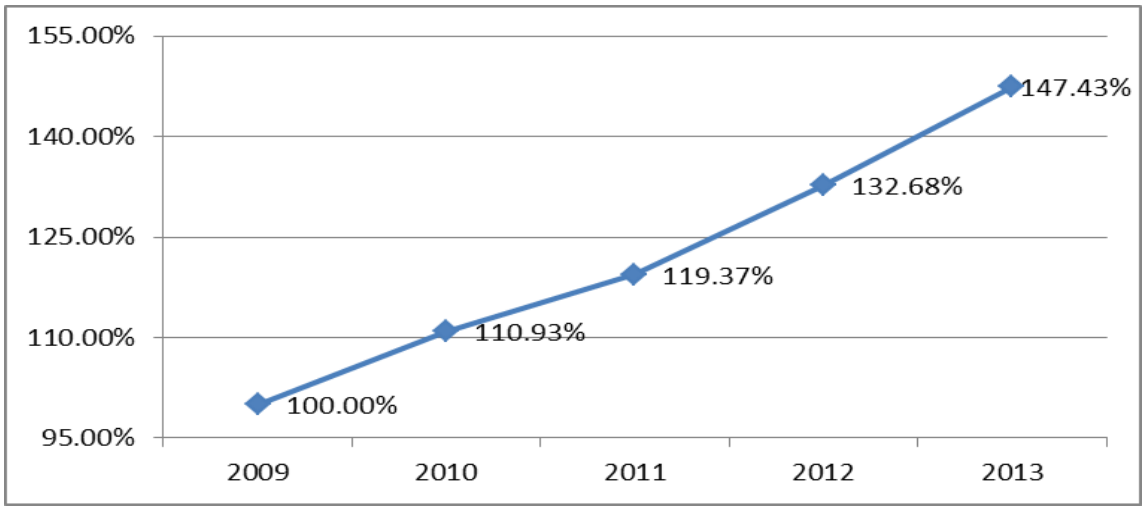


Source: Czech Post, Author's work

Chain index of total created data boxes listed above shows us that the growth rate is more or less around ten percent every year. It probably means that for more and more people or

business entities it is necessary to communicate with government or between each other and take advantage from this communication tool of e-government.

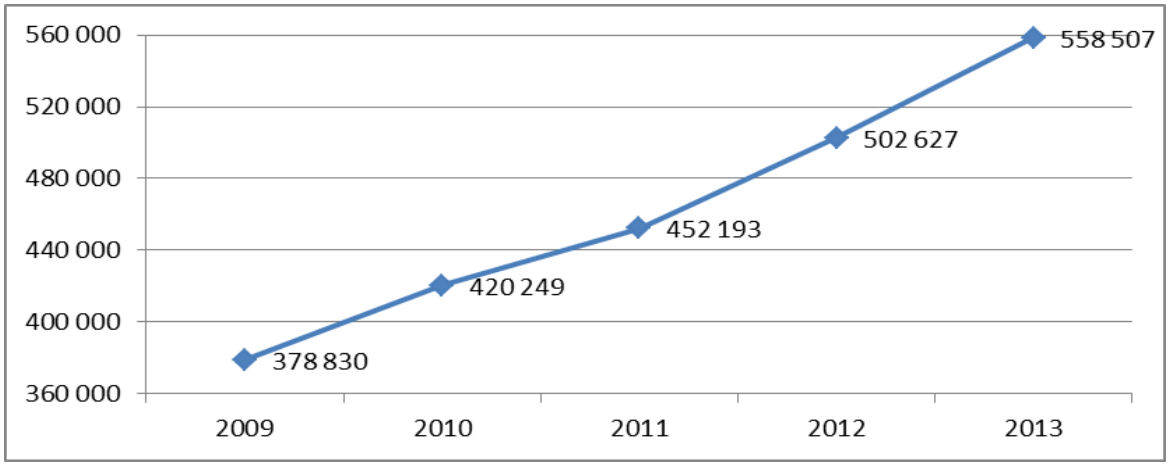
Chart 4 Fixed base index of total crated data boxes (%)



Source: Czech Post, Author's work

The fixed base index clearly states that within more than 4 years (information system of data boxes was implemented on 1st of November 2009) the amount of total crated data boxes increased almost by 47.43% and that there is still place for growth in following years. From the table above it is clear that each year there is an increase in the usage of ISDB.

Chart 5 Time series of total created data boxes (pieces)



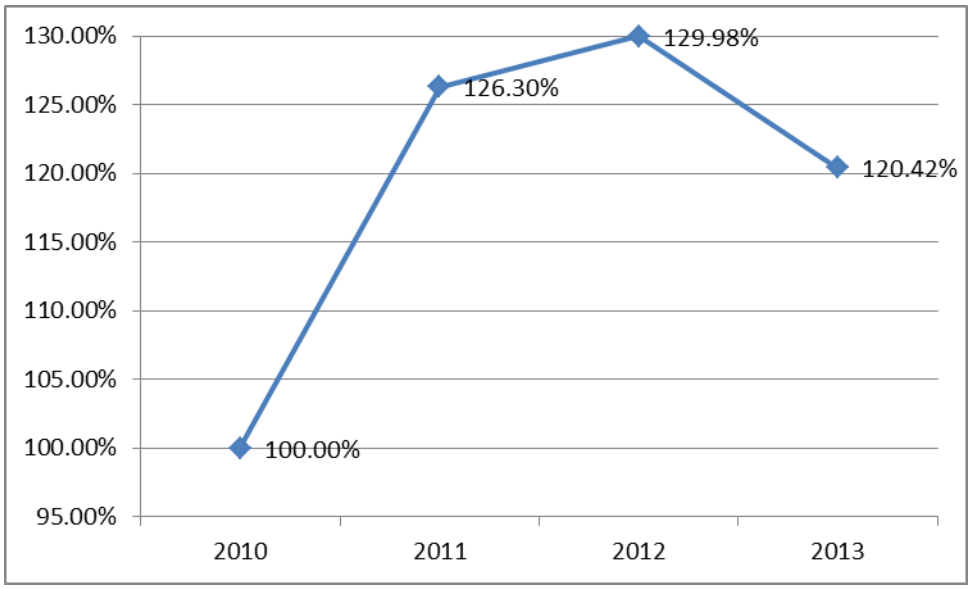
Source: Czech Post, Author's work

Chart 3 time series of total created data boxes (pieces) clearly states that by the end of 2013, there was created a total of 558 507 data boxes. So this graph shows the growth of number of crated data boxes from 2009 to 2013 in absolute numbers. The base is almost by a half higher than in beginning year (in which there were 378 830 data boxes created) what can be considered as a significant increase.

