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OPEN GOVERNMENT DATA
APPLICATION POSSIBILITIES IN
ESTONIAN NUTRITION SECTOR

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Ready for defence

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"We have lots of information technology. We just don't have any information."

Unknown Author



SUMMARY

The aim of the current piece is to investigate Open Government Data application possibilities by the example of Estonian nutrition sector.

The piece goes through defining various data types and analyzing Open Government Data situation in different countries. By comparing the recent developments, it finds Estonia's lag on Open Government Data developments compared to many other countries. By investigating more thoroughly current situation in Estonian e-service developments in healthcare, it presents the lack of success in dealing with innovation in a public sector organization. Based on existing e-services, examples are presented to illustrate the benefits and advantages of using Open Government Data in nutrition sector. By conducting a research in Estonian nutrition sector, the piece finds that awareness-level and usage of public sector e-services among people interested in healthy nutrition is low.

Based on empirical internet-based research, information gathered visiting public sector events and questionnaire conducted in Estonian nutrition sector, the piece suggests that there should be a clear strategy towards Open Government Data by finding resources to establish stable version of Open Government Data Portal, giving a strong political signal towards Open Government Data and using the support of Estonian Open Data Community to facilitating events where the creation of pilot e-services using Open Government Data would be addressed.

To summarize, it was found that Open Government Data can facilitate the creation of efficient e-services in nutrition sector because it enables new private sector organizations to enter with low cost, releasing Open Government Data makes the data more visible for possible e-service developers so there would be more e-services created, private sector nutrition solutions are better-known and people generally interested in healthy nutrition are interested in using new e-services.



TABLE OF CONTENTS

| | |
|--|-----------|
| SUMMARY..... | 3 |
| CHAPTER 1 INTRODUCTION..... | 6 |
| CHAPTER 2 METHODOLOGY..... | 10 |
| 2.1 The selection of quantitative approach..... | 10 |
| 2.2 Selection of population..... | 11 |
| 2.3 Preparation for collecting data..... | 12 |
| 2.4 Research design..... | 13 |
| CHAPTER 3 THE NATURE AND AVAILABILITY OF DATA..... | 15 |
| 3.1 Definitions and Literature Overview..... | 15 |
| 3.1.1 Big Data, Open Data and Open Government Data..... | 15 |
| 3.1.2 Why Open Government Data?..... | 18 |
| 3.1.3 Barriers of Open Government Data..... | 20 |
| 3.1.4 How to open Open Government Data..... | 22 |
| 3.2 Current Open Government Data situation..... | 23 |
| 3.2.1 Open Government Data developments in USA..... | 23 |
| 3.2.2 Open Government Data developments in Europe..... | 24 |
| 3.2.3 Open Government Data developments in Estonia..... | 27 |
| 3.3 Estonian Open Government Data comparison to other states..... | 29 |
| CHAPTER 4 HEALTHCARE E-SERVICES IN ESTONIA..... | 33 |
| 4.1 e-Estonia..... | 33 |
| 4.1.1 Efficiency of the public e-services in Estonia..... | 34 |
| 4.1.2 Interoperability..... | 34 |
| 4.2 eHealth situation in Estonia..... | 36 |
| 4.2.1 Organizational Change..... | 38 |
| 4.2.2 IT development..... | 39 |
| 4.2.3 Interoperability..... | 42 |
| 4.3 Examples of OGD impact in nutrition sector..... | 43 |
| 4.4 Estonian nutrition e-service NutriData..... | 46 |
| 4.4.1 Functionality..... | 46 |
| 4.4.2 Terms of Use..... | 47 |



