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**UKRAINIAN eID: ITS ASPECTS AND  
CITIZENS' AWARENESS TOWARDS IT**

Master's thesis

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**UKRAINA eID: SELLE RAKENDAMISE  
ASPEKTID JA KODANIKE TEADLIKKUS**

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## **Author's declaration of originality**

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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10.05.2017

## **Abstract**

Nowadays, information and communication technologies have become an essential part of many areas and aspects of our lives, and when it comes to governance and public administration, those are not exceptions.

The following thesis seeks to investigate the process of e-government implementation, mainly focusing on electronic identification, its goals, aspects, usage and importance for a good government realization in the state. In frames of the thesis, positive experience of various countries in electronic identity management is examined aiming to outline lessons that can be learned by Ukraine. The thesis aims to identify main issues and problems that inhibit the development of successful e-identification system in Ukraine. The positioning of citizens' awareness level towards e-government is identified by means of conducting a survey among Ukrainian citizens. Based on conducted interviews with officials, a local government e-solution is discussed as a project that can be potentially applicable on a national level. As a final part of the thesis research, personal vision of the author of improvement and raise of citizens' awareness on e-government and e-identity presented as a potential recommendation or a hypothesis for future consideration in theory or practice.

Key words: e-Government, ID card, e-Identification, Citizens' awareness, Ukraine.

This thesis is written in English and contains 76 pages, 7 chapters, 19 figures and 1 table.

## **Annotatsioon**

### **Ukraina eID: Selle e-Autentimise Aspektid ja Kodanike Teadlikolemine**

Tänapäeval on info- ja kommunikatsioonitehnoloogiad muutunud meie elu mitmete valdkondade ja aspektide oluliseks osaks. Eranditeks pole ka valitsemistava ja avaliku halduse sektorid.

Käesolev töö uurib e-valitsuse juurutamise protsessi, keskendudes peamiselt elektroonilisele identifitseerimisele, selle eesmärkidele, aspektidele, kasutusele ja riigi eduka valitsemise tähtsusele. Antud töö raames on käsitletud mitmete riikide positiivset kogemust elektroonilise isikutuvastamise halduses eesmärgiga tuua välja Ukraina poolt saadud õppetunnid. Töö eesmärgiks on määratleda põhiküsimused ja -probleemid, mis takistavad e-identifitseerimise süsteemi edukat arengut Ukrainas.

Kodanike teadlikkuse taset e-valitsuse suhtes positsioneeritakse küsitluse korraldamisega Ukraina elanike hulgas. Ametnikega läbi viidud intervjuude põhjal arutatakse kohaliku omavalitsuse e-lahendust projektina, mis on potentsiaalselt kohaldatav riiklikul tasemel. Uurimistöö lõpuosana esitletakse autori isiklikku visiooni kodanike teadlikkuse tõstmisest ja täiustamisest e-valitsuse ja e-identiteedi suhtes, mis on välja toodud kui võimalik soovitus või hüpotees edasiseks arutluseks teoorias ja praktikas.

Märksõnad: e-valitsemine, ID-kaart, e-identifitseerimine, kodanike teadlikkus, Ukraina.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 76 leheküljel, 7 peatükki, 19 joonist, 1 tabelit.

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I dedicate this thesis to my parents and my closest friends. I will always appreciate their limitless support during this period of my life which has not always been easy to walk through. They have always believed in me even when I was doubted by myself. If it wasn't for them, I wouldn't probably take a risk and change my life by taking the decision to absolutely exit my zone of comfort and moving to another country which turned out to be my brightest life experience, so far, and let me met my wonderful friends here. Especially, I would like to thank my mother who inspired me with her warm words to strive to better results and go beyond my own possibilities.

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## List of abbreviations and terms

ATM	Automated Teller Machine
ID	Identification Document
eID	Electronic Identification Document
eIDAS	Electronic Identification and Trust Services
G2C	Government to Citizen
EU	European Union
ICT	Information and Communication Technology
ICAO	International Civil Aviation Organization
NGO	Non-Governmental Organization
NPM	New Public Management
OECD	Organization for Economic Cooperation and Development
PKI	Public Key Infrastructure
PIN	Personal Identification Number
PIC	Personal Identification Code
SIM	Subscriber Identity Module
SK	Sertifitseerimiskeskus
UID	Unique Identification Number
USB	Universal Serial Bus

## Table of contents

1 Introduction .....	10
1.1 Overview of the research .....	10
1.2 Motivation for the research.....	10
1.3 Research problem and questions .....	11
2 Research design and methodology .....	13
3 Theoretical background .....	16
3.1 Identity theory.....	16
3.2 Good governance .....	18
3.3 New Public Management.....	19
4 State of Art .....	21
4.1 Estonia as an example of successful electronic identity management .....	21
4.2 Overview of electronic identity management in countries around the world.....	27
4.3 General requirements to eID.....	32
5 Ukraine: current developments in e-governance and e-identity.....	33
5.1 Overview of main e-identification components .....	33
5.2 Citizens' awareness .....	41
5.3 Lviv Citizen Card as a successful local e-government solution.....	47
6 Analysis and discussion.....	51
6.1 Summary of findings .....	51
6.2 Personal vision and future research .....	54
7 Conclusion.....	58
References .....	60
Appendix 1 – Interview questions and results.....	66
Appendix 2 – Questionnaire results .....	68
Appendix 3 – Service delivery process with Lviv Citizen Card .....	76



## List of figures

Figure 1. Front side of Estonian ID card. ....	22
Figure 2. Back side of Estonian ID card.....	23
Figure 3. Lviv Citizen Card.....	48
Figure 4. Answers to Q1.....	68
Figure 5. Answers to Q2.....	68
Figure 6. Answers to Q3.....	69
Figure 7. Answers to Q4.....	69
Figure 8. Answers to Q5.....	70
Figure 9. Answers to Q6.....	70
Figure 10. Answers to Q7.....	71
Figure 11. Answers to Q8.....	71
Figure 12. Answers to Q9.....	72
Figure 13. Answers to Q10.....	72
Figure 14. Answers to Q11.....	73
Figure 15. Answers to Q12.....	73
Figure 16. Answers to Q13.....	74
Figure 17. Answers to Q14.....	74
Figure 18. Answers to Q15.....	75
Figure 19. Process of financial aid request.....	76

# **1 Introduction**

## **1.1 Overview of the research**

Today, technologies determine a large part of success of most of the countries. Moving to digitalization is one of the important issues nowadays, and governments take this concern very seriously as e-governance proved itself to be a recognized tool of running the state smartly and efficiently. One of the most important components of e-government is e-identity, as it facilitates access to e-services that are delivered to citizens.

Countries whose citizens own ID cards which allow them to use public e-services showed that e-identity has to be one of the top priorities when it comes to building an e-state.

Ukraine, an East European country, considered to be of one of the developing states which relatively not a long time ago has proclaimed beginning of the development of e-government naming it one of the prioritized areas. Ukrainian government is already working on implementing eIDs, however, this is considered to be a very early stage of the process, since the citizens are not familiar with possibilities and benefits which they can receive when they will switch to plastic cards. Knowing how to deliver e-identity as a concept and as a product to population is obliged to be a biggest concern of the government if they are willing to success in this project. So far, in Ukraine this issue is somewhat has been neglected, and this fact accumulates a threat of reluctance to use the ID card and, as consequence, e-services.

I am aiming to analyze what kind of environment has to be created in order to facilitate the ID cards to become a common means of accessing e-services which currently are being designed and implemented in Ukraine.

## **1.2 Motivation for the research**

Researching this area of e-government within Ukraine is a matter of my curiosity that can be explained by my own experience of living my whole life in Ukraine and, as a

citizen that was encountering issues that are connected to bureaucratic burden, queues and corruption, I can conclude, that after experiencing Estonia's e-identity system for a change, there is an enormous difference of the entire idea how citizens and government can communicate both exchanging data, utilizing services and carry citizen's duties (for example, declaring taxes, voting and so on). Bringing up this matter towards Ukraine can potentially accelerate the movement towards e-state. The entire concept of e-government for Ukraine is quite new even though policymakers had put the ideas into action plans several decades ago. The current moment is crucially important for the state as this is the inception of new way of running it. If now the country is going to build the electronic government and its parts from the very beginning using best practices but also customize them to the needs of its population it might spare potentially a large amount of time and costs bringing new value. This research intends to be a motivator for future researches about Ukraine in terms of the given field.

### **1.3 Research problem and questions**

The key problems that spur the research are as following:

- Aspects of implementation of e-identity in Ukraine;
- Identifying citizens' attitudes and awareness towards eID;
- Identifying specifications of Ukrainian ID card.

Research questions are presented below as follows:

The main goal of this research is to analyze the main aspects and specifications of Ukrainian newly implemented eID and identify citizens' attitudes and awareness level towards it, based on the assumption of its importance to the general success of e-identification and e-governance in the country as certain conditions have to be guaranteed on multiple levels of state to ensure it. This urges three research questions displayed below that will allow presenting possible recommendations on *how to raise citizens' awareness towards eID and e-governance*, as the awareness matter is now being referred to more often, becoming a common issue when we speak about the reasons why yet in Ukraine there is such low level of development of e-identity despite its potential. Herewith, the following research questions will aim to be answered in frames of the thesis given below:

- *How to identify and describe main specifications of eID in Ukraine?*

Answering the given question, it will allow, further, providing a tailored recommendation for improvements that might be used in theory and practice, and future research perspectives.

- *How to apply lessons learned from other countries' positive experiences in the field of e-identity?*

Even though every country has its own path of design, development and establishment of e-governance elements but we still can observe some patterns in this process, lessons from which are recommended to be taken into account in case of Ukraine.

- *How to define main aspects of citizens' awareness towards eID and e-governance as a factor of electronic identity management success?*

This question is related to awareness matter as the answer will allow identifying issues that have to be tackled in order to ensure positive changes. This will be possible done by means of questionnaires that will be distributed among citizens of Ukraine. Moreover, interviews with officials who deal with e-identity implementation will be conducted in order to present an opinion from service provider's side as well.

## **2 Research design and methodology**

This chapter gives an overview and justification of the research methods that will be used in the thesis in order to answer the already named research questions.

Exploring the subject of e-identification system in Ukraine requires collection of empirical and comprehensive data. Due to the nature of the research, within its frames, qualitative research methods have been chosen.

The word “qualitative” implies an emphasis on processes and meaning that is not rigorously examined or measured (if measured at all). Qualitative researchers stress the socially constructed nature of reality and the situational constraints that shape inquiry. The answers for those questions are ought to stress on how social experience is created and given meaning [19]. The use of qualitative research is also justified by its ability to capture the individual's' point of view. Denzin and Lincoln believe that by applying named methods it is possible to get a better perspective from the actor by means of interviewing and observation. Moreover, it is considered that qualitative research is more likely to “to confront the constraints of the everyday social world”. Given the fact that the subject of e-identification in Ukraine that is being studied, is a dynamic one due to its constantly changing nature as it is at the stage of development during which numerous aspects of influence may come up or disappear, the data on it should be collected directly from representatives of society since they are the one whom the subject of e-identification is related to. Another comment from Denzin and Lincoln regarding the justification of the chosen method should be mentioned: “Qualitative researchers are committed to an emic, idiographic, case-based position, which directs their attention to the specifics of particular cases” [19].

During the research primary sources of data are chosen because of the nature of the studied subject that deals with attitudes of the population towards it. The use of the primary data during the research process can be explained by the fact that there no available resources on the given topic due to its novelty. As R. Kumar suggests, when collecting data from primary sources, a variety of aspects should be taken into account, such as socioeconomic and demographic characteristics of the study population because they may have an impact on the preciseness and objectivity of the outcomes [20].

Primary data will be collected with aims of such qualitative research methods such as online questionnaires and interviews. With the advancement in communication technologies, conducting online surveys in order to collect information for answering the research has become quite a common practice [20]. Surveys (or questionnaires) and interviews are considered to be a flexible tool for collection of qualitative data. A survey has a number of benefits, for instance, low cost of conduction, short duration, efficiency, direct data entry and wide geographic reach [21].

The layout of the survey is carefully designed considering the target audience, its width and heterogeneity. This way of collecting data is suitable due to the time constraints. Also, distribution of the surveys online is beneficial due to the geographic limitations during the research conduction, yet it is still possible to reach a relatively wide audience in this context, because with aims of social networks a chain reaction in distribution and sharing causes its positive effect. Moreover, during the design of survey layout, multiple-choice answers were chosen as answer types. V. M. Sue and L. A. Ritter in their work refer to research evidence that assumes forcing respondents to choose one answer from the list is considered to be better than including check-all-that-apply format which in the future survey were used comparatively less than multiple-choice answers [21].

In order to decrease the effect of low response rate of surveys as it is one of their shortcomings, an optimal length was chosen. Moreover, to increase the response rate and reach the widest possible audience, when distributing questionnaires, an effort has been put to assure that potential respondents will clearly understand the relevance and the purpose of study. Later on, when the survey conduction will be finished the results will be used for analysis and will be presented in the form of descriptive statistics.

As an e-government solution, e-identification system is supposed to be utilized by both citizens as consumers of the service and officials as providers of a service. In order to receive primary data on the studied subject, a certain number of interview will be conducted among representatives of governmental offices. Here, preference is given more to the interview rather than to questionnaire, since, as it was already indicated, the studied subject is a quite new solution for Ukraine which in being on the stage of implementation, hence, interview is more suitable in the sense, that one of its advantages is more suitable for complex situation and collection of in-depth information.

Also, it can be assumed that taking into account that the studied subject concerns each citizen of the country who owns an ID and hence, either way turns to public entities, this is usually followed by various issues caused by bureaucracy, queues corruption etc. Thus, the chosen research method can be considered as the most suitable one to investigate the specifications of various aspects of the current state in the given area [20].

By applying named methods, it is expected to receive data that will allow to analyze the level of citizens' awareness about e-identification and e-services, receive an insight about the attitudes citizen have towards them.

Since this is an exploratory research, the future analysis and outcomes will allow only formulating the problems, clarifying them and creating hypotheses on possible solutions, recommendations or frameworks that may be later implied.

### **3 Theoretical background**

The below chapter presents a theoretical description of the core concepts that underlie in the subject of the thesis. The aim of the chapter is not only to show insight from the theorists about identity theory, good governance and new public management but also to show the interconnection between the named concepts.

#### **3.1 Identity theory**

This subsection intends to show the connection of identity theory as the core idea where modern schemes of identification are taking their roots from.

Identity theory is one the most influential theories in modern sociology and is founded on the symbolic interactionism concept which is a set of ideas about individual's nature and its relationship with society. The origins of the theory one can find in the works of American classics C. Cooley, G. Mead, H. Blumer [4]. Modern theorists, the followers of symbolic interactionism, P. Burke, R. Turner, G. McCall, J. Simmons and S. Stryker consider individual's identity as a product of those roles that she performs in society. Self is treated as heterogeneous, dynamic nature which is differentiated by multiple social impacts. This theory analyzes mechanisms of identity creation on micro-social level linking it with the interaction, acceptance, individual understanding and social role performing processes [2].