4.1.2 Sent public data messages

Due to the comparability with following years data from 2010 till 2013 were used, because in 2009 information system of data boxes ran only two months. This part summarizes yearly trends in sending public data messages.

Chart 6 Chain index of sent public data messages (%)

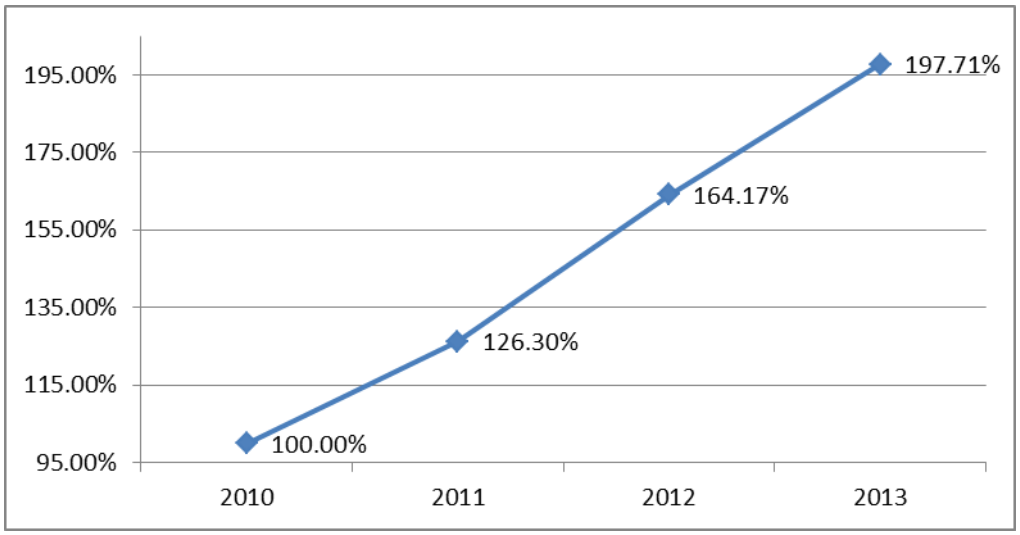


Source: Czech Post, Author's work

Although there was a slight decrease in sent public data messages in 2013, in total the data messages grew by 20.42 % in comparison with the previous year of 2012. This fact states Chart 6 Chain index of sent public data messages listed above. In 2011 and 2012 the growth may be caused by government indirectly forcing legal persons to use electronic means of communication instead of paper. Data messages were the easiest way to achieve such a condition. The growth of 20 % may be considered quite significant and sent public data messages are expected to maintain the tendency to grow for following years.

To support the facts mentioned above it is possible to illustrate them on the fixed base index analysis.

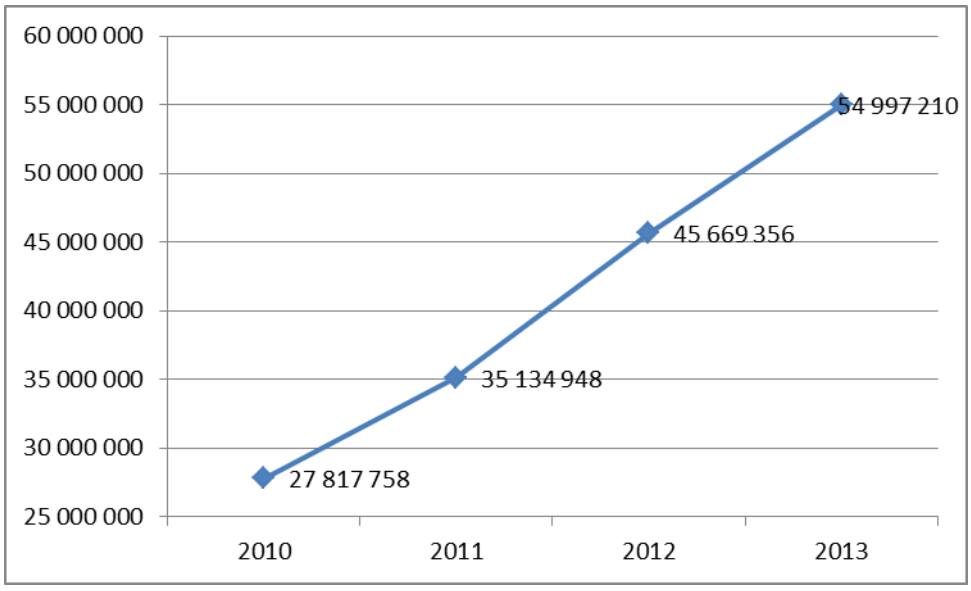
Chart 7 Fixed base index of sent public data messages (%)



Source: Czech Post, Author's work

Chart 7 Fixed base index of sent public data messages demonstrates the fact of increased traffic of public data messages. In 2013 there was an increase of 97.71 % in comparison with the first year-round round in 2010.

Chart 8 Time series of sent public data messages (pieces)



Source: Czech Post, Author's work

Chart 8 Time series of sent public data messages describes the absolute numbers of the amount of information sent between bodies of public authorities.

4.2 Net present value

Previous part was devoted to evaluation the information system of data boxes from the perspective of analysing hard data. ISDB might be also analysed from the economic point of view. In this thesis Net Present Value (abbreviation NPV) will be used to determine the inflows and outflows of ISDB. Net present value is usually calculated before the investment is done, so it has to be calculated for year 2009.

4.2.1 Net present value after 5 years

Computing and evaluation of this time period was chosen, because real data are already available from Ministry of Interior affairs. Therefore it is possible to make financial assessment of the system.

4.2.1.1 Outflows

The total costs of information system of data boxes are the sum of costs connected with running of system in particular year and for purposes of calculation of net present value is considered as an outflow.