4.4.3 Database..... 47

4.4.4 User support 47

CHAPTER 5 RESULTS AND RECOMMENDATIONS..... 48

5.1 Results 48

5.1.1 Background information of the sample..... 48

5.1.2 Information availability, sources being used, the usage of e-services..... 49

5.1.3 Awareness and usage level of current e-services. 53

5.1.4 Specific questions regarding NutriData 54

5.2 Conclusions and recommendations 56

5.3 Summary 58

CHAPTER 6 CONCLUSION..... 60

BIBLIOGRAPHY..... 62

LIST OF ILLUSTRATIONS..... 65

APPENDICES 66

Appendix A – Questionnaire..... 66

Appendix B – USDA Database..... 71

Appendix C – SuperTracker..... 72

Appendix D – EatThisMuch 73

Appendix E – Nutritionix..... 74

Appendix F – Foodily..... 75

Appendix G – Yummly..... 76

Appendix H – NutriData..... 77

SUMMARY IN ESTONIAN..... 78



Chapter 1

INTRODUCTION

The chapter introduces the context of current piece first by introducing general situation of overweight and obesity in the world and how this is related to new technologies and Open Government Data.

We live in a world where less people are expected to do more work with higher efficiency. Because of growing population and lack of natural resources, our food is produced via methods like genetic engineering thus especially in the recent decades people have developed illnesses and allergies that are directly or indirectly related to what they eat. The ever-changing environment and lack of time dealing with changes leaves us less time for taking care of ourselves. Less time equals less knowledge and education about things that matter the most e.g. what is right and wrong in proper nutrition. Such developments have resulted increasing the number of population becoming overweight and obese¹.

Obesity is one of the greatest modern public health challenges. Its volume has tripled in many countries since 1980, and the numbers of those affected continue to rise at an alarming rate. Overweight and obesity are major risk factors for a number of chronic diseases like: diabetes, cardiovascular diseases and cancer. Once considered a problem only in high income countries, overweight and obesity are now also dramatically on the rise in low- and middle-income countries.

Based on research made by USA Centers for Disease Control and Prevention in 2014 a dramatic increase of obesity started from 1990 and in 2012 more than one-third of USA adults were obese and the number is still increasing. In UK, Health and Social Care Information Centre found in 2014 that 24% of men and 25% of women are classified as obese, and 42% of men and 32% of women are overweight. Although the proportion of overweight people has remained broadly the

¹ Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health (www.who.int)



same over the last two decades, the proportion of obese people has nearly doubled. Europe's average obesity level is lower, however for example in Estonia 54% of men are overweight (National Institute for Health Development 2012). Based on some recently made forecasts 75% of British men will be overweight or obese by 2030.

Many governments have and are continuously trying to release programs to reduce the problem of obesity with no success. For example, Centers for Disease Control and Prevention 2014 found that in 2009 no state in the USA met the nation's "Healthy People 2010" goal to lower obesity prevalence to 15%. Denmark tried to reduce overweight by establishing additional taxation on fat which resulted the government saying: "The measure was costly and failed to change Danes' eating habits" (Aljazeera 2012).

At the same time the world is continuously utilizing the use of information and communication technologies (ICTs) by delivering services electronically to increasing amount of people which, in turn enables people to be more efficient at work or at home. This is mostly due to increasing possibilities to have the right data or information at the right time to make better decisions and take timely actions. One recent discovery and new technology enabler for improving peoples' lives is data. A McKinsey study in 2013 valued Big Data on health in the USA at 300 to 450 billion dollars. While some of that data is private, much is potentially Open Government Data. Such data as drug effectiveness and side effects, and other aspects of healthcare and public health present possibilities beyond imagination. For example a US-based company called iTriage² has developed a website and smartphone application based on Open Data and Open Government Data to log symptoms, get quick advice on the kind of care you need, get a list of nearby facilities that can help and book an appointment.

Although there is common agreement in the USA and the EU that Big Data and Open Data are both becoming increasingly important as business resources, it is not clear how much they will be worth. The task of determining the value of Open Government Data is extremely difficult because many businesses that are using Open Data are relatively new and it is too early to evaluate their success. There have been some attempts to grasp and measure the impact of Open Government Data, but more often than not, finding an appropriate measuring stick to certain data initiatives meant having to deal with very challenging questions.