According to Burke and Stets, "an identity is the set of meanings that define who one is when one is an occupant of a particular role in society, a member of a particular group, or claims particular characteristics that identify him or her as a unique person" [1]. They postulate that a person possesses multiple identities as he or she can have multiple roles being a member of various social groups. Burke states that an individual exists in the context of the social structure. As well as Burke, Stryker and colleagues agree that society is a product of actions of individuals [2]. Actions that are created within the social structure in their turn create this social structure and influenced by it. This leads to the need of understanding of both nature of individuals and society and their interconnectivity. They treat social structure as a pattern of individuals' behavior.



Since in their work, Burke and Stets are more focused on the individual itself yet in the context of society it has to be pointed out that although in sociology agents are usually referred to as “person”, “individual” or human being in overall, but in the context of identity theory agents and actors are referred to as “identities”. Each individual has several roles, for instance, a son, a friend, an employee, a group member, a citizen. Each of these roles is agents. A person, according to Burke and colleagues, is “a link between the various agencies that exist within the person” [1].

The mentioned theorists point out that what actually makes social system work is the interaction between different identities within a person that engage themselves into transactions as well as different identities between persons.

Another part of the theory that has to be mentioned and which was developed by Stryker is identity salience. It is defined in his work as the probability that an identity will be invoked across a variety of situations, or, alternatively, as the differential probability across persons that an identity will be invoked in a given situation [2].

Linking the subject of this thesis to identity theory the following thoughts have to be elaborated. It has already been mentioned that one person has multiple identities as he or she can execute multiple roles, especially, nowadays, when the technologies became rather a way of life and people are handling myriads of transactions online. The technological development has reached that level where identity has become one of the forefront issues. Identity theory easily applies in that sense that each individual of our modern society has a role of a citizen in frames of the institution of state he or she lives in. Before the technologies have intruded nowadays life, as J. Camp states [3], there was no such urgent need of identity management in pre-bureaucratic era. Now, when a massive amount of data is stored online, there is a free flow of information and it has become more available to everyone. In terms of institution of state, collection, storage and other transactions regarding the information about citizens (individuals) is regulated by international conventions and national laws. Since technologies invaded the institution of state as well, more and more countries are shifting to governing electronically providing services, exchanging information, bringing more value with less effort. It is a responsibility of the country to facilitate an access to e-services online. As the range of requirements for e-government is very wide, for now the problem of identification of a citizen online will be discussed.

Having said that, the state should ensure access to public services online, one of the priorities is not only to guarantee security of the information but to be assured in

parties' identities involved. J. Camp, the organizer of a workshop related to the matter of identity in the digital government, mentioned when defining the problem in his report: "The problem arises when an individual presents herself and requests permission for some transaction: how does the system, in the form of a bureaucrat or, increasingly, an automatic machine, confirm that the person is, in fact, who she says she is". During the identity process it is required to confirm your identity by presenting an identifier, a document which is issued by the state. Once the attributes in the identifier match with relevant ones in the governmental records, the identity is proven and the state representative allows the transaction to be proceeded with [3].

Going back to identity theory, the above description was ought to show the root concept that lies in the current mechanism of identification of a person being a citizen of a state whose priority is to take care of society's well-being. Hence, there is another concept which is related to the topic and its importance - the concept of good governance which will be discussed in the next subsection.

### **3.2 Good governance**

There is no unified definition of what is good governance. According to the United Nations Development program "Good governance refers to governing systems which are capable, responsive, inclusive, and transparent. All countries, developed and developing, need to work continuously towards better governance" [5], [6].

It has to be mentioned that Good Governance belongs to one of the Millennium Development Goals established by United Nations in 2000, and to be more specific, it is a subtarget that goes to the eighth goal - Development of a global partnership for development.

Good governance aims to facilitate decision-making process that in its turn causes a positive effect on various spheres of government. According to Sheng, John Graham, Bruce Amos and Tim Plumptre, good governance is supposed to be accountable, transparent, responsive, equitable and inclusive, effective and efficient, participatory and it has to follow the rule of law [7], [8].

Daniel Castro in his report on eIDs presents a section on the benefits of eID systems. According to him, "such systems generate a variety of benefits for individuals, businesses, and government, including facilitation commerce in the digital economy, enabling e-government services, and improving security for online transactions" [9].

Moreover, government can streamline many services, such as providing government benefits, which depend on knowing an individual's identity. Castro also mentions that by using eIDs citizens can vote online, that, for instance, in Estonia doesn't require physical presence at all. Completing transactions online is beneficial both for individuals and businesses which is considered to be time-efficient and is an opportunity to eliminate various costs. As Castro states, "using secure communication also eliminates the need to transcribe data from paper forms, helping to reduce errors and processing time. Government received many of the benefits from increased efficiency, for instance, by eliminating duplicate data entry, and reducing the costs associated with unnecessary paperwork including printing costs, storage, transportation and disposal." Additionally, utilization of electronic identification system is a way of enhancing the security of online transactions, and it lowers the risk of fraud and identity theft [9].

Having mentioned the above benefits, a statement can be made confirming that eID system can be considered as a tool of building and maintaining a great number of good governance characteristics. An increasing number of countries have already launched e-government including e-identity systems that have proven their efficiency and positive changes in general.

The concept of Good Governance goes closely along with the concept of New Public Management (NPM) as their main postulates intersect and complement each other, taking into account that a large number of e-governance initiatives are based on the concept of New Public Management.

### **3.3 New Public Management**

The "New Public Management" can be defined by Dunleavy and Hood as "summary description of a way of re-organizing public sector bodies to bring their management, reporting, and accounting approaches closer to (a particular perception of) business methods" [10]. According to Promberger, and Rauskala, new public management aims to eliminate the risk of failures and inadequacies of public sector performance through time by locating the problem that lies in the nature and the processes of the public sector and public administration activity [11].

Manliev characterizes the new public managements as a market-oriented approach to manage public sector [12].

ICT has become an indispensable means of implementation of NPM when improving the performance of public sector. NPM and e-governance are described in the context of each other as concepts and means respectively. For instance, Cordella argues that “the interconnection between NPM core ideas and e-government is thus explained by the potential benefits that ICT can bring to the re-organization of internal strategies in the public sector. ICT are perceived as a powerful tool to rationalize, streamline and re-engineer organization procedures [13]. Bellamy and Taylor, Heeks suggest e-government can serve as an enhancer of public administration reforms achieving particular goals of new public management agenda [14]. Bonina in her research [15] on NPM gives a practical policy insight from OECD that defines e-government as “the use of information and communication technologies, and particularly the Internet, as a tool to achieve better government” [16]. Schedler, Summermatter, and Schmidt state that emphasis on customer orientation and user satisfaction that are strongly supported and promoted by NPM are one of those factors that have driven numerous e-government initiatives which were aimed to improve the quality of public service delivery and organization streamlining [17].

Referring to the previous subsection on good governance, a noticeable suggestion by Tsankova is worth to be mentioned. She considers e-governance as one of the tools of NPM and states that “the wide use of Information and Communication Technologies is realized and now we are speaking about electronic Governance. The e-Governance bring administrative services near to citizens and businesses, involves citizens and stakeholder to participation in planning and decisions making processes, improve mutual information communication through ICT [18].

In frames of the given topic of this thesis, the incentive of implementation of eID system as an e-government solution can be considered as means of pursuing the goals of new public management and good governance. So far, many states have already adopted e-government solutions driven by the principles of NPM and good governance by means of ICT and even more states are on the stage of implementation. The examples of the best practices will be presented in the further chapter of the thesis.

## **4 State of Art**

This chapter aims to provide an overview of various e-identification management system practices in different countries outlining the positive experiences and lessons to be learned. A significant emphasis is put on the case of Estonia which is far ahead from other states in terms of advancement in e-governance development level. Estonia will be also positioned as an indicator of a successful e-government case which solutions and smooth and simultaneous measures taken in different areas ensured a comparatively quick adaptation and settle-down with a high level of acceptance both by population and government. Going further, an ambitious Estonian project of e-Residency will be discussed as a novel feature that redefines e-identity shifting the notion “outside the box”. The chapter is concluded by the last subsection with a set of generalized requirements to e-identification management system design and implementation. The shaped conclusions and lessons will contribute, as it was already mentioned to the case of Ukraine.

### **4.1 Estonia as an example of successful electronic identity management**

Estonia is known as a country with one of the most advanced digital societies in the world. Electronic identification document management system is highly developed and allows receiving a vast amount of different public and private e-services.

The launch of Estonian ID card program took place in February 1999 after Identity Document Act had been adopted by Estonian parliament and became effective on January 1, 2000. At the same time Digital Signature Act was passed and became effective in the same year which regulations were vital for usage of the future card as an electronic identification document. The first ID card was issued in 2002 and later by 2003, 130000 ID cards were issued to citizens. By 2011, 90% of Estonian population was provided with ID cards [9].

As for now, according to M. Pedak, Estonia has a comprehensive system for electronic identification, authentication, and digital signing which includes the following elements such as ID-card, Digi-ID, Mobile-ID, digital stamp, residence, permit card, e-residency card [21].

## Layout of Estonian ID card

Estonian ID contains the following elements on the front side including the photo and signature of the card holder (Figure 1):

- name of card holder;
- personal code (national ID code) of card holder;
- card holder birth time;
- card holder sex;
- card holder citizenship;
- residence permit details and other information (if applicable);
- card number;
- card validity end.

The back side contains the following data (Figure 2):

- card holder birth place;
- card issuing date;
- card and holder data in machine-readable (ICAO) format.



Figure 1. Front side of Estonian ID card.



- Partial replacement of a driver's license “Almost all traffic police cars are equipped with devices for querying information from the driver's license database, car insurance and car registry. When a car driver has his ID-card with him, it would allow checking the identity and retrieving all other relevant information” [23]
- e-Health and e-prescription one of the innovative e-services in Estonia which is completely paperless and allows to access health records of a patient both by himself and by doctors.
- e-Tax declaration one of the most popular public e-services that is used by means of ID authentication. It takes a few clicks for an individual or a private company to submit their tax declaration after checking the data which is pre-filled as it is already in the system thanks to the interoperability of X-road.
- ID as a customer card “For the client, using the ID-card as a customer card saves a great deal of time. Becoming a customer of the company only takes a few seconds until the data from the card has been read and entered in the client base of the company. For a business, implementing the ID-card as a customer card is useful in many ways. Firstly, the activities related to ordinary magnetic cards are no longer needed. There is no more need to have clients who are applying for the card fill in forms that the employees of the company have to electronically enter in the system afterwards” [25].

### **Cooperation of public and private sector as a factor of eID success**

The implementation of eID project in Estonia was carried with aims of public and private sector cooperation. On the political side two main ministries were the Ministry of Interior that supervised the Citizenship and Migration Bureau and the Ministry of Economic Affairs and Communications with its Department of State Information Systems and Estonian Informatics. On the side of private companies two bodies played a major role, TRÜB Baltic AG and Sertifitseerimiskeskus, that were being outsourced their tasks by the state. This cooperation turned out to be one of the key factors of success of this project. Outsourcing the named activities to private companies enhanced the speed of implementation and quality of the project. SK which consists of two biggest banks of Estonia (Swedbank and SEB) and two big telecommunication operators (Elion and EMT). This union has allowed bringing together public sector, telecommunication branch and banking sector. Moreover, SK was the party who played



a main role in establishing ID-cards as a preferred eID token keeping other alternatives from becoming a competitor.

Involvement of bank sector that took place from the very beginning of the launch of the project was also important because of its comparatively more advanced level of development and, moreover, e-services provided by private sector were in a much higher demand than public e-services. Estonian banks also taking measures that are supposed to favor the eID-based authentication and its increase, for example, lowering the maximum money transfer amount if authenticated with password cards; limiting the amount of services that can be requested with alternative methods of authentication.

Going further with participation of banks in dissemination of eIDs, SK did a breakthrough by developing a piece of software DigiDoc a digital signing system and since there were no restrictions put by the government to use this authentication scheme it is available to any outside developer, which means that any private company can embed it as authentication method. This was a part of systematic work of promotion for application developers and service providers. Now, SK is an excellence centre of support of end-users and service providers, as it was already mentioned before. Its website ([www.id.ee](http://www.id.ee)) contains well-structured information for end-users, developers, problem-solving solutions etc.

Another problem that usually arises when creating an environment for ID-cards implementation, is equipment for smartcards and its distribution. In case of Estonia, this issue has naturally appeared right after the software was launched in 2003. The required smartcard readers started to be available in the stores of already mentioned telecom giants but this first wave of equipment provision hasn't been considered completely successful as the software had a tendency to outdate and the price was also rather not affordable for an average user. The situation has changed in 2007 after a deal with a smartcard reader vendor Omnikey which led to their distribution via particular retail channels for a price around 6 EUR.

In order to ensure that ID cards and Internet were disseminated and making use of by each segment of population, special educational programs were ran, especially for elderly. Most of them were organized in frames of "Computer Security 2009" project [23].

Nowadays, Estonian perceive Estonian ID and its opportunities as a given, however, in the beginning of the launch the attitudes of population were quite different. "The lack of applications, unawareness and news about outrageous investment of 20 million euro

into the project raised a lot of criticism in the public” [23]. Rapidly, the situation had changed as the government facilitated the system for itself and private sector, but citizens as well taking their interests into account raising people’s awareness, educating them and providing them support.

To conclude, Estonia’s example in implementation of e-identity system and e-government in general, can be very valuable not only for Ukraine, but for each country that is moving towards digitalization of society. Of course, the pattern cannot be fully applied to a case of Ukraine as there a significant differences and conditions, yet lessons learned should be taken into account. Right now, Ukrainian-Estonian relations are constantly developing and getting stronger, and Estonia is willing to share its experience. For instance, NGO “e-Governance Academy” based in Tallinn has already a great history of numerous successful international projects and continues to provide its activities around the globe including Ukraine.

Recently, Estonia once more has proven its highly advanced level of development by launching an ambitious project “E-residency” offering digital identity to anyone in the world general features and opportunities of which will be presented in the next subsection.

### **E-Residency**

An innovative Estonian initiative has been launched in 2014 which allowed citizens from all over the worlds become digital residents of another country [25]. As have already been discussed, Estonia has reached remarkable advancements in e-government are. E-residency project is not an exception. Its founders state that “it expands Estonia’s unique identification code system to foreigners who are not physically present in the country” [25].

The two key bases of E-residency are eIDs and country’s e-government infrastructure. Since the eIDs have already been discussed in details, here, more detailed, the infrastructure for e-Residency will be described. Even before the Identity Documents Act and Digital signature Act were adopted, the Database Act in 1997 was passed giving provision on regulation of digital databases. Along with the launch of the eID program, a project “X-Road” was established which is “exchange layer that enables secure interconnections between state information systems” [26]. When using Estonian e-services, all the data operates is contained by the various governmental databases that are connected by means of one digital platform enabling their communication. This

solution by its nature requires being secure and private to function properly, where at this point eIDs are becoming necessary. X-road facilitates the functioning of e-services and creation of new ones on the existing infrastructure.