Table 1 Outflows after 5 years

The list of individual costs for ISDB (including VAT) in CZK					
Year	2009	2010	2011	2012	2013
Payments for Public Data Messages	45 905 053.18	471 491 865.40	524 757 940.80	577 045 536.00	0.00
Flat rate	107 100 000.00	217 922 000.00	237 912 000.00	216 000 000.00	605 000 000.00
Fee for creating access to data box	52 925 576.60	13 609 224.20	13 482 818.00	10 636 385.00	7 134 681.20
Amendments to contracts	0.00	285 600 000.00	149 931 345.60	0.00	6 483 966.50
The total costs of IDSB	205 930 629.78	988 623 089.60	926 084 104.40	803 681 921.00	618 618 647.70

Source: Ministry of Interior affairs

The table above, Table 1 Outflows after 5 years, represents all costs connected with information system of data boxes which were spent by the Czech government (represented by administrator Ministry of Interior affairs) from the system implementation (1st of November 2009) till the end of year 2013. All money goes to Czech Post, holder of postal licence and operator of ISDB. Data are segmented. Payments for public data messages

represent payments for all messages which were realized between bodies of public authority and the others. As described on diagram of communication with data boxes (Figure 2, page 23). This data is increasing as the number of sent public data messages increases. Price per one data message was changeable with the amount of total sent public messages. See appendix 2. In 2012 the negotiation started between the administrator (Ministry of interior affairs) and the system operator (Czech Post) about optimization of costs, because it was obvious that in following year payments for public data messages would be too high.

In 2013 the contract was changed between administrator and system operator. This agreement led to cancellation of payments per public data messages and its change to flat rate. In previous years, flat rate served as a fee for maintenance and operating of system, it was changeable and paid to Czech Post. These two items of Table 1 in 2009 covered 74.3%, 69.73% in 2010, and 82.35% in 2011, of total costs for ISDB. In 2012 it significantly increased (due to the decrease of amendments of contracts) to 98.68%, 2013 to 97.8% of total cost for ISDB for particular year.

Fee for creating access to data box consists of fixed payments of 30 CZK and variable cost associated with delivering of login information (user name and password) which are changeable throughout the years. This fee is paid by government, because the state does not want to build any barriers in communication with him and thus making it as smooth as possible. This number was the highest in 2009 because the system started running, so most of data boxes for public authorities were crated (and financed) that year. It was 25.7% of all costs in 2009, meanwhile in following years it did not go across the two percentage border.

Amendments to contracts were as well changeable throughout the years. We can say that in the first year, there were no amendments to contract. Due to the start of system and identification of problems connected with this important moment, which probably could not be predicted before, amendments to contract increased in following years. Solving of problems, which had arisen from the beginning of running the system, was financed in the following year. In 2010 it was also found out that some extra services were needed, which were not intended in the original idea and which showed up as a necessity during proper running of this proprietary information system. Financing a solution to the problem was

realized in the following year, in 2011. In 2010 amendments were a bit higher than one quarter, 28.89% and in 2011 they were 16.19%, 2012 0.0% and in 2013 negligible 1.05%. of the total costs of ISDB in given year.

4.2.1.2 Inflows

Inflows are supposed to be savings for government, which would be acquired by using information system of data boxes in comparison with sending registered letters. This can be known as expected savings.

Table 2 Statistics of sent public data messages in each year (pieces) and price for sending registered letter (in CZK)

Year	2009*	2010	2011	2012	2013
Sent public data messages	2 623 336	27 817 758	35 134 948	45 669 356	54 997 210
* ISDB worked only last two months					
Price for sending registered letter from 2008 till half of 2013					26

Source: Czech Post

Table 3 Costs for sending registered letter instead of public data message in each year

Year	2009	2010	2011	2012	2013
Price in CZK	68 206 736	723 261 708	913 508 648	1 187 403 256	1 429 927 460

Source: Author's work

For calculation inflows it is necessary to know the amount of sent public data messages in each year, price for sending registered letter (Table 2). It is also important to know the total cost of information system of data boxes (Table 1). Trends of sent public data messages are described in previous chapter. Price of registered letter was from the year 2008 till half of 2013 26 CZK (Table 2), so this value was used for computation the whole of-2013 as well as for previous years. Cost for sending registered letter instead of public data message (Table 3) is simply multiplication of the amount sent public data messages in each year and price for registered letter. This number grows at the same rate as the volume of sent public data messages. This is one side of equation of inflows, the other is the total cost of ISDB. Total costs are subtracted from the value that would be spent for sending registered letter instead of data message. These are expected savings and are considered as an inflow.

Table 4 Inflows after 5 years

Year	2009	2010	2011	2012	2013
Inflows in CZK	-137 723 893.78	-265 361 381.60	-12 575 456.40	383 721 335.00	811 308 812.30

Source: Author's work

The values of inflows were negative at the beginning of given period. This was caused by costs and probably by the amendments to contracts which were unexpected but significantly influenced the total costs of ISDB, thus the inflow outcome. At the end values were positive. This was caused by decreasing total costs and at the same time increasing number of sent public data messages. Increased number created data boxes is not significant cost but it is important, because it allows higher interchange of data messages which led to increase of potential savings.

4.2.1.3 Cost of capital

Cost of capital is essential parameter. It helps us take into consideration time value of money. It is obvious that dollar/euro/koruna today is worth more than a given currency tomorrow or in ten years. In case of project evaluation of ISDB average value of 10year bond of Treasury of the Czech Republic is used, because project was realized by Czech government.

Table 5 Average of 10-year maturity Treasury bond yield (Maastricht criterion) for each year (%)

Year	2010	2011	2012	2013
Average of 10-year maturity Treasury bond yield (Maastricht criterion) for each year[29]	3.88%	3.71%	2.78%	2.11%

Source: Czech National Bank

Table 5 describes the decrease in average yield of 10 year maturity Treasury bond. This trend could be influence by international ratings of credit rating agencies such as Moody's,

[29] ARAD - Time Serie System - Czech National bank. CZECH NATIONAL BANK. ARAD - Time Serie System - Czech National bank [online]. ©2014 [cit. 2014-03-10]. Available at: http://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_period=1&p_sort=2&p_des=50&p_sestuid=375&p_uka=1&p_strid=EBA&p_od=200004&p_do=201401&p_lang=EN&p_format=0&p_decsep=.

Standard and Poor's or Fitch where is apparent long-time improvement of the Czech Republic´s credibility[30].

4.2.1.4 Calculation of NPV

Net present value is usually calculated before the investment is done, so it has to be calculated for 2009. For this purpose, values of inflow and outflow were discounted by the values of average of 10-year maturity Treasury bond yield for each year.