² iTriage: www.itriagehealth.com



It is interesting to note that the motivations underlying the steps towards Open Government Data have been different in different countries. With the example of Finland, where many projects have been initiated for private organizations to create public services, the question of releasing Open Government Data is to some extent the question whether the public sector should create e-services or leave it for others. Since the topic of Open Government Data is still relatively new and in many areas the evidence and effects take time, the time when the current piece was written there was no literature about whether governments should release data or be in charge of developing new e-services. “While the value generated by Open Government Data has been widely discussed by public bodies and other stakeholders, little attention has been paid to this phenomenon in the academic literature” (Jetzek, Avital and Bjørn-Andersen 2013). “While there has been a proliferation of open data portals and data re-using tools and applications of tremendous speed in the last decade, research and understanding about the impact of opening up public sector information and open government data Open Government Data has been lacking behind” (Granickas 2013).

The authors’ interest in the topic of Open Government Data is initiated due to Estonia’s lag in publishing government data for public use compared to other EU countries. The interest leads to a research area – whether Estonian private sector e-services are more efficient compared to public sector and if Open Government Data could be the driver for more efficient e-services resulting in better use of government data.

The aim of the current piece is to investigate Open Government Data application possibilities by the example of Estonian nutrition sector. Initial elaboration on the topic of Open Government Data and its relation to e-service developments in healthcare is expected to provide general understanding of current Estonian public sector e-service situation and direction. By conducting the research in nutrition sector, the situation can be verified and research area investigated on very specific sample. Later it is hoped to draw more general conclusions for further Open Government Data developments in Estonia.

To achieve that aim, the following research question is raised:

How can Open Government Data facilitate creating efficient e-services in Estonian nutrition sector?

Efficiency in the context of the piece at hand will be measured by the level of awareness and usage of e-services. In order to answer the research question the following hypotheses are raised:



1. Opening government nutrition data will create more e-services;
2. People interested in healthy nutrition are not well-informed about Estonian public sector e-services;
3. People interested in healthy nutrition are open to use new e-services.

The piece initially defines various data types, analyses the Open Government Data situation in different countries and compares their recent developments (Chapter 3). Secondly, in Chapter 4 current situation in Estonian healthcare developments regarding e-services are elaborated by taking into account the complexity of dealing with innovation in a public sector organization. The chapter also presents examples how Open Government Data can facilitate innovative e-service developments in nutrition sector and presents an Estonian public sector nutrition e-service that is built on public sector information. Chapter 5 presents results of a quantitative research targeted towards e-services in Estonian nutrition sector and analyzes the situation in regards awareness-level about public sector e-services. Finally, Chapter 6 presents the conclusions.

To initiate the research, first the reasoning behind selecting a specific research method, procedure picking a sample from a population and overview of research design is presented in the following chapter.



Chapter 2

METHODOLOGY

The purpose of this chapter is to present the methodology used to answer the research questions and hypothesis stated in Chapter 1. The overall approach of the piece will be clarified. In addition, how the selection of population was made and based on which intentions questions were formed, are discussed.

For answering the research question, the following actions will be taken: in order to prove the first hypothesis, an empirical internet-based research will be made to find working solutions that use OGD in nutrition sector. The second and third hypothesis will be answered with a quantitative questionnaire.

2.1 The selection of quantitative approach

Traditionally, it has been accepted that qualitative data collection is linked to more subjectivist positions whereas quantitative data collection more linked to objectivism. Morgan and Smircich (1980) argue that viewing different positions as a continuum results in a situation where qualitative as well as quantitative approaches can be adopted by scientists. "Qualitative research stands for an approach rather than a particular set of techniques, and its appropriateness – like that of quantitative research – is contingent on the nature of the phenomena to be studied" (Morgan and Smircich 1980, 491-55). In regards to the current piece, it is assessed that a quantitative approach of data collection is the most appropriate. As the scope of the piece is directly targeted to validating the current situation of e-services in healthy nutrition, the resources spent for getting sufficient number of samples via qualitative research is assessed too comprehensive of a task. Before the quantitative data collection empirical data is necessary to identify current situation and problems.