Having already mentioned that the PIC system is extended for foreigners, i.e. once a person outside Estonia has applied for e-Residency, during the generation of its digital identity, he or she will be assigned a PIC similar to those that citizens have. After the application process is complete, the person will be issued an e-residency card, which is based on Estonian Digi-ID solution, “the official national digital document for personal identification in an electronic environment and for generating digital signatures. However, unlike the ID-card, the e-residency card is not designed for visual personal identification.

The card holder can apply the e-residency card in the following cases:

- Sign documents digitally;
- Establish an Estonian company online and run it from any part of the world;
- Handle its banking;
- Declare taxes;
- Access international payment service providers [27].

Yet, it has to be mentioned that e-Residency is not identical to a citizenship or permanent residency. Whilst having e-Residency card, the card holder, however, cannot vote in election nor use it as a travel document to travel to Estonia or to EU [26].

Despite the project being in its beta phase, since the launch the results are continuing to impress - so far, there are more than 10000 e-Residents from 130 countries and over 600 new countries have been founded by them [26].

As the founders of the program state, their goal towards the businesspersons is “to unlock the entrepreneurial potential of every citizen” and discover the benefits of utilization of Estonian electronic infrastructure that simplifies administering and cuts its cost, and in general, gives a whole new experience of being a member of digital society [25].

## **4.2 Overview of electronic identity management in countries around the world**

### **Austria**

Austrian ID card (“Bürgerkarte” - Citizen Card) was launched in 2004 as a strategy of identity management supported by a legal framework that includes legal regulations concerning e-government, e-signature and national registry of population [28].

The aspects of Austrian Citizen Card worth mentioning are the following:

- *Multiple tokens.* Unlike other European initiatives, Austrian electronic identity document is not represented by a single card, but incorporates a virtual concept of personalized electronic identity data that can be installed on different carrier devices. This enables the usage of multiple tokens and possibility to use various cards that serve as Citizen Card [29]. Valid eID cards can be issued in a form of national eID card, ATM cards, SIM cards, USB fobs. So far, the most popular ones are ATM cards and electronic social security cards.
- *Unlinkability.* Putting forward security and privacy as a first priority and core design principle at the legal, technical and organizational levels, Austrian government created a “specific ID model and privacy concept based on sector-specific PINs which has evolved as a compromise between the goals and requirements represented by different stakeholders.” [30]

The identity management system is based on the Centralized registration policy and PKI. The first one relies on the Central Resident Register that plays a role of Certification Authority that issues unique numbers to all Austrian residents. Same actor is responsible for PKI on which the e-signature is based [28, 29].

With aims of Austrian Citizen Card it is possible to use public e-services at one-stop-shop resource and sign documents electronically.

Because of the special multi-token concept enabling a wide range of options to serve as a valid eID, Austrian national ID card is not the most popular token in spite of ATM and social security cards. S. Arora suggests that this is the matter of interoperability that eIDs schemes lack if to compare them with “the ability to use an ATM card at foreign banks, authentication to a mobile phone network when roaming or the use of a driver’s license to prove one’s right to operate vehicles even when abroad” [30]. As a matter of fact, when it comes to interoperability, so far, Austrian concept of eID is compatible with Belgian, Estonian, Finnish and Italian [31].

## **India**

Indian ID project “Aadhaar” is considered to be one of the most ambitious ones in the history of digital identity. India happens to be the first country that has launched such a large-scale project - a biometric-based unique ID system [32].

The project itself was launched in 2009 by the Unique Identification Authority of India that along with other stakeholders developed an UID, a unique identification number, based on biometrics. The government’s aim was to provide UID to each and every resident of India. Taking into account the area and the number of the country’s population it is obvious why this project was considered to be challenging.

Indian UID combines in itself demographic data (name, date of birth or age, gender, address, mobile number (optional), email ID (optional) and biometric data (ten fingerprints, two iris scans and facial photograph [33]. The significant attribute of UID is the fact that it is not an actual card but a number that is authenticated online which means that in order to fulfill a payment transaction or request public services the person has to be identified only by biometric data [34].

There were several incentives for establishing this idea as a national ID scheme which are the following:

- Large number of different tokens that are usually not owned by poor and underprivileged population which leads to lack of access to various public and private services, and this also leads to different requirement for verification of identity in service agencies.
- Decrease of transaction costs spending on delivering the social welfare programs to the beneficiaries and, hence, assurance of their access to such welfare services with aims of a single identity that had been lacked earlier.
- Track of usage of social welfare services that emanates from the previous bullet point statement.
- Improved track of population number of the country, eliminating the number of fake and bogus identities [32].

Whilst implementing the national ID system, the government has taken measures ensure that stakeholders and residents will be guaranteed the provision of required infrastructure. It has to be highlighted that Indian government had made an effective strategic step in order to ensure ubiquitous spread of UID by means of its enabled micro-payments. The goal was to make it a “killer app” that would have become a kind of utility, a part of everyday life which at that time was quite challengeable considering

the low percentage of those who owned bank account and the number of ATMs and the number of withdrawals [34]. The government has put a big effort into negotiating with banks that were expected to design a program suitable for each category of population. The solution was to open a “no-frills” bank account during the enrollment stage. Furthermore, the state also invested resources into the Aadhaar brand building and its marketing and positioning as a reliable family friend [35].

The Indian Government expects by spring 2017 1.28 billion of residents to get a UID. They have estimated that more that \$400 million in the last 2 years thanks to the payment management to beneficiaries under various social welfare schemes and, additionally, more than 16 million fake identities were deleted that led to \$150 million of savings [36].

Yet, the government has to address risks that are caused by the nature of the project and its scale, for instance, as Vikas Sharma concludes, “this is the first time in the world that storage, authentication and de-duplication of biometrics are being attempted simultaneously on this scale” [32]. The technological capacity of the system and databases will have to constantly being maintained, updated and expanded due to the growth of Indian population. Moreover, security and privacy risks in the cyber context have to be addressed carefully.

## **Sweden**

Swedish eID system exists in frames of the e-government strategy which goal is to increase productivity of public sector and development of digital society in general. Sweden does not have a unified legislation for eID although there are legal acts that regulate the e-signature utilization. These regulations define “advanced” and “qualified” e-signatures where the latter is considered to be more secure with the use of PKI but it requires a special device to be created on. The eID system itself is based on the centralized registration policy: in order to issue a certificate the service providers access the population register [37].

In Sweden, there is no single Certification Authority. By means of public procurement the government selected four certificate service providers from private sector which are mainly banks and one telecom company. This decision was made based on the fact the major part of the country’s population was among the three banks which resulted in a quite high acceptance level.

Swedish e-identity system supports two types of credentials: a hard and a soft token. A hard token exists in the form of a smart card while the soft token is downloadable software for a PC. These tokens can be used both for authentication and digital signing. A hard token in the form of a National ID is issued since 2005 by police and is mainly used as a travel document within the countries of Schengen Treaty and so far does not contain a certificate though includes a chip. Another hard token in a form of a smartcard is issued by the Tax Authority since 2009 that may contain a certificate of four main certificate service providers and its purpose is to be distributed to as many people as possible who is above age of 13 including non-Swedish residents.

All service providers of certificates use the same technical specifications. Each of them has to comply with the security and risks requirements which are supervised by the Post and Telecom Agency.

As OECD report, there also other forms of authentication online such as login/password or two-factor-authentication. Authentication solutions to be offered are decisions of each service provider. Furthermore, as it is reported, “inter-operability between the four providers is provided to the extent that online services accept all the credentials they offer. When some local and regional bodies are limiting access to credentials issued by one or two providers, the interoperability cannot be guaranteed” [28].

As it was already mentioned above, because of the major part of Swedish population who are the clients of Swedish banks which is the main certificate service providers, BankID prevails as a form of eID. Like in many other countries where e-services are provided, the most common used is tax income declaration. Already in 2007 a survey conducted, proved that almost entire population (95%) is aware of the BankID. [37].

Another aspect that explains why eID is not developed in a form of smart card as it is, for example, in Estonia, is outlined by Åke Grönlund in his case study on electronic identity management in Sweden: “Downloadable eID was the first choice for a token for online authentication, continues to be in terms of use and will most likely continue to be as people mainly access services from their personal computer” [37].

Swedish model of identity management has met criticism that is based on arguments of the whole system “not being open enough, not flexible towards different security needs for different e-services and drawing on unstandardized technologies among a multitude of a providers leading to e-services needing to be adapted to different technical solutions which leads to high costs and complicated use”, outlines Åke Grönlund [37].

Challenges for Sweden in electronic identity management are lying in its uncertain legislation that doesn't clearly define e-identity and e-signatures, technical contradictions and lack of interoperability. Going further with the latter, after that eIDAS regulation being put in force, Sweden is expected to adopt a new law that will comply with the new European regulation, and, moreover, build a new infrastructure enabling authentication of users from other countries [38].

### **4.3 General requirements to eID**

To conclude this chapter, the following subsection is dedicated to a presentation of brief overview of generalized requirements to eIDs and electronic identity management based on the international experience, including the examples of the abovementioned countries.

Being one of the main cornerstones of e-government advancement [39], digital identity and its infrastructure implementation requires:

- National strategy for digital identity management that fully leverages both public and private sectors. National strategy is also important in the sense it will facilitate the shift of existing offline services towards digital environment, as OECD guidelines for government policy makers outline [28].
- E-government strategy should be aligned with the national strategy which means that identity management policies should be regulated regardless whether they are specifically belong to the electronic ones.
- Assurance of security and privacy. According to OECD guidelines for government policy makers, "The development and implementation of digital identity management systems should include privacy protection, including data security" by means of technologies and innovations wherever possible [28].
- PKI should be used as means of secure authentication provided by trusted service providers.

Cross-border digital identity management should be strived by government ensuring compliance with international standards.



## **5 Ukraine: current developments in e-governance and e-identity**

This chapter gives an insight of the current level of e-government and e-identification in Ukraine. Main matters of legislation are described followed by the parties involved in the ecosystem of e-identification influencing its further development. Being interested in the studied subject and having researched the case of Ukraine, that adds to a long-term experience in interaction with the Ukrainian public administrative system from a citizen's perspective, afterwards, it was discovered that the constraints to build a successful e-state inside Ukraine, are not hidden only in legislation acts and lack of advanced infrastructure, but also in the low level of population's awareness on the potential benefits they can receive from electronic government. Herewith, it is considered that citizens' awareness is one of the most important matters that have to be taken into account by the state as a condition of successful and smooth adaptation of the newly implemented system. Therefore, this chapter will answer the research questions about specifications of eIDs in Ukraine and people's awareness by researching the existing capacities and conducting a survey that is aimed to clarify the main aspect of the awareness concern. This will help to create a more clear understanding how to tackle it from the government perspective keeping in mind the international practice and experience simultaneously striving to tailor them to the case of Ukraine. Going further, an example of one of the first successful initiatives of local e-government projects in Lviv that is associated with an smartcard will be presented including the conversation with officials who are involved in the program. Altogether, in terms of this research, it will make possible to lay a foundation for the final results and formulate hypotheses and recommendations for future research or practical use.

### **5.1 Overview of main e-identification components**

This subsection is dedicated to provision of an overview of main legal aspects that regulate the field of e-governance and e-identity in Ukraine and main actors that play key roles in operating the given field; description and attributes of existing means of e-

identification will be presented below. Hence, this will contribute in finding the answer to one of the research questions on specifications of Ukrainian eID.

### **Legislation**

In 2007, a legal act on Basic principles of information society development in Ukraine was adopted later [40], followed by governmental directive in 2013 on the Information society development strategy [59]. The main goal was to create a favorable environment for information society development, socio-economic and cultural development of the market economy state which is driven by European political and economic values, increase welfare of citizens, provision of wide opportunities to meet needs and free development of an individual, enhancing Ukraine's competitiveness, improvements of public administration system by means of ICT [41]. According to mentioned acts, their realization is divided into two stages. The first stage (2013-2015) seeks the realization of goals and tasks of the strategy; the second one (2016-2020) aims to reach harmonization of achieved results in the development of information society in Ukraine with the rest of world's results. In general, Ukraine's pace of development in this area are estimated to be slow, according to rankings of various international evaluations.

The legislative framework that regulates matters related to information society includes the following acts and provisions on:

- Information;
- Access to public information;
- electronic signature;
- Protection of personal information;
- National registry of electronic information resources;
- Formulations of system of electronic information resources;
- Electronic exchange of documents within governmental agencies;
- Procedure on application of electronic signature by state agencies, local governments, enterprises, institutions and organizations of state ownership;
- Action plan on implementation the initiative of Open Government [41].

As a part of European integration, Ukraine is putting efforts to comply EU requirements for e-identification and trust services. Within European Union the most recent and updated legal act on the given field is Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust

services for electronic transactions in the internal market was adopted that has repealed Directive 1999/93/EC [44].

The provisions of eIDAS regulation cover two main areas: electronic identity and electronic services.

Electronic identity provisions define the conditions of member states' mutual recognition of means of identification of individuals and entities that are issued within national notified schemes of e-identity. It forms legal, organizational and technological base for cross-border identification and authentication in EU member states. Electronic services part of Regulation defines rules of qualified trust e-services provision.

In terms of eIDAS Regulation, eID is the identification of individuals and legal entities by issuing them special personal electronic identification tools in accordance with the procedure established by law and on the basis of the established scheme (electronic cards, passports and so on, i.e. electronic identifiers associated with specific person). eID can also be defined as the provision of a technological capability to authenticate the owner of an electronic identifier when performing any electronic transactions. These two aspects are mandatory when it comes to provision of e-services and conducting electronic transactions. Regulation defines such basic principles of electronic identification as mutual recognition, eligibility for notification of electronic identification schemes, assurance levels of electronic identification schemes, notification, security breach, liability, cooperation and interoperability.

Throughout last two decades EU has put many efforts in standardizing legislation for e-signatures and e-ID cross-border interoperability. European Commission has adopted "Action Plan on e-signatures and e-identification to facilitate the provision of cross-border public services in the Single Market." This plan had a recommendation nature and included also advises such as creating a list of trusted list of certificate providers and movement towards interoperability to avoid legal, organizational and technical obstacles between solutions of member states as most of the EU countries have already launched their eID national systems [9].

In 2014, the same year when eIDAS was adopted, ago Ukrainian Prime Minister has ratified a Concept of reform of legislation on the use of public key infrastructure and the provision of electronic trust services, which main implications for Ukraine are mentioned by Potiy *et. al* [45].