Table 6 Discounted inflow and outflow after 5 years

Year	Discounted inflow (expected savings) in CZK			
2013	717 557 533.67	745 398 765.97	773 053 060.19	794 543 935.27
2012	346 541 106.84	359 986 901.78	373 342 415.84	
2011	-11 672 696.15	-12 125 596.76		
2010	-255 449 924.53			
2009	-137 723 893.78			
Sum	659 252 126.05			

Year	Discounted outflow (the total costs of ISDB) in CZK			
2013	547 133 797.14	568 362 588.47	589 448 840.50	605 835 518.26
2012	725810105	753971537.1	781 943 881.11	
2011	859602865.8	892955456.9		
2010	951697236.8			
2009	205 930 629.78			
Sum	3 290 174 634.49			

Source: Author's work

Therefore, inflow from 2013, (811 308 812.3 CZK) see Table 34, was discounted by average of 10-year maturity Treasury bond yield from 2013 (2.11%) see Table 45, then this value (794 543 935.27 CZK), see Table 56, was discounted by value of yield of 10-year bond in 2012 (2.78%), same principle was used till 2009 with value from 2010 (3.88%). Value of inflow in 2009 was not discounted because those two months would not significantly influence the results. Sum of discounted inflows (expected savings) was estimated to 659 252 126.05 CZK.

Same method of discounting was used for outflows, representing total cost of information system of data boxes. Value from 2013 (618 618 647.70 CZK) see Table 1, was discounted

[30] Rating agencies - Czech National Bank. CZECH NATIONAL BANK. *Rating agencies - Czech National Bank* [online]. © 2013 [cit. 2014-03-10]. Available at: https://www.cnb.cz/en/about_cnb/international_relations/rating/

by value yield of 10-year maturity Treasury bond from 2013 (2.11%) see 5.Year 2009 was chosen as a year of beginning of running system Sum of discounted outflows (the total cost of ISDB), is 3 290 175 634.49 CZK. For more details see Appendix 5.

Net present value is a result of subtracting outflows from inflows. In our case is net present value after five years negative and would be rejected as an investment opportunity. Exact value is - 2 630 922 508.44 CZK.

It is debatable whether there is a chance that expected savings (inflows) will be able to balance costs associated with ISDB or even overcome it. As the following prediction will show this possibility is likely.

4.2.2 Net present value after 7 years

In 2015 there should be implemented an amendment of act No. 582/1991 Coll., which will indirectly force all self-employed persons to own and use data boxes, especially in communication with the Czech social security administration and if not, then at least once a year for communication with tax office for purposes of tax declaration. Indirectly, because there will still be another electronic opportunity for communication, but not that easy and widely used as the data boxes.

4.2.2.1 Outflows

Outflows for years 2009, 2010, 2011, 2012 and 2013 stated the same. They are based on relevant information. Outflows for 2014 and 2015 are estimated. This estimation will be explained bellow the following table.

Table 7 Estimated outflows after 7 years

The list of estimated individual costs for ISDB (including VAT) in CZK			
Year	2013	2014	2015
Payments for Public Data Messages	0.00	0.00	0.00
Flat rate	605 000 000.00	605 000 000.00	605 000 000.00
Fee for creating access to data box	7 134 681.20	0.00	171 102 315.75
Amendments to contracts	6 483 966.50	0.00	0.00
The total costs of ISDB	618 618 647.70	605 000 000.00	776 102 315.75

Source: Author's work

Data from previous years are the same as was mentioned above (Table 1). Data for years 2014 and 2015 are estimated and the procedure described below. In 2014 there are not supposed to any amendments to contracts or significant increase in section fee for creating access to data boxes. In previous year (2013) both segments shared on the total cost of ISDB close to one percent. Fee for creating access to data boxes was 1.15% of the total cost and in case of amendments to contracts it was 1.05% of the total costs of IDSB. Flat rate for following years stayed same.

In 2015 fee for creating access to the data box will increase due to the above mentioned reasons (self-employed persons are indirectly forced to use data boxes). This number was derived from average fee for creating access to data box and number of self-employed persons which was registered by Czech social security administration[31] at the end of December 2013. Number of registered self-employed persons in December 2013 was 977 228 people. Of course some of them already have data boxes, but this mount could be even up by individuals who will need to use data box. Average fee for creating access to data box was determined by sum of fee for creating access to data box 2009-2013 (97 788 685 CZK), see Table 1, divided by total created data boxes 2009-2013 (558 507 pieces), see Chart 5. Average fee for creating access to the data box was calculated to 175.09 CZK. So finally, amount of money which should be spent for creating access to data box in 2015 should be 171 102 315.75 CZK and due to this, the total cost should increase to 776 102 315.75 CZK. There is no obvious trend in the fee for creating access to data boxes, perhaps step increase caused by implementation of a new law. E.g. in 2009, when data boxes started to be used and all public authorities together with legal persons were obliged to own and use data boxes according to law.

4.2.2.2 Inflows

As was already mentioned, inflows are expected savings which would public sector gain from using ISDB instead of registered letters.

[31] Statistika počtu klientů za rok 2013 - Česká správa sociálního zabezpečení: Přehled o celkovém počtu OSVČ podle krajů: k 31. 12. 2013. THE CZECH SOCIAL SECURITY ADMINISTRATION. *Statistika počtu klientů za rok 2013 - Česká správa sociálního zabezpečení* [online]. 2014 [cit. 2014-03-10]. Available at: http://www.cssz.cz/NR/rdonlyres/94D91C7A-70E0-47C8-9A43-F8E9486477C3/0/k31_12_2013_pocetOSVC.pdf

Table 8 Estimated statistics of sent public data in messages in each year

Year	2013	2014	2015
Sent public messages	54 997 210	65 544 504	79 091 773

Source: Author's work

Table 9 Price for sending registered letter in each year (in CZK)

Price of registered letter from 2008 till half of 2013	26
Price of registered letter from second half of 2013 till now	29

Source: Czech Post

Table 10 Estimation of costs for sending registered letter instead of public data message in each year

Year	2013	2014	2015
In CZK	1 429 927 460	1 900 790 621	2 293 661 412

Source: Author's work

Inflows for previous years (2009, 2010, 2011, 2012) remained the same as well as for 2013. But for estimation inflows in 2014 and 2015 it would be necessary to know estimation of number of sent public data messages in 2014 and 2015. For estimation number of sent public data messages in 2014 would be used the average from chain index of sent public data messages 2009-2013 - 19.18% and value of sent public data messages in 2013. The value of sent public data messages in 2014 would increase by 19.18% to 65 544 504 pieces, in comparison with 2013. For estimation of number of sent public data messages in 2015 average from chain index of sent public data messages 2009-2014 was used, which was actually the same as in previous year - 19.18% and value of sent public data messages in 2014 plus number of registered self-employed persons at the end of December 2013 (977 288 people). As was mentioned above, in the beginning of chapter NPV after 7 years, self-employed persons would be indirectly forced to use the data boxes for communication at least one time for the purpose of tax declaration. The amount of sent public data messages was estimated to be 79 091 773 messages.