Thus, it is evaluated that the current situation in the field of Open Governance Data in public sector is best captured and assessed through internet-based data collection and visiting public



sector events connected with e-Governance such as: Public Sector Open Data Day (March 28th, 2014), Nordic Digital Agenda Day (March 25th, 2014) and Overview of the Current Situation of Linked Data in Estonia (May 16th, 2014). The public sector events provide the latest body of knowledge as background information to assess current developments in the area of Open Government Data in addition to internet research. The empirical data collection will provide a sound preparation for formulating quantitative research. Thus the questions will be formulated according to latest body of knowledge. The main challenge in quantitative research is to get representative number of responses from the right type of target-group.

2.2 Selection of population

To initiate a quantitative research, first a selection of population is required. A population is a group of individuals who have the same characteristic (Creswell 2005, 141). In order to get the sufficient number of answers from the right type of population for a questionnaire a list of prerequisites was formed. Population prerequisites was chosen to be the following:

1. The person has to use internet;
2. The person has to speak Estonian;
3. The person has to have interest against healthy nutrition.

The reason why the person had to use internet is because all available Estonian e-services focused on healthy nutrition require internet. The reason why the person had to be Estonian was because it would reduce the risk of getting answers from foreigners that might not be aware different Estonian nutrition e-services. The reasoning behind the previous claim is verified via research made in the different nutrition Estonian e-services which unfortunately do not have multilingual support (e.g. Estonian public sector nutrition e-service is only in Estonian). The third precondition was chosen to ensure the fact that the person would be likely to use the existing e-services.

To perform the questionnaire within the range of the three prerequisites, Facebook was chosen as a channel in finding the right population. Initially a Facebook Community Group called “Toiduguru” was created in November 2013. By choosing Facebook as a channel the first prerequisite was already achieved. Next the name and the language of the community was intentionally selected to be Estonian to ensure the second prerequisite. To gather followers interested in healthy nutrition, the following description was selected: “Toiduguru is a social network focused on healthy nutrition that helps people of different nutrition habits to have proper

nutrition and eat healthy food”³. In the following months the user-base was raised via posting tips and photos about healthy nutrition.

By the time the questionnaire was posted to the community in 9th of May, the group had raised 5458 followers. To ensure that there would be representative amount of responses a call was made, while posting the questionnaire, to help creating a new e-service by answering the questionnaire. Such actions ensured the total amount of 115 responses from people that met the exact prerequisites. For the purposes of evaluating the current situation of e-services in Estonian nutrition sector the selection was considered reasonable.

The following section specifies how the base components of the questionnaire were selected.

2.3 Preparation for collecting data

Based on the research question and hypothesis raised, the questionnaire (Appendix A) was designed in four parts: General background information; Overall questions regarding information availability; Awareness- and usage-level of currently available e-services; and Specific questions regarding NutriData⁴. The reasoning behind selecting such categories and questions into each group is discussed in the following:

1. General background information regarding the respondents in terms of gender, age and time period having interest in healthy nutrition. The reason why it was necessary to ask questions in this group was to have general background knowledge about the population, not specific to the research. General background information was formed by the general categories used in EUROSTAT statistics database⁵ so that later, if the necessity would appear, it would be possible to compare the statistics to e.g. Estonia’s or Europe’s general usage of the internet.
2. Overall questions regarding information availability, sources being used and the usage of e-services. The intent asking questions in this category was to have a broad conception of which type sources people use the most e.g. to validate if internet-based channels are the favorite. In addition, the question “which e-service are you mostly using” had the intent to ensure that the selection of e-services made for following questions was of proper

³ Toiduguru on tervisliku toitumise sotsiaalvõrgustik, mis aitab erinevate toitumisharjumistega inimestel õigesti toituda ja tervislikult süüa.

⁴ Estonian Nutrition e-service NutriData: tap.nutridata.ee

⁵ EUROSTAT: epp.eurostat.ec.europa.eu

proportion. The results of the second category was expected to provide answer for third hypothesis.