This reform is crucial for e-identity national system in Ukraine as public key infrastructure lies in the essence of eID functioning. This step has to be considered as

ground-settling due to the fact the Ukraine has already for a relatively long time been pursuing its acceptance to European Union. One of the pre-conditions of the Association with EU was implementation of national ID cards. Melashchenko *et. al* who are discussing the e-identity issues concerning interoperability, state that it is expected that cooperation on legislation matters will be reinforced by exchanging data, experience, R&D cooperation, aiming to improve the quality of technical regulations, standards, testing, accreditation and market surveillance, which will ensure efficient use of regulatory and legal resources, implementing procedures and compliance. Concept also states that Ukraine will gradually implement the set of European standards as national, in particular harmonized ones. Simultaneously, the country will abolish outdated standards [43].

The Concept argues, that one of the biggest problems right now is the lack of interoperability of National system of e-signature (PKI) which is a repercussion of absence of equivalency of e-signatures created by means of various software and hardware devices which makes it difficult to integrate with European PKI.

Referring to analysis presented by Potiy *et. al* government has defined the following factors that prevent the development of PKI and e-signatures:

- Lack of citizens' awareness about the opportunities of e-signature utilization as an alternative of hard copy document with handwritten signature.
- Case of non-recognition by judiciary the legal value of documents signed digitally which results in distrust of individuals or legal entities towards e-services that are delivered by means of digital signature.
- Lack of legal basis for the use of all possibilities of public key infrastructure for the development and effective functioning of electronic trust services, including administrative services electronically, e-commerce, electronic document management, electronic archive, electronic legal proceedings, etc.
- Flaws in state control over the activities of providing digital signature services, which leads to excessive state control of officially registered businesses, and the existence of black market for such services, state control for which is not exercised.
- Insufficient level of terminology harmonization that is used in legal acts regulating PKI area and e-signature services with the one used in international acts.

The mentioned problem is expected to be solved, as the Concept states, with aims of following actions:

- Preparation and submission to government legal acts that will assure functioning of PKI and provision of qualified trust services
- Integration of National electronic digital signature system with European and resolving issues with interoperability by establishing regulations in different areas that will allow cooperation in the field of PKI.
- Harmonization of Ukrainian law with international in the given field.
- Creation of a single trust e-signature center of Ukraine as a single point of contact in order to achieve interoperability of technical solutions in the given field by implementing international standards and unification of PKI technical components.

Along with the Concept that was adopted by the Ministry of Justice, The Action plan for implementation was adopted. Measures of the Action Plan are differentiated between the legal entities that are in charge of execution of certain tasks which are scheduled within 2015-1017 [45].

Being implemented, this issue is actively discussed not only on governmental level. NGOs are constantly taking part in the distribution of the idea by organizing events to raise attention and awareness on the key issues. For instance, in 2016 in Kyiv PKI Forum UA “From Digital Ukraine to Digital Single Market” had taken place organized by non-governmental organization “Ukrainian Association “Information security and information technologies”, various IT-companies, State Agency for e-government in Ukraine in cooperation with other parties. The aim of the Forum was to create an information platform for discussion, exchange of ideas and experiences between experts, government representatives, businesses and public organizations. Among the topics related to e-government that were discussed there, the matter of e-identity was raised. More precisely, the members were discussing new tendencies of the branch as implementation of ID card, security issues of electronic identification and trust services, interoperability of technical solutions, organizational and legal prerequisites of trust services provision. Additionally, such matter as directions of popularization of electronic identification and trust services in various areas of economic, social and administrative life of Ukraine [46]. However, there might be a room for assumption that in terms of this program there is no citizen-centric approach yet.

To conclude the legislation overview, today building e-state is one of the major priorities in Ukraine. Unfortunately, its implementation and development is taking place rather slowly in the past few years. However, it can be stated that a necessity of widespread implementation of e-governance not only has been acknowledged, but efforts to make it real are being put on a daily basis. So far, in general, there are several obstacles that inhibit its development which are undefined means of electronic identification system, lack of unified scientific approach to a national system of electronic service provision, inconsistency of basic principles of building a relevant infrastructure, undeveloped public-private partnership [42].

### **Actor constellation**

State Agency for e-Governance is a new central executive body that implements state policy in the area of informatization, e-governance, development and use of national information resources, information society development. The agency is challenged by many complex tasks that require significant amount of time, intellectual and financial resources. The Agency is concentrated of formulation as precise and clear goals to reach as possible. It has defined strategic directions of e-government implementation in the state which are the following: e-services, electronic interaction, e-identity, and open data. Aside from that, public-private partnership in e-governance field is not being left without attention as business is the one that is capable of providing latest technologies, offering skills and ability to manage complex projects that are required for rapid and efficient design of the system, its openness, elimination of corruption etc. Such goals demand relevant policy design in this area. Nowadays, Agency is conducting an experimental work on it by preparing a unified e-governance Green paper and four White papers. This approach is considered to be a common European practice which could also have been noticed in the above presented cases in the previous chapter [42].

Beside from state representatives, there also NGOs who proactively participate in the process of e-governance development. So far, the most popular is the iGov project ([www.igov.org.ua](http://www.igov.org.ua)), which is a portal that can be accessed to request administrative services existing in particular regions. The project was developed voluntarily by IT-specialists from all over the world [47]. The initiators are currently cooperating with government enabling the provision of administrative services online. The portal allows requesting services once there was an authentication processed through existing

methods that will be described below. Authentication with ID card has not been enabled yet though, is displayed on the website as one of the options.

### **ID card**

The matter of e-identity in Ukraine is urgent in terms of political and economic integration with EU, and also taking into account the growing penetration of technologies into people's lives, society and economy digitization. The lack of a common approach in this matter have led to a situation where in systems that are used for different purposes and scale use means of electronic identification without complying the basic requirements in security, protection of personal data, trusted identification and authentication, interoperability, accessibility and usability. Solving problems associated with implementation of e-identification technologies by means of regional or sectoral management is rather inefficient due to the need of providing the substantial part of e-services in frames of appropriate legislation and technical regulations, coordination of measures, which are aimed to solve the problems according to the concept of information society, cybersecurity, socio-economic problems focusing on integration to a single European market.

According to the State Migration Service of Ukraine, the plastic passport will be issued as a card with embedded electronic chip. The new ID will contain name of the country, name of the document, name, sex, citizenship, date of birth, unique registry number, number of the document, expiration date, date of issue, name of entity that issued, place of birth, signature and photo. The information that will be stored on the electronic chip will include marital status and place of residence information, e-signature (optional), biometric data (optional). To update or insert new personal information will be possible by submitting a solicitation; however, it's not applicable to the registry of place of residence.

It is planned that paper passports will be replaced by plastic ones during 5 years and, hence, there is no need for citizens to do it immediately. An important aspect that has to be outlined is the fact that if a person due to her religious beliefs will have a right to refuse to receive a document with electronic identifier by submitting a relevant application. The document will be issued for 10 years. [49]

The Ukrainian experts from various reform centres argue that the idea of implementing eIDs is promising and innovative in terms of general reformation of the administrative system; however, unfortunately, the procedure itself is not followed in qualified and

systematic way. One of the shortcomings is that the information about the place of residence is not displayed graphically. Government has planned this information to be incorporated electronically but, based on the common experience, it is known that almost in each governmental office the officials need data about place of residence. Herewith, so far people will be obliged to carry a paper annex similarly to one with personal identity number issued by tax authority. This will in turn cause certain inconveniences for average citizens. Experts consider that this information should have been put graphically due to lack of necessary equipment and devices that would read the information stored electronically. Moreover, the choice of the most expensive format of the document which includes electronic chip requires a setup of high-price equipment in order to accept and process applications for IDs. [50]

A piece of information is being spread over the web the newly implemented eID will allow it to be used as a travel document to cross the borders of EU and visa-free entry countries. For example, if a citizen of Ukraine can enter Belarus with his or her National passport (hard version), it's not possible to cross the border with new plastic ID cards as there is no mention about it in the relevant bilateral agreement with Belarus [51]. So far, Ukraine hasn't initiated the procedure of recognition of plastic ID card as a travel document between the foreign affairs ministries yet. The mentioned confusion was caused by the fact that implementation of new format national ID was an EU requirement for liberalization of visa regime, hence, the public mistakenly made such conclusion [52].

### **Other types of authentication**

Today, Ukraine is already offering opportunities to prove one's identity electronically using several high-trust technologies which are BankID, e-signature and, lastly, MobileID.

The BankID project was launched in November 2016 by National Bank of Ukraine which allowed the commercial banks of Ukraine to join the program that aims to facilitate provision of administrative services online verifying identity of their clients to governmental institutions and other third parties. During the implementation of the project, more than 10 banks has join it and this in it turn has increased the level of applications from citizens' side as banking in Ukraine is a quite developed field and the majority of population owns at least one bank account. Among the governmental portals, there are Ministry of Justice, The Single State portal of administrative services,



iGov.org.ua project and one of the local city councils who enabled access to website by means of BankID [53].

E-signature area appeared in Ukraine back in 2003, when first legislation was adopted by the Ministry of Justice in Ukraine along with technical standards based on PKI. E-Signature in Ukraine is being used in bank payment systems, accounting, tax declaration, signing documents [54].

As it was already outlined above when discussing international experience on PKI and Certification authorities, the mentioned countries outsourced the task of certificates issue to private sector using public-private partnership or public procurement. If, for instance, in Estonia, only a single authority of bank and telecom alliance is in charge of it, then, in contrary, according to the law on electronic signature, a public or private entity can be granted a status of accredited certification center if it has passed the accreditation procedure in compliance with the law. So far, according to the State Statistics Committee of Ukraine, there are 11 accredited certification centers, which caused lack of interoperability, first of all, following by different requirements set by mentioned centers [55]. Because of the complexity of receiving a certificate for an average individual that is characterized also by low demand among citizens, the use of e-signature is more popular in private sector and governmental entities who are switching to run their affairs without paper.

MobileID is a promising project which is going to be launched soon in a pilot mode by the major telecom provider Kyivstar. However, to ensure its functioning, a range of reforms has to be conducted, most importantly, in the law on electronic signature that has to comply with the requirements of eIDAS, along with the adopting of the new legislation on trust services [56].

Among these types of online authentication eID is one of the less developed ones and in the future, most certainly, will compete with Bank- and MobileID because of their relatively higher level of maturity and prevalence. Therefore, a similar path will be take place in Ukraine, as it happened in most countries when they have started to implement e-identification.

## **5.2 Citizens' awareness**

In frames of this thesis aiming to identify the level of Ukrainian citizens' awareness towards e-governance and e-identification, a survey has been conducted. The

questionnaire has been distributed via internet using social networks and email channels. The overall number of respondents that have submitted their reply is 222. Taking into account a very short period of the survey conduction the mentioned response rate can be considered as efficient and comparatively high.

The questionnaire consisted of 14 positions that, in general, had a purpose to receive basic information about citizens' opinions, attitudes, concerns, interests, access to various resources in terms of the given field, their feedback etc.

Delving into details and results, to start with, the age of responders was requested to be specified, hence, the results show the majority of responders were aged 21-40 y. o. which is 66,2% from the total number of people who submitted their reply (see Figure. Going further, the next age group was 41-50 (15% of responders) and 50 y. o. and higher (12,2%) which is a larger number of respondents aged 14-20 y. o. (6,3%). It can be assumed that while the survey had been distributed it was followed by a description of its goal and content, and, as a consequence, the given topic of the research is more appealing to older category of population which has already been interacting with governmental institutions, identity documents more often than younger category of citizens, and hence, they have more interest in giving their feedback.

The people were asked about the availability to access the internet, so results have shown that 77% have access to both mobile and home internet, 22,5% have chosen one of the types of access, and only 1 respondent out of 222 confirmed that he hasn't a permanent access to internet (see Appendix 2, Figure 5). This allows making a conclusion that citizens are able to access the web by using PC at home or using their cell phones.

The next question is related to the previous one and it aimed to provide an overview of the purpose people are using the web for. The purposes were categorized in 4 types as follows: social networks, information requests, work or study process, and purchase of goods or order of services. The results have shown that people are mostly using it for entertainment purposes such as, for example, the variety of social networks, and then it is followed by receiving information to their requests (see Appendix 2, Figure 6).

This is providing us with data that can be interpreted as the fact that Internet is being used more as a rather entertainment than a tool for education or working process along with requesting goods and services both from private and public sector. However, this conclusion has also a subjective and limited interpretation due to the correlation between the total number of respondents and the number of Ukraine's population; since

this indicator is too high, the results on this part of the survey cannot be fully generalizable reflecting the real situation.

Moving forward, the next issue that was found out during result analysis is that people when turning to governmental institutions experiencing lines very often and only few have confirmed that they either do not face it often or not at all; or they have used an option of electronic line if it was available (see Appendix 2, Figure 7).

Such numbers definitely prove that government institutions cannot process the current flow of citizens' requests that can be explained by already discussed reasons such as bureaucracy, unnecessary complexity, lack of communication within governmental departments etc., which could be potentially eliminated by means of ICT and other e-state attributes.

Considering the current existence of some electronic public services and the opportunity to use them, citizens were actually asked about it, and the correlation between positive and negative responses is somewhat overwhelming: 79,3% do not such services exist (see Appendix 2, Figure 8). This indicator can be used to assume with a high level of confidence that, even though the development of e-government has started, such component of its potential success as informing citizens about such opportunity was let out of attention.

People were asked which e-services they have already used amongst those that exist so far, and result have shown that 23,9% were using the opportunity to fill in required documents in advance to bring them later to governmental offices (see Appendix 2, Figure 9). 24,8% of respondents were authenticated to portals and sent their requests online. A minority of 5% of respondents failed to request a service online due to its unavailability in their region. The rest, which is nearly half of respondents, didn't use any e-services. It has to be pointed out that those websites that provide the possibility to make an administrative request still lack the attribute of ubiquity and accessibility, so those who refer, for example to already abovementioned [igov.org.ua](http://igov.org.ua) portal, more than often find out that this particular service they want to use is not available in their locality. This leads, naturally, to dissatisfaction and fails people's expectations towards state's performance and losing trust to it.

Consequently, the next question's results about people's trust to e-services show that the trust itself cannot be something the can people feel towards what they don't know about or if it can't be experienced. This is why 28% answered that they actually trust e-

services, 64% trust only partially and the rest doesn't trust them at all (see Appendix 2, Figure 11).

The next section of survey was dedicated to ID passports and aspects of national identification. Even though the ID-passport has started to be issued less than a year ago, when respondents were asked what national ID document they are holding now, 8 of 222 answered they already have a new format plastic passport. 81% confirmed they have a regular paper passport, and the rest 15,3% informed they use driving license as an identification document (see Appendix 2, Figure 10).