Price for sending registered letter for years 2009-2013 stood the same but prices for year 2014 and 2015 were changed. Price would increase from 26 CZK to 29 CZK. Cost for sending registered letter instead of public data message is determined by multiplication amount of sent public data messages in given year and price particular year. Cost for 2009-2013 remained the same, with the using price of registered letter (26 CZK). For 2014 and 2015 price of registered letter would increase to 29 CZK.

Table 11 Estimation of inflows after 7 years

Year	2013	2014	2015
Inflows in CZK	811 308 812.30	1 295 790 620.86	1 517 559 096.59

Source: Author's work

Inflow is created by subtracting total costs of ISDB in particular year from value that would be spent for sending registered letter instead of data message. Data for previous years remained the same. There is clear trend of increasing inflows as the number of sent public data messages growing at the same time.

4.2.2.3 Cost of capital

Cost of capital takes into consideration time value of money. In our case (evaluation project of ISDB) average value of 10-year bond of Treasury of the Czech Republic from particular year would be used. Value from 2014 would be abstracted from January 2014. In 2015 average from all values of 10 year bond between January 2010 and January 2014 would be used. See Appendix 4.

Table 12 Average of 10-year maturity Treasury bond yield (Maastricht criterion) for each year (%)

Year	2010	2011	2012	2013	2014	2015
Average of 10-year maturity Treasury bond yield (Maastricht criterion) for each year[32]	3.88%	3.71%	2.78%	2.11%	2.43%	3.11%

Source: Czech National Bank and author's work

Table 12 describes the changes in average yield of 10 year maturity Treasury bond. Financial markets which borrow money to government might be influence by international agencies such as Standard and Poor's, Fitch or Moody's where is apparent long-time improvement in sovereign debt ratings of the Czech Republic´s credibility[33].

4.2.2.4 Calculation of NPV

This method is mostly used sooner than the project is even started to be build. Therefore it should be counted in 2009. In order to achieve right values, inflows and outflows were discounted for the year 2009.

[32] Reference No. 29
[33] Reference No. 30

Table 13 Estimated discounted inflow and outflow after 7 years

Year	Discounted inflow (expected savings) in CZK					
2015	1 270 832 134.60	1 320 140 421.43	1 369 117 631.06	1 407 179 101.20	1 436 870 580.24	1 471 786 535.34
2014	1 118 866 303.75	1 162 278 316.34	1 205 398 841.88	1 238 908 929.68	1 265 049 908.10	
2013	717 557 533.67	745 398 765.97	773 053 060.19	794 543 935.27		
2012	346 541 106.84	359 986 901.78	373 342 415.84			
2011	-11 672 696.15	-12 125 596.76				
2010	-255 449 924.53					
2009	-137 723 893.78					
Sum	**3 048 950 564.41**					

Year	Discounted outflow (the total costs of ISDB) in CZK					
2015	649 922 474.07	675 139 466.06	700 187 140.25	719 652 342.75	734 837 007.19	752 693 546.46
2014	522 394 670.00	542 663 583.19	562 796 402.13	578 442 142.11	590 647 271.31	
2013	547 133 797.14	568 362 588.47	589 448 840.50	605 835 518.26		
2012	725 810 105.01	753 971 537.08	781 943 881.11			
2011	859 602 865.76	892 955 456.95				
2010	951 697 236.81					
2009	205 930 629.78					
Sum	**4 462 491 778.56**					

Source: Author's work

Inflows in 2015 (1 517 599 096.59 CZK), see Table 11, would be discounted by average value of all values of 10-year bond between January 2010 and January 2014 (3.11%). Then this calculated value (1 471 786 535.34 CZK), see Table 13 would be again discounted by the latest value of 10-year maturity Treasury bond yield which was taken from January 2014 (2.43%). Discounted value from previous calculation (1 436 870 580.24 CZK) would be anew discounted by value for 2013 (2.11%) and etc. Same procedure would be used for all inflows from particular year. Sum of discounted expected savings (inflows) is 3 048 950 564.41 CZK.

Exactly the same technique would be used for total costs of information system of data boxes (outflows). The sum of discounted total costs of ISDB (outflows) would be 4 462 491 778.56 CZK.

Net present value is similar to the previous example result of subtracting outflows from inflows. In the second case net present value after seven years would be also negative and would be likewise rejected as investment opportunity. Exact value of the loss would be 1 413 541 214.15 CZK. For more details see Appendix 6.

5 Results and discussion

Evaluation of indexes of created data boxes clearly describe trends that even small increase in number of users together with new law implementation led to significant increase in usage of data boxes a therefore number of sent data messages.

Indexes mentioned above state that number of data boxes is likely to grow, especially thanks to new amendment of law and self-employed persons. This should also apply to sent public data messages. Although in 2013 sent public data messages grew slower then they grew in 2012, they shouldn't drop any lower.

As a result of NPV evaluation informational system of data boxes it is save to assume that money invested in the system was worth more than the system is worth now. NPV after 5 years as well as NPV after 7 years as an investment would be rejected. However the loss is significantly lower after 7 years in comparison with 5 year evaluation. While in 5 years of system's existence the financial loss is 2 630 922 508.44 CZK, the loss after 7 years of system's existence is 1 413 541 214.15 CZK. The difference in expected savings in 2 years is 1 217 381 294.29 CZK. Currently the system is meant to be used for more than 7 years, resulting in better financial results.

It is hard to compare financial and nonfinancial benefits due to different personal opinion and perception. Important facts regarding the effectiveness of the communication system are positive externalities. Delivery speed, archiving, time management or data availability are crucial perks and the reason why the system was started in the first place. It enables people to work more comfortable and it increases their effectiveness.

6 Conclusion

Main objective of this thesis was to describe current state of e-government. Czech government chose to implement the e-government system slowly. It allows adapting the communication system accordingly to users and their feedbacks. On the other hand, if the e-government communication system would be implemented all at once, it might have avoided current reluctance towards the system and its changes.

With extensive system change it might not be ideal to make compromises. It might be better to choose a narrow way to implement change. It comes with mistakes which can be revealed during the trial. Also negative reactions are needed to be dealt with promptly and accordingly, which means identifying reasonable and constructive complaints.

It is needed to point out that the current state of main e-government applications in the Czech Republic may be considered as functional. Nevertheless, there are several issues. Nowadays data boxes are generally connected with negative emotions, which may come from implementing the system too early and not well prepared. One of the possibilities to make the system more acceptable would be making the system more user-friendly, although there should remain some level of bureaucracy to ensure legal integrity.