People were asked both reasons why they would change their passport to a new ID card and why would they prefer not to do that. The first question has brought the following results (see Appendix 2, Figure 12):

Almost half of respondents believes that new ID card is expected to be used to reach government services online, but there is a significant part of them (31%) who have to intention to get a new ID card, while the other 2% do not know about such type of identification document. It is assumed that the change of existing passport is not a priority for Ukrainian citizen for many reasons (see Appendix 2, Figure 13). A large number of them will be discussed below, but at this point it has to be mentioned that such reluctance can be explained by the government's positioning of the beginning of new ID issuance. To be more precise, they are informing that replacement of old format passport is not compulsory and the change will take place gradually, at least 5 years. Despite the fact that paper passports will not be issued anymore to young people who reached 14 years, yet, citizens who have to change their passport photo once they reaching age of 25 and 45 years will still have an opportunity just to replace the photo keeping the paper passport. Another important aspect that has already been pointed out above is that citizens are able to refuse to store their data electronically on the card by filling in a certain application. Such option is rather unreasonable in some sense since it inhibits various important processes which are, for example, the spread of e-solution that has numerous benefits as one of the core factors of e-government; pace of adaptation to a new standard document which is a factor of low awareness level cause. Moreover, in the future, if potentially, the state will be able to provide services electronically, people who earlier were issued cards without a chip won't be able to access all benefits, and this can lead to unnecessary expenses both for citizens and government, performance of the identification system, citizens' satisfaction level. Recalling the case of Estonia, it was clearly decided that replacement of old identity

documents is mandatory, so now this is proven to be an absolutely reasonable step because of a very high level of acceptance among Estonian citizens.

Apart from that, answers of respondents show that what most stops them to change their passport is time consuming procedure that is associated with collecting various paper documents. The other part of respondents considers there are no benefits in doing so. Only 5% replied that they would not start the procedure due to the state fee. Third part of the total number respondents replied choosing all options mentioned, and 11,5% have named other reasons that preventing them replace current IDs, for example, someone didn't know about such opportunity or explained that since there is a very low level of development of required infrastructure, the new ID won't have any advantages. Three respondents, who have left a comment, informed that they do not trust the country and government.

The next set of questions is concerning technical specifications of ID card; The aim was to have a better understanding of people's attitude towards some potentially sensitive matters that are usually present when a new technological solution is being implemented and, moreover, to realize the background factors that cause these attitudes as this can serve as an area for improvements striving to lean them towards a positive side.

People were asked whether they are aware of what an electronic signature is, and it can be presumed, that due to its implementation which started back into 2003, respondents' replies show that 63,1% know what it is though don't use it; 22,5% do not know about it; 14,4% are actually using it (see Appendix 2, Figure 14). Taking into account a relatively high level of awareness on e-signature, it can be argued that this simplifies and speed the process of acceptance and adaptation of new-format document. Being a core element of electronic identification, there has to be a big emphasis on e-signature, raising awareness of civil population, businesses and government side. Low percentage of those who uses electronic signature nowadays in Ukraine can be explained by a complex and long procedure of receiving a certificate, interoperability issues, ease of use matters, etc. Before starting taking measures to encourage not only entities use it but citizens as well, the entire field has to go from top to bottom through a set of reforms simplifying the complex procedures and regulations, mainly legislative and technical ones.

While learning electronic identification document attributes and international experience in using different standards within the given topic it was decided to include also a position about storage of biometrics (see Appendix 2, Figure 15). Major number

of respondents (62,2%) answering the question would they agree their biometric data to be stored on national ID cards, thought positive, considering such attribute as an additional level of protection and higher standard of identification. Almost all the rest of the respondents (32,9%) would not want their data to be stored in government databases. 2,7% replied they do not know or didn't understand what it is. 5 respondents answered this is against their religious beliefs. Such results, ambiguously, confirm that people care about security of their personal information but if the major part has an understanding how does it work when it comes to this solution, some might, yet know, but having to trust towards state questioning its ability to guarantee security. This gives a room to suggest putting additional efforts and attention to a matter of data protection provisions and their delivery to citizens ensuring their awareness on it.

Continuing with the technical specifications of eID, respondents' answers for the question on would they prefer eID as means of authentication when accessing e-services, have drawn the following picture (see Appendix 2, Figure 16).

Nearly half of the people who answered would prefer to use ID card to confirm their identity but 14% mentioned that this option wouldn't be suitable for them as in some situations there is need to ask for an advice or help from official. Yet, 21% would choose to authenticate themselves with use of username and password. Here, it has to be mentioned, that, presumably, people chose this method because of its ease of use, however, because of a high risk of identity theft which in case of citizens and government communication and institutional relationships can lead to certain troublesome consequences. Thus, occurrence of cybersecurity breaches and fraud risks have to be explained to population whilst stressing on the means with higher level of safety use. Going further, 6% would use alternative methods, which currently, most common one is BankID. 10% of respondents confirmed it is easier for them to go personally to the entity.

Generalizing, 90,1%, which is 200 of respondents confirmed that they would use governmental e-services rather than going to administrative centres and offices. The rest 9,9% would prefer things to remain as they are right now (see Appendix 2, Figure 17). Naturally, citizens' opinion shows that the problem which is being researched within the thesis is urgent and positive changes required and expected.

Additionally, within the conducted survey, respondents were given an opportunity to share their thoughts, feedbacks or comments which were submitted by 15 of them (see Appendix 2, Figure 18). Having analysed the submitted comments, several of them

relate to particular issues such as low level of e-services development and e-government in general; inefficiency of authority; the matter of trust to government. Moreover, feedbacks on using existing electronic authentication methods and e-services portals were left, confirming their satisfaction with the ability to do it remotely and much faster. It can be confidently argued that even though the scale of conducted survey might not bring fully objective results, but it is clear that the situation with people's realization of upcoming changes is urgent and requires actions. Going further with the research, a local e-government project implemented by the City Council of Lviv will be presented as an e-identification solution that provides benefits to citizens of Lviv.

### **5.3 Lviv Citizen Card as a successful local e-government solution**

Currently, in Ukraine e-government solutions on local level are being implemented fragmentally and scattered. When it comes to e-identity, there are a few cities that have already started to work on projects that aim to bring existing electronic services to citizens without a need to visit administrative service centers. The cities which already have more or less mature concept are Kyiv, Lviv and Dnipro. This subsection will give an overview about Lviv case based on the conducted interviews with general managers and developers of the project. The members of the project were asked a set of specific questions aiming to help find answers for the research questions. The set of interview questions can be found in the Appendix 1, Figure 18.

Located in the Western Ukraine, Lviv is considered to be one of the cities with a high level of public activity where citizens proactively participate in public life.

The idea of the project was established in 2015 as a potential solution for all Lviv citizens but back in that time it aimed to be issued to members of antiterrorist operation (ATO) that is still taking place in the conflict zone in the Eastern Ukraine. The card itself is an identity document that can be used for accessing various services more effectively and efficiently. Initially, the card included services that are most relevant and demanded to the members of ATO, for instance, social protection and financial aid, but now, as the current manager of the project, Myroslava Tsyhelyk, states, the card will include more services that can be used by all citizens of the city. The card of citizen of Lviv is also a bank card which allows using it for financial operations (Figure 3). Hence, it contains an electronic chip that stores personal information and can contain certificates allowing it to be utilized for digital signatures as well. The data stored can

be access by the official who extracts it by putting it into card reader device. As the general manager of the project informs, Lviv City Council is already equipped with required infrastructure in order to ensure the delivery of services and operating with information online.

As it was just mentioned above, the card allows requesting social protection services and financial aid which normally is followed by collection of a number of applications but once the card was issued, the owner will be able to do it skipping this step as all information will be stored in the system. Moreover, being a bank card of one of the biggest banks in Ukraine it allows the owner to identify himself with BankID and access e-services in their personal account on the city council's website. Furthermore, the owner of the Lviv citizen's card is able to use public electric transportation free of charge.



Figure 3. Lviv Citizen Card.

The current manager of the project has informed that the project is being on its pilot stage. So far, the card could be used by ATO members but now the team is working on scaling it for every average citizen along with enabling to use a larger range of e-services. To be more precise, currently, an e-ticket for public transportation with the possibility of contactless payment is being implemented. The former manager of the project, Tymofiy Aleksandronets, states that this is one of the advantages of this card - it can be used as e-ticket and also can be used for electronic signatures as it contains certificates by one of the banks. At the moment, more than two thousand cards have been issued.

During the interview, the interviewees were asked what were and are currently the biggest obstacles and difficulties for them as service providers. All three respondents named various reasons but the common one was the lack of a single identifier and a unified database and electronic document exchange system. The manager of the project



states that, for instance, a person who holds Lviv Citizen Card requests a service, the internal departments usually need additional information that is not stored within their access in their internal databases, so they are forced to make official requests to other state entities which significantly slows the delivery of service down along with its efficiency. The former manager of the project also mentioned that there is no infrastructure developed and people do not own the card readers to use the full range of benefits. Moreover, if the Lviv City Council's services can be requested online, other public services are mostly not available at the moment. The third respondent, Rostyslav Vasiuta, who deals with technical specifications, points out that another problem is the lack of understanding the aim of the project in certain departments or their reluctance to support its implementation. Answering the question about the potential possibility to scale this project on the national level, the respondents have ambiguous opinions. The current manager of the project mentioned that interoperability of their solution theoretically can be possible once other regions start design their own local solutions but it has a range of technical and bureaucratic issues that have to be solved. The technical specialist, R. Vasiuta, states that their solution is meant to be used on the local level while on the national newly implemented ID passport is ought to function as enabler of access to other public e-services.

Moving forward to people's awareness, the respondents were asked their opinion on this matter and its importance for the success of e-government solutions. All of them have agreed that this aspect plays one of the key roles when running the discussed solutions as it has to be kept in mind that not only this is implemented for the state effectiveness increase but for citizens since they are the "end users and customers". Here we can refer to already mentioned concepts of good governance and new public management.

Going back to the Lviv Citizen Card, respondents were asked to provide information on the activities that were carried out by them aiming to inform the publicity raising their awareness towards this solution. Summarizing, it has been informed that the following activities were carried out such as media campaigns, press releases, reports on thematic conferences, social network announces, informing about new possibilities on sight, meaning all administrative service centers. The current manager of the project states that Lviv is a city where people are very active taking part in the public life of the city and are always interested in new implementations, especially, the younger generation; as R. Tsyhelyk mentioned, youth values its time and, naturally, is more opened easier to

accept innovations. When it comes, to elderly, the manager confirmed that the level of interest is not so high though it's there and is being encouraged.

In order to better understand how Lviv Citizen Card works, the responders described the process of providing an e-service takes place. The scheme below visual displays the mentioned process step-by-step, according to information received during the interview (see Figure 18). The respondents have described a process of request of financial aid for a citizen. To start with brief explanation, the citizen has to show up to one of the administrative service centers and request this service in person because so far citizens do not own a special smartcard reader. Afterwards, citizen presents his card and by means of reader device the official accesses citizens' personal data stored in the card and checks if citizens' profile contains required documents that are required to approve financial aid according to the procedures. If the necessary documents are already inserted to the system beforehand, the official processes the request and sends an approval to relevant department who is responsible for processing the transfers. In case some documents are missed, the official sends a request to departments who can provide such documents, and once they respond, the official, as it was already mentioned, processed the approval for transferring the amount to the citizen's bank account which in most cases is located in the bank who is cooperating with Lviv City Council and is responsible for issuing the cards.

In overall, all respondents agree that this project is still very raw and requires systemized reforms that are expected to be approved on the national level. Indeed, it can be argued that the above described project is very promising but without further actions on the national level it will not be possible to reach set goals.

Having analysed the primary data received during the conduction of survey and interviews, it can be summarized that the received information is very valuable and allows building hypotheses and formulating recommendations aiming to answer research questions in frames of the thesis. The discussion and a summary of the research will be presented in the final chapter below.

## **6 Analysis and discussion**

This chapter is aimed to finalize the research within this thesis summarizing the findings that were received from studying theoretical foundations, international experience and specific case of Ukraine. This will allow fully answering the research questions, formulating a personal vision of possible solutions that will contribute to the future research practice and theory.

### **6.1 Summary of findings**

As the author of this thesis who originates from Ukraine and has first-hand experience in facing difficulties when communication with public institutions, I was inspired to investigate this topic inspired by dealing with completely different experience being in Estonia and using the benefits of e-state. Delving into literature which was used to build the structure of this work and formulating my arguments, I have encountered various contradictions, gaps and ambiguous aspects that have impacted the opinion and conclusions below.

As any other country, Ukraine is very special with its history, culture and mentality that majorly define the core and essence of it. Today, when the whole world is being adapted and changed by ICT to its very roots and in some fields and areas is completely redefined by them. ICT is used as an ultimate and powerful tool to make positive changes, and it is not news that governments use innovations to benefit from them shifting the notion of government itself towards technologies and innovations. Having learned what is standing behind the domain that is being researched, as it was already said above, identity, within the state that is driven by the principles of good governance and the concept of new public management, by means of ICT, has been shifted to digital world becoming a component and a tool at the same time, of e-state. Moving forward, and as said before, being inspired by Estonia, its example was presented as a successful case of a state that can now totally exist and operate online, and strong e-identity management system for this purpose was one of prerequisites. Going further, cases of countries from different regions of the world have also proven that having their own challenges, back in each of their times, India, Austria and Sweden have also managed to

implement electronic identities tailoring the infrastructure to their needs. In each studied case it was discovered that in one way or another, countries have put their efforts not only to restructure and build legislation, develop technical side and infrastructure but also taking measures that ensure that their citizens will be encouraged and aware how to use new solutions understanding the agenda. Ukraine is characterized as a state that only has started to make first steps towards e-governance. Understanding the benefits and advantages, the government of Ukraine is striving to move forward and succeed but various issues and obstacles of different scale are preventing to do it currently. Seeking to find answers to research questions in frames of the thesis, Ukraine's specifications concerning e-identification were learned.

ID cards in Ukraine that were approved as a new format of National ID are aimed to be a tool for citizens that can be used by them accessing e-services. Being justified by a very early stage of development that is explained by a raw legislation and lack of infrastructure, yet it can already be stated that Ukraine has to put significantly more efforts in order to successfully implement and run electronic identification system. After analyzing the existent legislation on main components that are have to be included to e-identification and e-governance in general, adopted programs and action plans, it is argued that though and enormous amount of work is done already but because of its fragmental and superficial nature, a wide range of matter are being lost from sight which causes the current situation when objectively the overall level of success in this area is estimated to be very little.

Analysing the factors that influence the subject of this work, it was assumed that citizens' awareness on eID and e-governance in general is an important aspect that is somewhat neglected and has to be tackled by the government. By using the methodology described above, meaning the conduction of survey with citizens and interviews with officials involved in e-identity area, throughout the research several statements can be made based on the results and studying the materials on the current situation in Ukraine, which are as follows:

- So far, *Ukraine is risking to fail at managing to establish the ID card project because a number of issues*. This is a general statement that will be followed by arguments that underpin it specifying the mentioned issues;
- Despite the fact that relevant regulations and action plans on matters related to e-governance and eID do exist already, authorities hesitate to implement and follow them. This mainly can be explained by a long history and

tradition of running state errands that foster corruption, which, if it may be stated in such way, reached ridiculous level and, what is even worse, is sometimes taken as granted by people. It is known, that unfortunately, many politicians are driven by the personal advantage they want to receive which results in indifference to what is not concerning their interests and, hence, leads to problems in socio-economic development and welfare;

- Emanating from the previous statement, it has to be pointed out, also based on the results of survey, that Ukrainians, naturally, realize the abovementioned problem and the urge of changes. This can be also proven by the events that took place in Kyiv in the fall 2013 [58] that basically showed how much people did not trust government and politicians that ruled back at that time. As this turning point since then caused some positive changes, yet, people do not trust government. Going back to the subject of research, it has to be stated that because of strong trust issues changes for the implemented ID project to success are low;
- This leads to another statement that underpins the focus thought of this research: citizens are not fully informed about all aspects and reasons for implementing this solutions.
- Due to the big percentage of respondents who informed that they are not aware of existing innovations and lack understanding of purpose, citizens require more education in order to increase their digital literacy;
- Results of interview show that on local level there are already initiatives driven by principles of transparency and efficiency but they are not able to develop and improve further because of the foundation which is legislation and infrastructure. This leads to fragmental and scattered developments of some solutions (volunteer projects, portals, initiatives etc.) that though might benefit the citizens but is rather creates a growing number of solutions that are not interoperable between each other and creates their unnecessary heterogeneity and variety, for instance, the number of already existing portable with public services or the number of certification centers;
- The absence of citizen-centered approach that is supposed to put people's interests and needs in the front in terms of delivering public services, leads to already mentioned many times low awareness level.

Hence, it can be concluded the mentioned statements above are highly interconnected and emanate from other. Referring again to results of questionnaire and interview, confidently, the citizens' awareness towards is one of the key aspects that have to be considered when implementing e-governance and its components.

Based on the conclusions of the research conducted above, a personal vision of the problem solution and possible future research perspectives of the matter of awareness will be outlined below in the next subsection.

## **6.2 Personal vision and future research**

In frames of the thesis given above, the background idea of electronic identity and e-governance in general was discussed, followed by presenting international practice of electronic identity management, going further to the case of Ukraine, analyzing its existing implementations in e-identity area, outlined as a research question. Moving to the second research question, the issue of citizens' awareness towards eID and e-governance was put as a key aspect and factor of success when implementing such solution was aimed to identify during the research process. After conducting the research by means of qualitative methods, it was managed to prove citizens' awareness as one of the weak spots of Ukrainian electronic identity management and e-government strategy. Lastly, the third research question was to outline the lessons that had to be learned from positive experience of Estonia, Austria, India and Sweden whose practice differs but, yet, has a significant level of acceptance among their citizens.

After getting familiar with the case of Ukraine and identifying the specifications that determine the current state of its electronic identity management and the environment in which it exists and develops, an analysis of people's attitudes and awareness on the given subject was conducted. Moreover, a case of positive local government e-solution was described thanks to the officials who are directly involved in the project development and its maintenance.

All mentioned above have allowed making comprehensive conclusions and statements that answer two of three research questions. According to the made statements, I will below describe my personal vision on how the existing problems might be solved and will outline future research perspectives in the given area.

Before presenting the measures and activities that have to be carried out by governments in order to raise people's awareness towards eID and e-governance in

general and changing their attitudes, a set of prerequisites has to be presented. The reason of their implementation is that based on the international practices, it is clear that there are some general conditions of proper functioning of electronic identity management within a country. In case of Ukraine, the following prerequisites have to be met:

- Harmonization of electronic identity management system with eIDAS Regulation;
- Legislation that defines a unified identifier has to be adopted that will ensure successful and seamless operation with electronic entries that will be linked to a unique number; this will also benefit the unified electronic document exchange system which so far doesn't exist;
- Unified electronic document exchange system has to be implemented between the governmental authorities to facilitate secure and efficient data flow;
- Amendment that will make ID passport a compulsory document format based on the experience of Estonia which was one of the conditions of ID card spread among the entire population;
- Amendment to PKI legislation which will ensure a limited number of authorized certification authorities responsible for certificates issue; this has to be conducted for the sake of interoperability and guarantee of verification process;
- Provision of the required equipment in all administrative centers to ensure the ability to operate with eID and delivery of services.

Currently, as it was mentioned before, Ukraine cannot fulfil these requirements instantly, and it will take year for these changes to take place. Furthermore, the already discussed above matter of common corruption phenomenon within state structures urges not only these prerequisites to be met, but rather a disruptive change to happen that would fundamentally redefine the way of running state errands eradicating the old routine. This statement is somewhat vague and indistinct based on personal vision but nevertheless has a right to take place in frames of the given research.

Herewith, aiming to change the citizens' attitudes and awareness towards eIDs and e-governance in general that would guarantee a higher level of their acceptance, the following recommendations are presented as follows:

1. Adopting a Concept on raising citizens' awareness on e-governance and increasing the level of digital literacy enhancing their computer skills and knowledge based on the approach of continuous learning models. The Concept should include separate projects for different age categories of population personalizing methods of education to each of those.
2. Redefine the concept of public service provision on each level of government using citizen-centered approach and put in front people's interests and needs. Lessons can be learned from private sector that is usually much more successful when meeting customer/user needs. This is also reasoned by the already mentioned concept of new public management.
3. Ensuring citizens in the guaranteed security of their personal data retention transparently communicating main principles of cybersecurity.
4. Running ubiquitous campaigns that positioning e-governance and, of course, eID as a prerequisite of transparent, effective, efficient and corruption-free government which will ensure the increase of citizens' trust towards it and will also give an insight of e-services and their benefits.
5. Development of a one-stop-shop web portal where all e-services will be gathered facilitating their access and ensuring a decent, clear and functional system of online assistance.
6. Ensuring that all above mentioned will be provided in each region equally to every citizen.

It is understandable that the above measures require enormous resources and time but judging from practices of other countries, by systemized and precise policies and strategies that have clear goals will guarantee positive changes.

To outline the prospects of future research, at first it has to be mentioned, that based on existing literature, it hasn't been discovered any relevant sources that would provide some knowledge on the phenomenon of national mentality and nation's perception of the phenomenon of corruption. The purpose of mentioning this statement is the fact of the commonly spread belief that mentality in case of Ukraine, plays a significant role in the current situation. Such issue is not researched enough, and it is presumed that in theory, the possible outcomes would be valuable, having mentioned already, the interdependency of corruption and citizens' awareness.



Within the context of the conducted research it is also offered to raise the issue of service provision in Ukraine and the lack of citizen-centricity in public sector as a factor of dissatisfaction of government and a reason of low trust level.

## 7 Conclusion

During the work on the thesis given above the methodology of qualitative research was used which can be justified by the immaturity and early stage of development of the studied field in Ukraine. Qualitative data allowed to provide exploratory outcomes as it was aimed in the beginning of the research.

Thoroughly examined the concepts that stand behind of e-government and its components (here, e-identification) allowed receiving a better understanding of their purpose of implementation.

The primary data for the research was gathered by means of conduction of questionnaires (surveys) that were distributed online to citizens of Ukraine, and interviews that were conducted with 3 respondents, representatives of Lviv City Council, giving an insight about the local e-government solution related to e-identification. During analysis of survey results, descriptive statistics method was used with already mentioned qualitative means of research.

The above methodology helped to answer 3 research questions that were set in the introduction of the thesis.

Firstly, specifications of Ukrainian eID were discovered along with identifying main aspects that determine its current state of development. Ukrainian electronic identity management is being on the stage where it can be characterized by immaturity an early stage of development. Because of the legislation flaws, complex bureaucratic procedures, lack of infrastructure and the situation and attitudes of Ukrainians towards their government in general, eID is so far the less developed means of electronic identification and at this point, as survey has shown, quite a big percentage would rather keep the old format document and would access e-services using other methods showing low level of trust towards authorities, especially when it comes to operation and storage of personal information.

Secondly, the analysis of results gained during research conduction allowed identifying citizens' awareness towards e-governance and eID as one of the weak spots that inhibits successful operation of the project. Moreover, main aspects of such effects on awareness level were described which helped to answer the second research question.

Thirdly, having studied international experiences on electronic identity management implementations in such countries as Austria, India and Austria, and, of course Estonia, lessons were drawn which was the aim of the last research question. This helped to distinguish most remarkable lessons that may be applied in Ukraine. A special attention was given to the case of Estonia which is now being fairly put as an example of e-state with highly functioning and effective electronic identity management.

Lastly, in frames of the research, the answered questions allowed formulating personal vision of author and her recommendations as possible problem solving tools that might be used in future research, theory or practice. Moreover, prospects of future research were outlined.

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## Appendix 1 – Interview questions and results

Within this research, for purposes of collecting primary data regarding Lviv Citizen Card, interviews with three representatives of Lviv City Council were conducted. Due to the lack of possibility meeting them in person, the set of interview questions were sent to respondents via social networks and email as a preferred channel of communication. All three representatives agreed their names to be referred. In order to present their answers in a compact and convenient way, the below table was built and moved to Appendices in frames of this thesis.

		Respondents		
		Myroslava Tsyhelyk	Tymofiy Aleksandronets	Rostyslav Vasiuta
<b>Questions</b>	What is your role in the project	Current manager	Former manager	Technical specialist
	Which stage the project is currently in?	Pilot project	Respondent doesn't own relevant information at this point	Pilot project
	How can you describe the success of the project? Provide an example or numbers.	More than 2000 cards were issued to the members of ATO	The card is going to be used as means of digital signing, e-ticket for public transportation	Respondent considers it is too early, so far, to summarize
	Being a service provider, name difficulties and obstacles faced during development and launch of the project	Complexity and bureaucratic nature of procedures; lack of digitized resources; absence of electronic system of document exchange between authorities	Lack of infrastructure; lack of smartcard readers amongst citizens; only Lviv Council services can be requested online, while other entities' cannot be accessed	Reluctance and unawareness of certain officials to implement the project; Lack of single identifier  Format of registries

What measures and actions were carried out to inform citizens about the availability of this solution?	Media campaigns; information pamphlets; informing citizens on sight, in the administrative service centres	Press releases; Conference reports, promotion online on websites and social networks	Press conferences	
In your opinion, does the awareness level of citizens towards e-government solutions play an important role in their success	Significantly. Respondent also mentions that in this sense Lviv can be proud of their citizens as they are very proactive when it comes to participation in the public activity, especially youth.	Positive. Citizens are the end users of services, there is an explicit interrelation between it	It is very important as not only ensures the usage of these services but also engages the community in the public life of the city or country	
Is there a potential possibility to scale this project to the national level?	Yes, but due to the above mentioned obstacles now it does not seem to be possible	Potentially, yes	Such solution aims to be used within local government. National level services have to be provided by means of National ID card	
Is it planned that this solution will be also interoperable to be used to authenticate one to other governmental web portals?	Yes, the team is working on it right now but due to mentioned obstacles this task is challengeable	Respondent did not provide an answer	Potentially, yes. Right now there is no such possibility	
Please describe a process of certain service delivery to the owner of Lviv Citizen Card	Please see Figure 4			

Table 1. Interview questions and answers.

## Appendix 2 – Questionnaire results

**Q1.** Please specify your age.

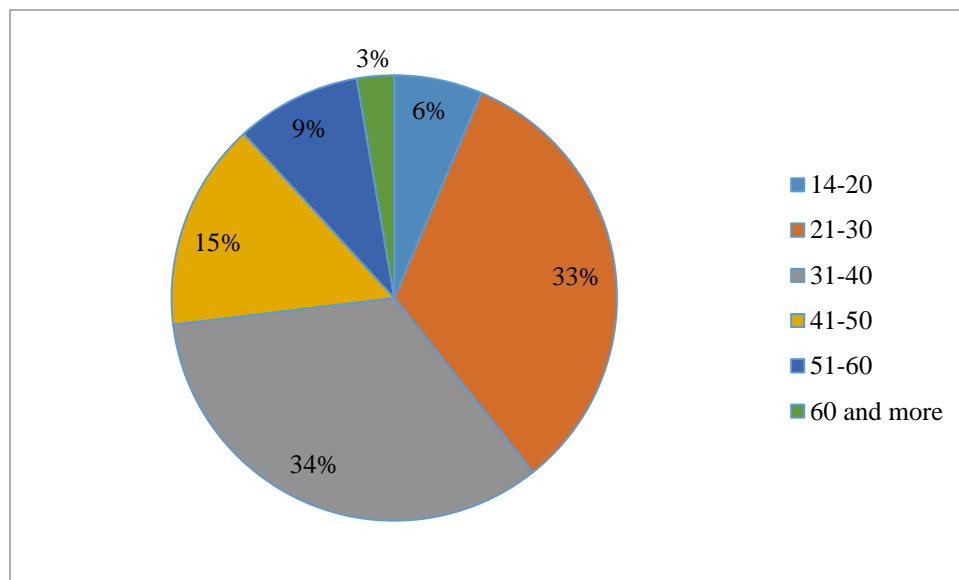


Figure 4. Answers to Q1.

**Q2.** Do you have access to Internet?

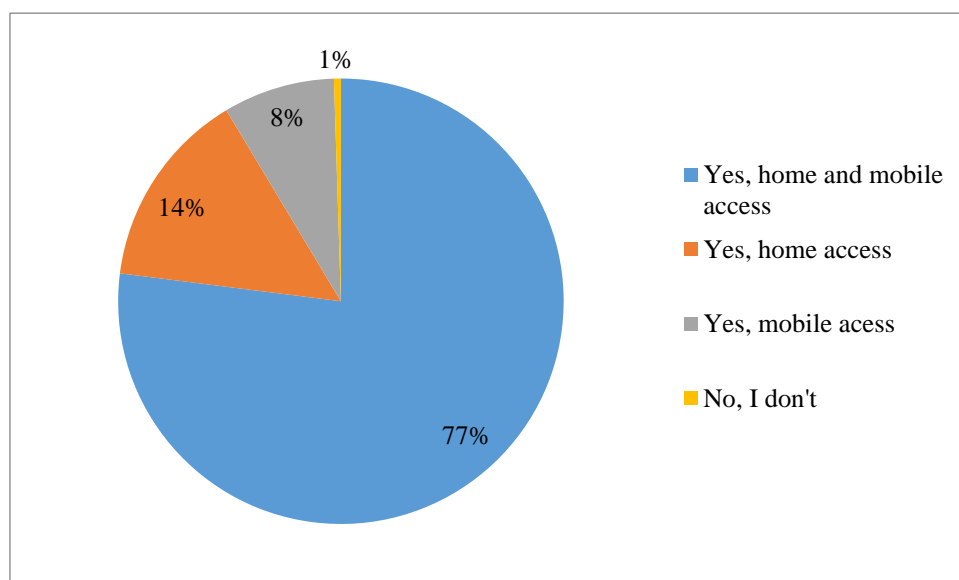


Figure 5. Answers to Q2.