Evaluation of economic effectiveness of Information system of data boxes done in this thesis shows that as an investment opportunity this project would be rejected, unless the positive externalities would be considered more valuable than costs associated with running the system.

It is debatable whether positive externalities of information system of data boxes such as delivery speed, effortlessness of (low demands for) archiving, availability of using of data boxes almost everywhere (where is connection to the Internet), time savings, increasing of enforceability of law, purifying of register of companies and other can prevail over this negative value.

As a result of this thesis it is possible to say that communication system of Czech government works sufficiently without major faults. However implementation of the system is slow and thus not as efficient as primarily thought, especially amendments to contracts increase total costs and reduce financial effectiveness.

7 Bibliography:

7.1 Books and Report Resources

Act No. 227/2000 Coll.

Act No. 300/2008 Coll.

Act No. 99/1963 Coll.

BOVAIRD, A a Elke LÖFFLER. *Public management and governance: re-booting the state*. 2nd ed. New York: Routledge, 2009, xxviii, 220 p. ISBN 02-038-8409-4

GITMAN, Lawrence J. *Principles of managerial finance*. 11. ed., internat. ed. Boston, Mass. [u.a.]: Pearson/Addison-Wesley. ISBN 03-213-1150-7.

HEEKS, Richard. *Implementing and managing eGovernment: an international text*. Thousand Oaks, Calif.: SAGE, 2006. ISBN 07-619-6792-3.

LECHNER, Tomáš. *Elektronické dokumenty v právní praxi /: Tomáš Lechner*. Praha: Leges, 2013, 255 s. Praktik. ISBN 978-80-87576-41-0

MATES, Pavel a Vladimír SMEJKAL. *E-government v České republice: právní a technologické aspekty*. 2., podstatně přeprac. a rozš. vyd. Praha: Leges, 2012, 464 s. Teoretik. ISBN 978-80-87576-36-6.

NIXON, Paul a Vassiliki N KOUTRAKOU. *E-government in Europe: re-booting the state*. New York: SAGE, 2007, xxviii, 220 p. ISBN 02-039-6238-9.

NEWBOLD Paul, William L. *Statistics for business and economics*. 7th ed. Upper Saddle River, N.J: Pearson Education. ISBN 978-013-5072-486.

Regulation No. 194/2009

SMEJKAL, Vladimír a Michal Altair VALÁŠEK. *Jak na datové schránky: praktický manuál pro každého*. 1. vyd. Praha: Linde, 2009, 197 s. ISBN 978-808-6131-801

SMEJKAL, Vladimír. *Datové schránky v právním řádu ČR*. 1. vyd. Praha: ABF, 2009, 176 s. ISBN 978-80-86284-78-1

SMEJKAL, Vladimír. *Datové schránky v právním řádu ČR: zákon č. 300/2008 Sb., o elektronických úkonech a autorizované konverzi dokumentů, s komentářem*. 1. vyd. Praha: ABF, 2009, 176 s. ISBN 978-80-86284-78-1

7.2 Web Resources

ARAD - Time Serie System - Czech National bank. CZECH NATIONAL BANK. *ARAD - Time Serie System - Czech National bank* [online]. ©2014 [cit. 2014-03-10]. Available at: http://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_period=1&p_sort=2&p_des=50&p_sestuid=375&p_uka=1&p_strid=EBA&p_od=200004&p_do=201401&p_lang=EN&p_format=0&p_decsep=.

CZECH POST, state-owned enterprise. *Datové schránky* [online]. © 2014 [cit. 2014-03-04]. Available at: http://www.datoveschranky.info/

E-Governance Software Solutions | e-Governance Website Development Services. VERVE SYSTEMS PVT. LTD. *Verve Systems Pvt. Ltd.* [online]. 2011 [cit. 2014-03-10]. Available at: http://vervesys.com/wp-content/uploads/2011/10/e-governance.jpg

E-Government - Definition of E-Government. *The World Bank* [online]. © 2011 [cit. 2014-02-19].
Available at: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/EXTEGOVERNMENT/0,,contentMDK:20507153~menuPK:702592~pagePK:148956~piPK:216618~theSitePK:702586,00.html

Glossary:Chain index: Statistics Explained. EUROSTAT. [online]. 2013 [cit. 2014-03-15]. Available at:
http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Chain_index#

Households - level of Internet access. [online]. [cit. 2014-03-01]. Available at: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ci_in_h&lang=en

MADDEN, Ned. Sustainability Software, Part 2: Cutting the Paper Chase. TechNewsWorld [online]. 12/08/09 [cit. 2014-02-17]. Available at: http://www.technewsworld.com/story/68834.html

MINISTRY OF THE INTERIOR OF THE CZECH REPUBLIC. Home Page - Ministry of the Interior of the Czech Republic [online]. 2014 [cit. 2014-03-08]. Available at: http://www.mvcr.cz/mvcren

Moore's Law. GORDON E. MOORE. *Moore's Law* [online]. 1965 [cit. 2014-03-08]. Available at: http://www.mooreslaw.org/

OECD Glossary of Statistical Terms - E-government Definition. *OECD* [online]. 2002 [cit. 2014-02-19]. Available at: https://stats.oecd.org/glossary/detail.asp?ID=4752

PETERKA. Jiří. *Jiří Peterka - Lupa.cz* [online]. 2014 [cit. 2014-03-08]. Available at: http://www.lupa.cz/autori/jiri-peterka/

PETERKA. Jiří. *Jiří Peterka:archiv článků a přednášek* [online]. [cit. 2014-03-04]. Available at: http://www.earchiv.cz/

Rating agencies - Czech National Bank. CZECH NATIONAL BANK. *Rating agencies - Czech National Bank* [online]. © 2013 [cit. 2014-03-10]. Available at: https://www.cnb.cz/en/about_cnb/international_relations/rating/

Signals Intelligence - NSA/CSS. SHEA, Teresa H. [online]. [cit. 2014-03-01]. Available at: http://www.nsa.gov/sigint/index.shtml

Statistika počtu klientů za rok 2013 - Česká správa sociálního zabezpečení: Přehled o celkovém počtu OSVČ podle krajů: k 31. 12. 2013. THE CZECH SOCIAL SECURITY ADMINISTRATION. *Statistika počtu klientů za rok 2013 - Česká správa sociálního zabezpečení* [online]. 2014 [cit. 2014-03-10]. Available at: http://www.cssz.cz/NR/rdonlyres/94D91C7A-70E0-47C8-9A43-F8E9486477C3/0/k31_12_2013_pocetOSVC.pdf