**Q3.** Please select purposes you use Internet for.

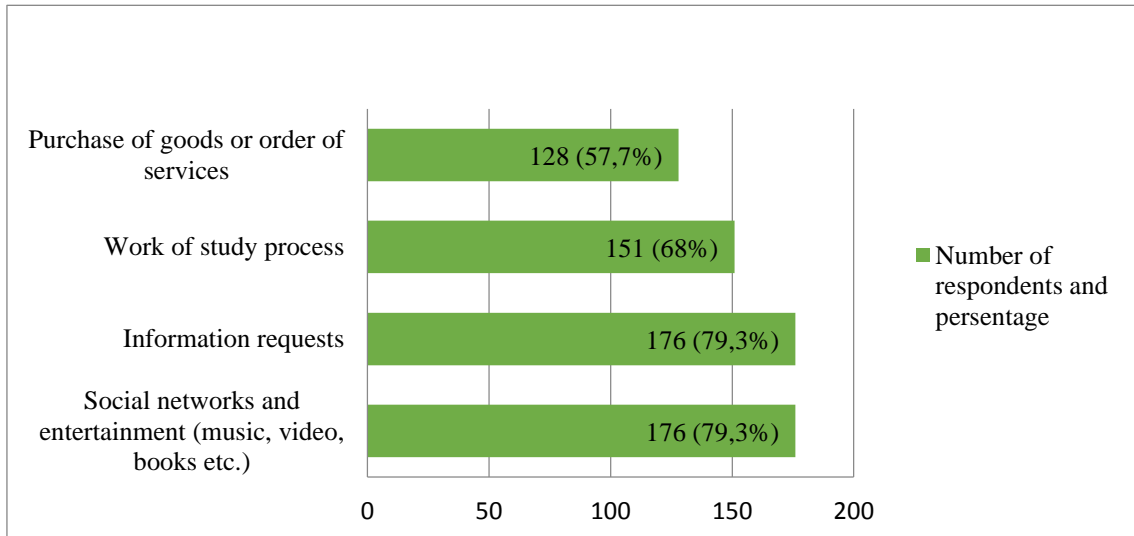


Figure 6. Answers to Q3.

**Q4.** Do you experiences queues when turning to governmental offices?

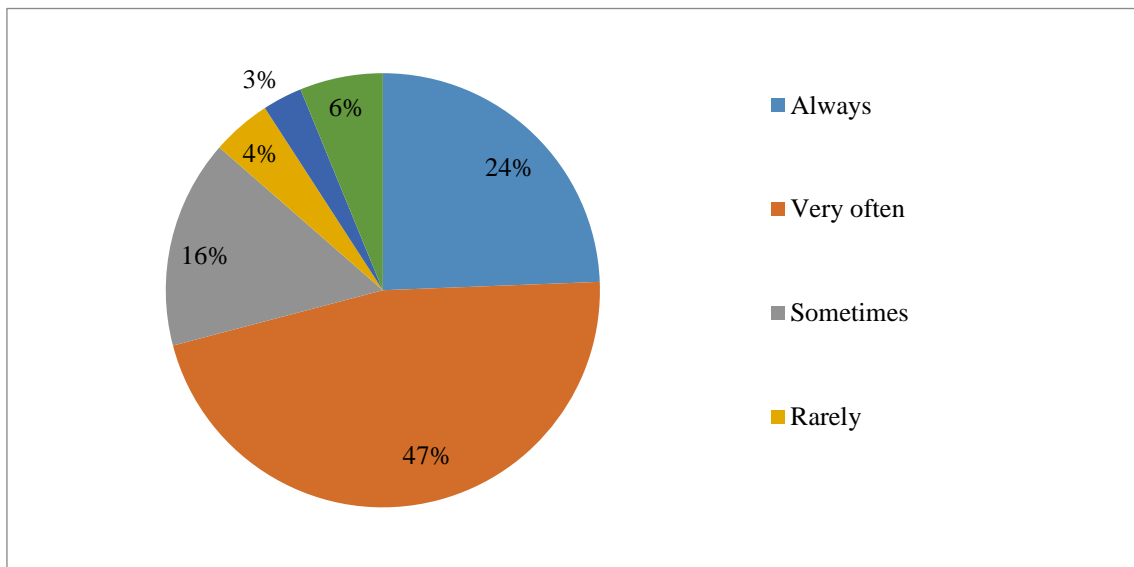


Figure 7. Answers to Q4.

**Q5.** Do you know about public services that can be requested via Internet?

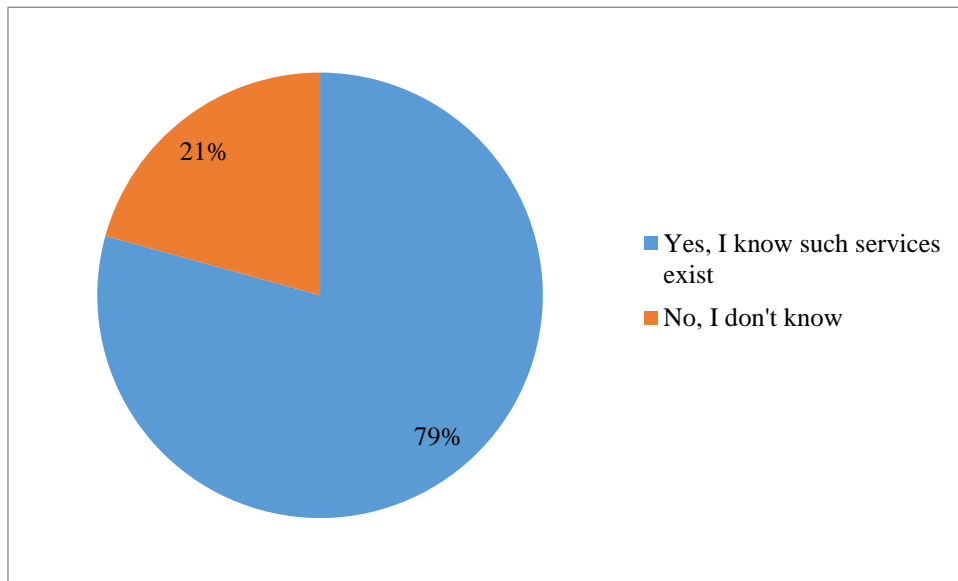


Figure 8. Answers to Q5.

**Q6.** What public e-services you have used already?

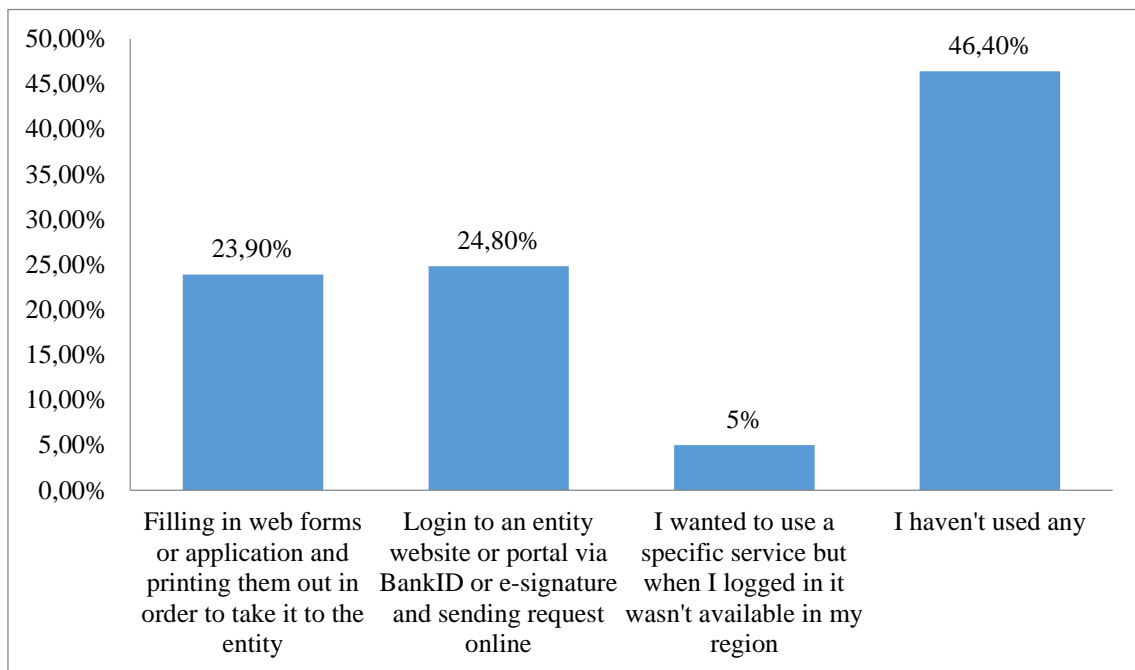


Figure 94. Answers to Q6.

**Q7.** What kind of identity document do you have currently?

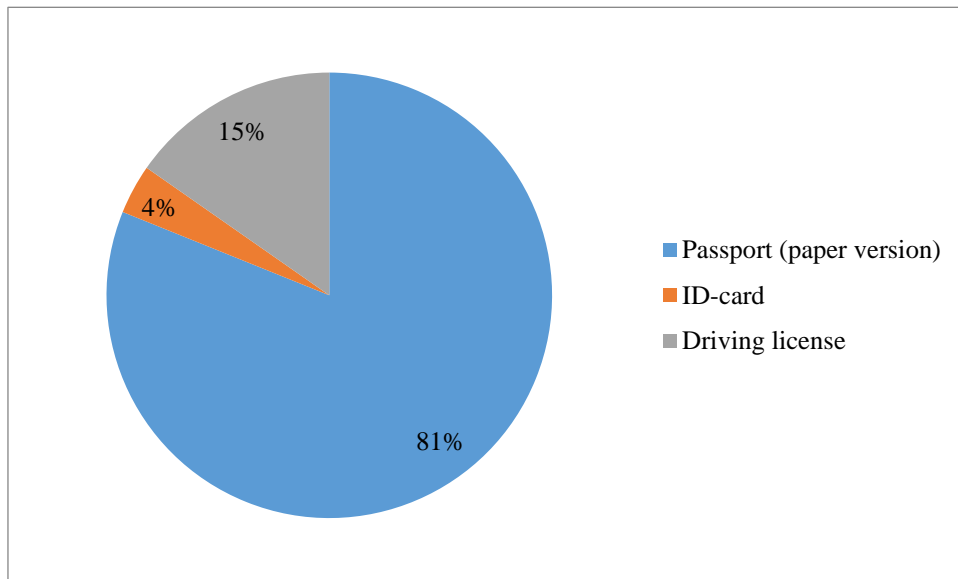


Figure 5. Answers to Q7.

**Q8.** Do you trust public e-services?

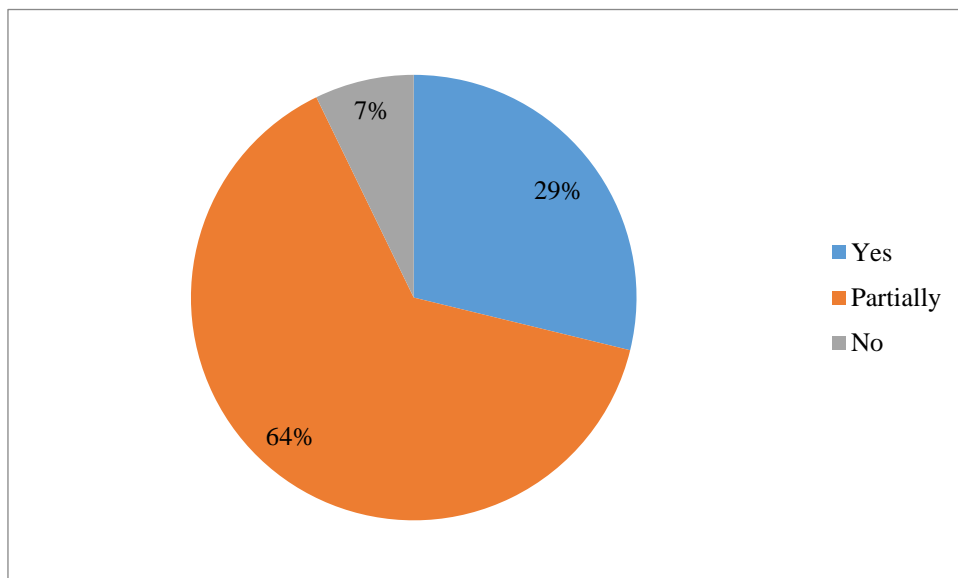


Figure 6. Answers to Q8.

**Q9.** What would be the reason for you to change your regular passport to an ID card?

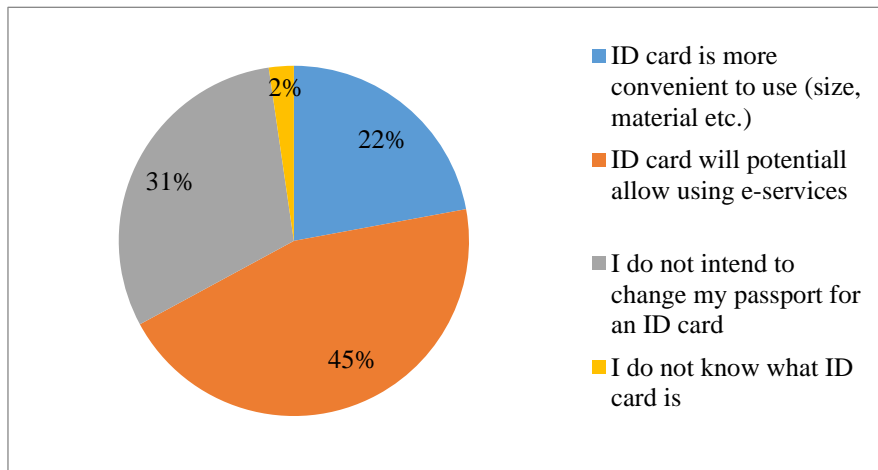


Figure 7. Answers to Q9.