United Nations E-Government Development Database: Overview - United Nation E-Government Database. *The United Nations* [online]. © 2010 [cit. 2014-02-19]. Available at: http://unpan3.un.org/egovkb/egovernment_overview/ereadiness.htm

Vládní návrh zákona o elektronických úkonech, osobních číslech a autorizované konverzi dokumentů. PARLAMENT ČESKÉ REPUBLIKY. *Parlament České republiky, Poslanecká sněmovna* [online]. 2008 [cit. 2014-03-08]. Available at: http://www.psp.cz/sqw/text/orig2.sqw?idd=26163

List of Tables

Table 1 Outflows after 5 years 30
Table 2 Statistics of sent public data messages in each year (pieces) and price for sending registered letter (in CZK) 32
Table 3 Costs for sending registered letter instead of public data message in each year 32
Table 4 Inflows after 5 years 33
Table 5 Average of 10-year maturity Treasury bond yield (Maastricht criterion) for each year (%) 33
Table 6 Discounted inflow and outflow after 5 years 34
Table 7 Estimated outflows after 7 years 35
Table 8 Estimated statistics of sent public data in messages in each year 37
Table 9 Price for sending registered letter in each year (in CZK) 37
Table 10 Estimation of costs for sending registered letter instead of public data message in each year 37
Table 11 Estimation of inflows after 7 years 38
Table 12 Average of 10-year maturity Treasury bond yield (Maastricht criterion) for each year (%) 38
Table 13 Estimated discounted inflow and outflow after 7 years 39

List of Figures

Figure 1 G2G, C2C, B2B, G2C, G2B, C2B communication diagram..... 16
Figure 2 Diagram of communication with data boxes 23

List of Charts

Chart 1 Households having access to the Internet at home (% of all households) 10
Chart 2 Reasons for using e-government websites, EU-28, 2013 (% of e-government users) 11
Chart 3 Chain index of total created data boxes (%)..... 26
Chart 4 Fixed base index of total crated data boxes (%)..... 27
Chart 5 Time series of total created data boxes (pieces) 27
Chart 6 Chain index of sent public data messages (%) 28
Chart 7 Fixed base index of sent public data messages (%)..... 29
Chart 8 Time series of sent public data messages (pieces)..... 29

Appendix

1. List of attachments of data message

a) pdf (Portable Document Format)

b) PDF/A (Portable Document Format for the Long-term Archiving)

c) xml (Extensible Markup Language Document

d) fo/zfo (602XML Filler document)

e) html/htm (Hypertext Markup Language Document)

f) odt (Open Document Text)

g) ods (Open Document Spreadsheet)

h) odp (Open Document Presentation)

i) txt (prostý text)

j) rtf (Rich Text Format)

k) doc/docx (MS Word Document)

l) xls/xslx (MS Excel Spreadsheet)

m) ppt/pptx (MS PowerPoint Presentation)

n) jpg/jpeg/jfif (Joint Photographic Experts Group File Interchange Format)

o) png (Portable Network Graphics)

p) tif/tiff (Tagged Image File Format)

q) gif (Graphics Interchange Format)

r) mpeg1/mpeg2 (Moving Picture Experts Group Phase 1/Phase 2)

s) wav (Waveform Audio Format)

t) mp2/mp3 (MPEG-1 Audio Layer 2/Layer 3)

u) isdoc/isdocx (Information System Document) version 5.2 and updated

v) edi (international standard EDIFACT, standards ODETTE a EANCOM for economic exchange of business documents - EDI)

w) dwg (AutoCAD DraWinG File Format) version 2007 and updated

x) shp/dbf/shx/prj/qix/sbn/sbx (ESRI Shapefile)

y) dgn (Bentley MicroStation Format) version V7 a V8

z) gml/gfs/xsd (Geography Markup Language Document)

Source: The code of operation of ISDB

2. Price of public data message

Price of public data message	
Limits Accumulated quantity of public data messages	Price per one data message including VAT (in CZK)
0-33 mil	17.9
33-66 mil	15.9
66-100 mil	13.9
100 - 123 mil	11.9
Above 123 mil	9.9

Source: Regulation No. 194/2009

3. Price of postal data message

Price of postal data message (including VAT) in CZK	14.13

Source: Czech Post

4. Average of interest rate of 10-year maturity Treasury bond yield (Maastricht criterion)

Average of interest rate of 10-year maturity Treasury bond yield (Maastricht criterion)

Month.year	1.14		Average of interest rate of 10-year maturity Treasury bond yield for 01.01.2010-01.01.2014											
Interest rate (%)	2.43													3.11
Month.year	12.13	11.13	10.13	9.13	8.13	7.13	6.13	5.13	4.13	3.13	2.13	1.13	Average	
Interest rate (%)	2.2	2.18	2.33	2.42	2.4	2.23	2.14	1.67	1.82	1.98	2.01	1.96		2.11
Month.year	12.12	11.12	10.12	9.12	8.12	7.12	6.12	5.12	4.12	3.12	2.12	1.12	Average	
Interest rate (%)	1.92	1.92	2.24	2.37	2.38	2.6	3.11	3.31	3.51	3.51	3.12	3.39		2.78
Month.year	12.11	11.11	10.11	9.11	8.11	7.11	6.11	5.11	4.11	3.11	2.11	1.11	Average	
Interest rate (%)	3.7	3.67	3.14	3	3.4	3.79	3.77	3.89	4.05	4.05	4.05	3.98		3.71
Month.year	12.10	11.10	10.10	9.10	8.10	7.10	6.10	5.10	4.10	3.10	2.10	1.10	Average	
Interest rate (%)	3.89	3.59	3.43	3.34	3.56	3.97	4.26	4.1	3.84	4.02	4.33	4.28		3.88

Source:

EN http://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_period=1&p_sort=2&p_des=50&p_sestuid=375&p_uka=1&p_strid=EBA&p_od=200004&p_do=201401&p_lang=EN&p_format=0&p_decsep=.