**Q10.** What is preventing you to change your passport to an ID card?

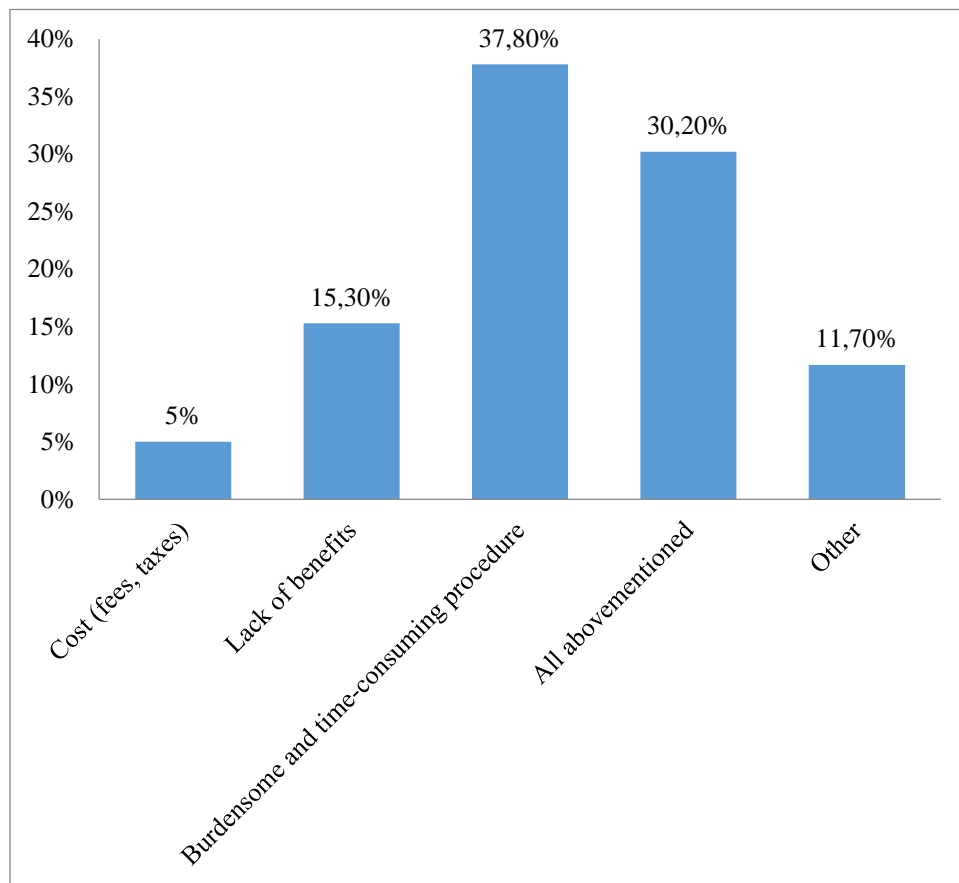


Figure 8. Answers to Q10.



**Q11.** Do you know what e-signature is?

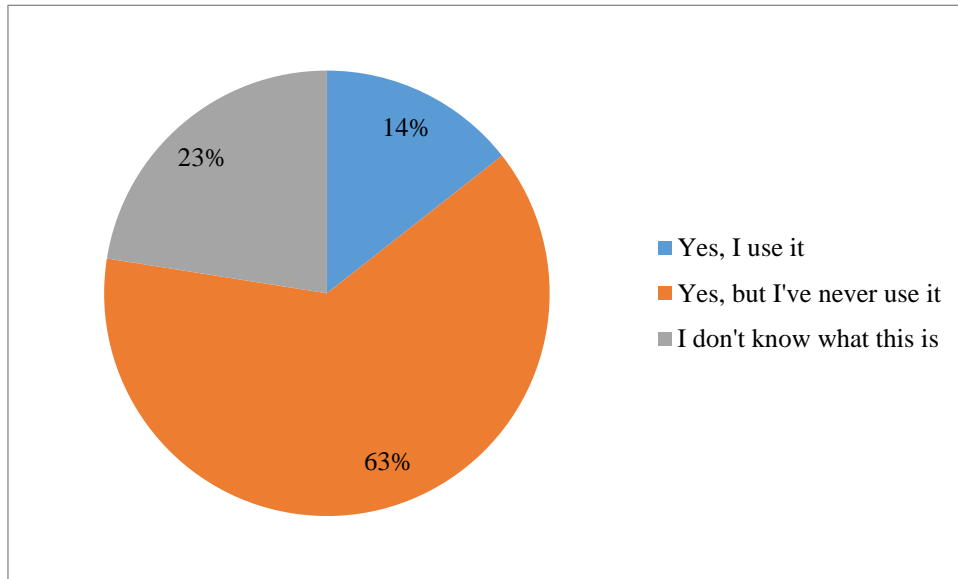


Figure 9. Answers to Q11.

**Q12.** If you have decided to change your passport to an ID card would you agree that your biometric data were stored in the document?

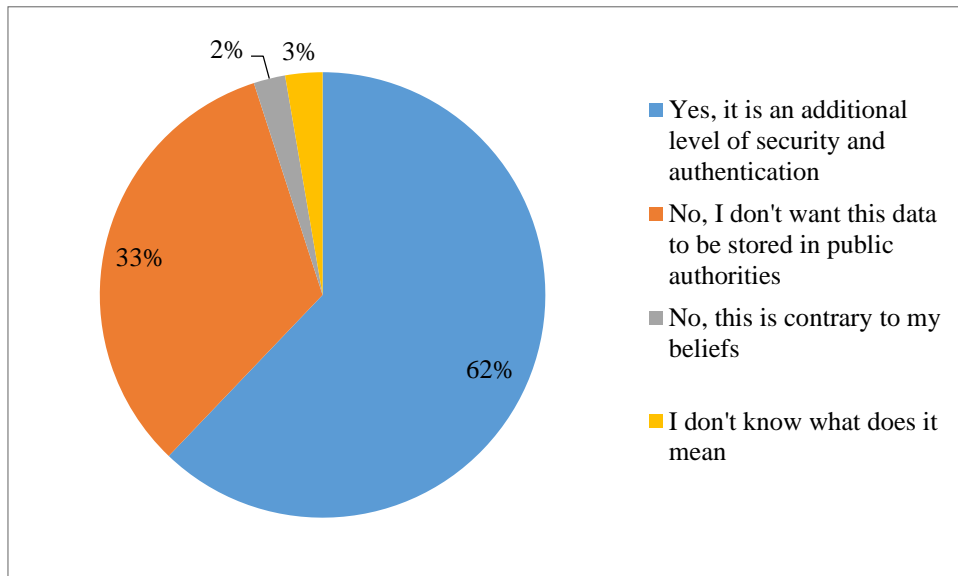


Figure 10. Answers to Q12.

**Q13.** Would you prefer to use ID card as means of authentication when accessing e-services?

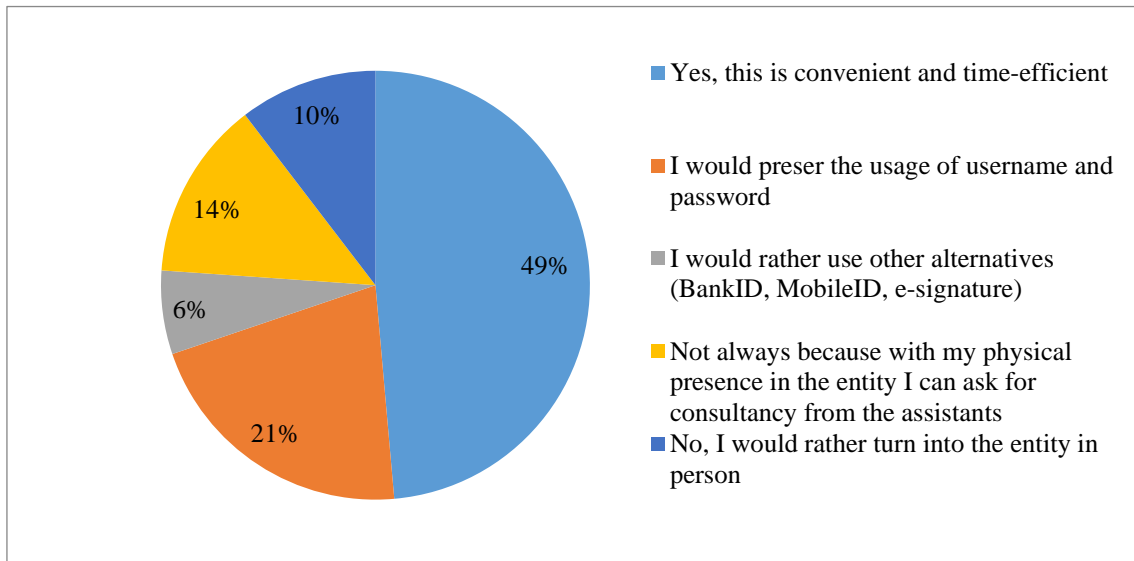


Figure 11. Answers to Q13.

**Q14.** Would you use public e-services online in your everyday life excluding the need to visit governmental offices in most cases?

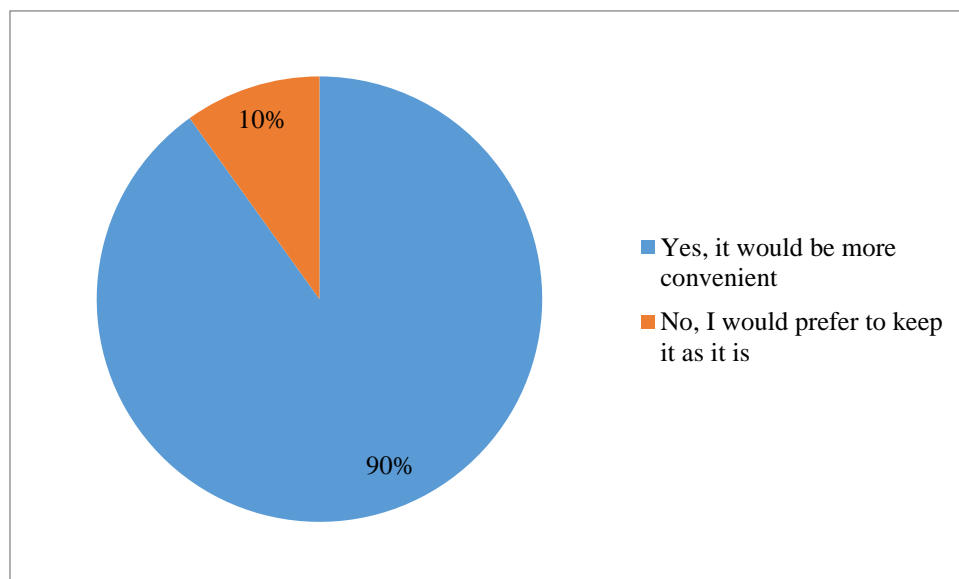


Figure 12. Answers to Q14.

**Q15.** If you like, below you can leave your comment or feedback about e-services in Ukraine of related topic.

Електронні послуги в Україні ще на низькому рівні
Оформление ЕЦП очень длительный процесс, который занимает много времени. Не все гос учреждения читают такую подпись и не многие берутся рассматривать подписанные таким образом документы.
Сервіс igov часто допомагає економити час.
Наразі в нас недостатній рівень обслуговування (то система підвисає, а подекуди взагалі відсутня потрібна техніка для считування інформації з тих самих ID карток).
Я користуюся лише системою послуг оплати через Приват24. Зручно.
Все безопасно, быстро и удобно!
Нормальних державних ел.послуг в Україні наразі нема!
Нажаль використання електронних послуг в Україні ще тільки починає розвиватися, але на мою думку Державі треба взяти за основу найбільший інноваційний банк України Приват Банк. По суті це єдина фінансова, яка надає можливість використання електронних послуг своїм клієнтам не виходячи з дому. Таким чином якщо об'єднати найбільшу базу клієнтів банку які будуть мати ID- картки і використовувати її як спосіб авторизації на усіх державних порталах для доступу до інформації, то це дасть великий поштовх до реалізації електронного документообігу в державі.
В Україні надзвичайно низький рівень використання простими людьми інтернету та електронних засобів комунікації!
Хороша ідея, але недовіра державі переважає.
Україна страшенно бюрократична країна. Тут без папірців неможливо нічого зробити. Електронні черги та інші послуги наче існують, але по факту зареєструвавшись чи подавши запит онлайн, все-рівно потрібно продублювати те саме на папірці і бодай би відправити його поштою туди ж, а ще краще особисто прийти на прийом і посидіти в живій черзі :( Але, як сказав класик: "Длубайте сю скалу...", тож вірю, що нехай і не відразу, але ми все ж зможемо жити без черг і гір макулатури!
За для розширення функціоналу ID карти, держава повинна нести реальну відповідальність за захист інформації та нести покарання в разі не виконання умов; постійно вдосконалювати засоби безпеки; цілодобова служба підтримки та керування документом через веб-додаток.
Я НЕ ВЕРЮ НАШЕМУ ГОСУДАРСТВУ! Я гораздо быстрее буду пользоваться элетронными услугами частных компаний!
Використовував портал igov.org.ua для оформлення допомоги при народженні дитини, це було у січні 2017 року, але все одно треба було їхати ставити підпис до органів срцзахичту. Читав, що на теперішній час цю послугу можна оформити не виходячи з дому
На мій погляд було б зручніше без черг в держ. установах з економією свого часу.

Figure 13. Answers to Q15.

## Appendix 3 – Service delivery process with Lviv Citizen Card

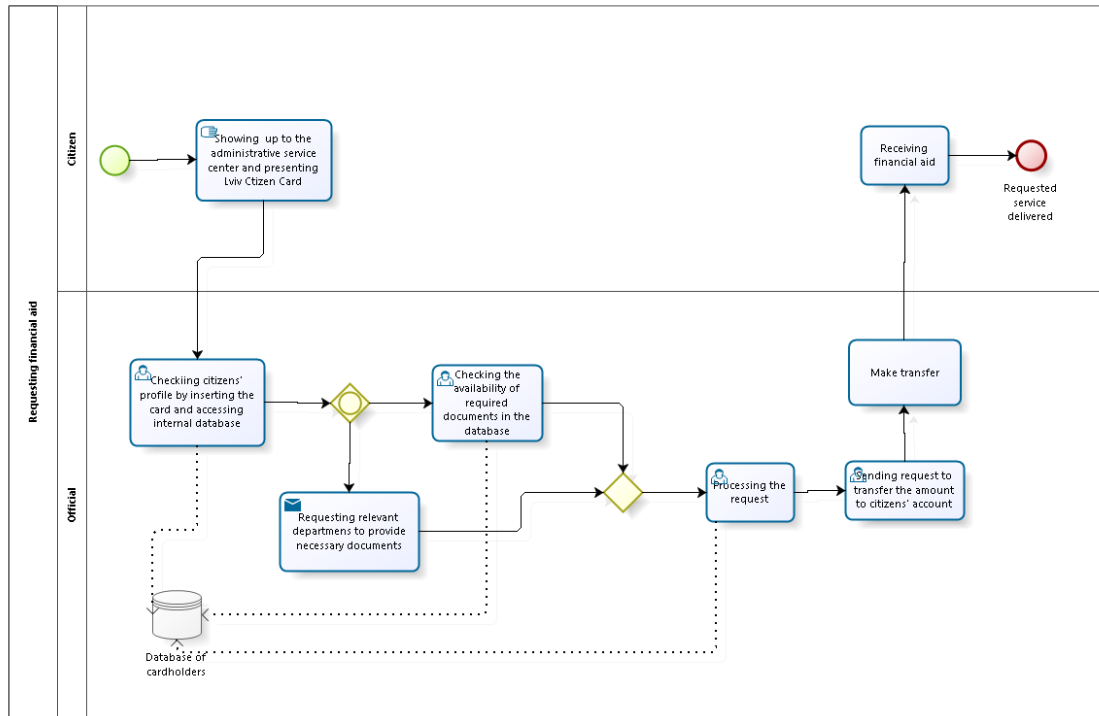


Figure 14. Process of financial aid request.