CZ http://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_period=1&p_sort=2&p_des=50&p_sestuid=22049&p_uka=3&p_strid=EBA&p_od=200004&p_do=201401&p_lang=CS&p_format=0&p_decsep=%2C

5. Calculation NPV after 5 years

Table 1	Outflows after 5 years				
	The list of individual costs for ISDB (including VAT) in CZK				
Year	2009	2010	2011	2012	2013
Payments for Public Data Messages	45 905 053.18	471 491 865.40	524 757 940.80	577 045 536.00	0.00
Flat rate	107 100 000.00	217 922 000.00	237 912 000.00	216 000 000.00	605 000 000.00
Fee for crating acces to data box	52 925 576.60	13 609 224.20	13 482 818.00	10 636 385.00	7 134 681.20
Amendments to contracts	0.00	285 600 000.00	149 931 345.60	0.00	6 483 966.50
The total cost of IDSB	205 930 629.78	988 623 089.60	926 084 104.40	803 681 921.00	618 618 647.70
Source: Minitsry of Interior affairs					

Table 2	Statistics of sent public data messages in each year (pieces) and price for sending registered				
Year	2009 [1]	2010	2011	2012	2013
Sent public messages	2 623 336	27 817 758	35 134 948	45 669 356	54 997 210
[1] ISDS worked only last two months					
Price of registered letter from 2008 till half of 2013					26
Source: Czech Post					

Table 3	Costs for sending retistered letter instead of public data message in each year				
Year	2009	2010	2011	2012	2013
Price in CZK	68 206 736	723 261 708	913 508 648	1 187 403 256	1 429 927 460
Source: Czech Post					

Table 4	Inflows after 5 years				
Year	**2009**	**2010**	**2011**	**2012**	**2013**
Inflows in CZK	-137 723 893.78	-265 361 381.60	-12 575 456.40	383 721 335.00	811 308 812.30
Source: Author's work					

Table 5	Average of Interest rate of 10-year maturity Treasury bond yield (Maastricht criterion) for each year (%)			
Year	2010	2011	2012	2013
Average of Interest rate of 10-year maturity Treasury bond yield (Maastricht criterion) for each year [2]	3.88%	3.71%	2.78%	2.11%
[2] See appendix 4 (page 54)				
Source: Czech National Bank				

Table 6	Discounted inflow and outwlof after 5 years			
Year	Discounted inflow (expected savings) in CZK			
2013	717 557 533.67	745 398 765.97	773 053 060.19	794 543 935.27
2012	346 541 106.84	359 986 901.78	373 342 415.84	
2011	-11 672 696.15	-12 125 596.76		
2010	-255 449 924.53			
2009	-137 723 893.78			
Sum	659 252 126.05			

Year	Discounted outflow (the total costs of ISDB) in CZK			
2013	547 133 797.14	568 362 588.47	589 448 840.50	605 835 518.26
2012	725810105	753971537.1	781 943 881.11	
2011	859602865.8	892955456.9		
2010	951697236.8			
2009	205 930 629.78			
Sum	3 290 174 634.49			
Source: Author's work				

NPV after 5 years (in CZK) [3]	-2 630 922 508.44
[3] Subtracted outflows from inflows	
Source: Author's work	

6. Calculation NPV after 7 years

Table 7 Estimated outflows after 7 years

The list of individual costs for ISDB (including VAT) in CZK							
Year	2009	2010	2011	2012	2013	2014	2015
Payments for Public Data Messages	45 905 053.18	471 491 865.40	524 757 940.80	577 045 536.00	0.00	0.00	0.00
Flat rate	107 100 000.00	217 922 000.00	237 912 000.00	216 000 000.00	605 000 000.00	605 000 000.00	605 000 000.00
Fee for crating acces to data box	52 925 576.60	13 609 224.20	13 482 818.00	10 636 385.00	7 134 681.20	0.00	171 102 315.75
Amendments to contracts	0.00	285 600 000.00	149 931 345.60	0.00	6 483 966.50	0.00	0.00
The total cost	205 930 629.78	988 623 089.60	926 084 104.40	803 681 921.00	618 618 647.70	605 000 000.00	776 102 315.75

Source: Ministry of Interior affairs and author of thesis

Table 8 Estimated statistics of sent public data in messages in each year

Year	2009	2010	2011	2012	2013	2014	2015
Sent public messages	2 623 336	27 817 758	35 134 948	45 669 356	54 997 210	65 544 504	79 091 773

Source: Czech Post and author of thesis

Table 9 Price for sending registered letter in each year (in CZK)

Price of registered letter from 2008 till half of 2013	26
Price of registered letter from second half of 2013 till now	29

Source: Czech Post

Table 10 Estimation of costs for sending registered letter instead of public data message in each year

Year	2009	2010	2011	2012	2013	2014	2015
In CZK	68 206 736	723 261 708	913 508 648	1 187 403 256	1 429 927 460	1 900 790 621	2 293 661 412

Source: Author's work

Table 11 Estimation of inflows after 7 years

Year	2009	2010	2011	2012	2013	2014	2015
Inflows in CZK	-137 723 893.78	-265 361 381.60	-12 575 456.40	383 721 335.00	811 308 812.30	1 295 790 620.86	1 517 559 096.59

Source: Author's work

Table 12 Average of Interest rate of 10-year maturity Treasury bond yield (Maastricht criterion) for each year (%)

Year	2010	2011	2012	2013	2014	2015
Average of Interest rate of 10-year maturity Treasury bond yield (Maastricht criterion) for each year	3.88%	3.71%	2.78%	2.11%	2.43%	3.11%

Source: Czech National Bank

Table 13 Estimated discounted inflow and outflow after 7 years

Year	Discounted inflow (expected savings) in CZK					
2015	1 270 832 134.60	1 320 140 421.43	1 369 117 631.06	1 407 179 101.20	1 436 870 580.24	1 471 786 535.34
2014	1 118 866 303.75	1 162 278 316.34	1 205 398 841.88	1 238 908 929.68	1 265 049 908.10	
2013	717 557 533.67	745 398 765.97	773 053 060.19	794 543 935.27		
2012	346 541 106.84	359 986 901.78	373 342 415.84			
2011	-11 672 696.15	-12 125 596.76				
2010	-255 449 924.53					
2009	-137 723 893.78					
Sum	**3 048 950 564.41**					

Year	Discounted outflow (the total costs of ISDB) in CZK					
2015	649 922 474.07	675 139 466.06	700 187 140.25	719 652 342.75	734 837 007.19	752 693 546.46
2014	522 394 670.00	542 663 583.19	562 796 402.13	578 442 142.11	590 647 271.31	
2013	547 133 797.14	568 362 588.47	589 448 840.50	605 835 518.26		
2012	725 810 105.01	753 971 537.08	781 943 881.11			
2011	859 602 865.76	892 955 456.95				
2010	951 697 236.81					
2009	205 930 629.78					
Sum	**4 462 491 778.56**					

Source: Author's work

NPV after 7 years (in CZK)	-1 413 541 214.15

Source: Author's work