3. Awareness- and usage-level of currently available e-services. Here the intent was to find out which existing e-services are known to the widest majority. Also to find out whether public e-services are more popular than private. The choice of e-services was selected into the questionnaire based on internet research. There were multiple e-services intentionally left out from questionnaire. For example Facebook was considered too broad. In addition, the National Nutrition Website⁶ was considered not suitable as a subject that another e-service could replace. Rather, the choice of public e-services was made selecting by the active campaign banners on the National Nutrition Website: Fiidi karu⁷, Lihtne viis⁸, Sööme ära⁹, Fiidi mesilast¹⁰. NutriData was selected as the main subject of the questionnaire because it is the only e-service provided by Estonian public sector where the users can follow their eating habits to have balanced nutrition. The private sector e-services were selected based on research made on Google and social media.
4. Specific questions regarding NutriData. Asking question regarding NutriData was expected to give feedback on what people like and do not like about the e-service. E.g. the reasons for not using it. The intention of the last two categories of questions was asked to provide answer to the second hypothesis.

2.4 Research design

The aim of the current piece is to investigate Open Government Data application possibilities in Estonian nutrition sector. To achieve that aim the Estonian nutrition sector is addressed. The approach towards conducting the research is illustrated through the following model (Illustration 1 Page 14).

⁶ National Nutrition Website: www.toitumine.ee

⁷ Fiidi karu: www.toitumine.ee/kampaania/fiidikaru

⁸ Lihtne viis: www.toitumine.ee/kampaania/kergemviis

⁹ Sööme ära: www.toitumine.ee/kampaania/soomeara

¹⁰ Fiidi mesilast: www.toitumine.ee/kampaania/fiidimesilast

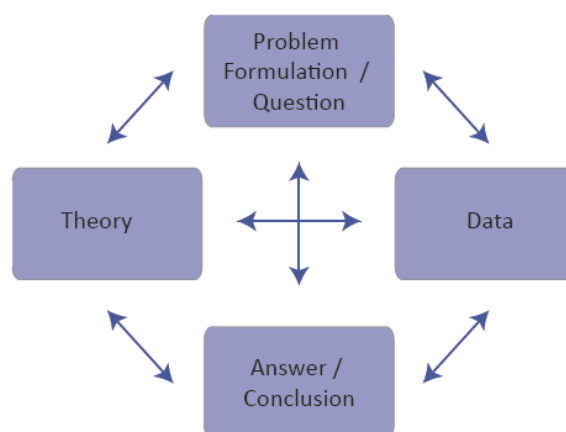


Illustration 1 - The Work Process Model

The process of conducting the research can be broken down into the stages defined in the model. As seen, the model contains relationships between stages: Problem Formulation, Data, Theory and Answer/Conclusion. Initially a research questions and hypothesis were formulated. The following step was to define the concepts by using relevant theory. After the definitions were established, empirical internet-based data collection had the purpose to identify historical developments and current situation regarding Open Government Data in different countries including Estonia. The next step was to focus on eHealth and e-services in Estonia. Latest research by well-known public and private organizations was used. In addition, some theory from the field of change management and IT development was necessary to explain the situation regarding public sector e-service development. Next, some e-services related to Open Government Data in nutrition sector were researched with the intention to prove the first hypothesis. Based on the former, the following step was to conduct a survey for quantitative data collection. After the respondents' data was collected, the results were analyzed with such tools as SPSS¹¹ and MS Excel to prove the second and third hypothesis and in the Chapter 6 answering the research question.

To initiate the research, first understanding of the terminology and current situation on Open Government Data Developments is required. Thus, in the following chapter data types and Open Government Data developments in different countries are discussed with finally providing a set of comparisons in the developments of these countries.

¹¹ SPSS: Statistical Package for the Social Sciences (IBM SPSS Statistics software)

Chapter 3

THE NATURE AND AVAILABILITY OF DATA

The chapter goes through defining terminology related to Open Government Data. Further, it introduces the latest developments in Open Government Data around the world by including overview of developments in USA, United Kingdom, Denmark, Finland and Estonia. Finally, Estonia's developments in OGD are compared against other countries. Although Estonia is known as a successful IT country (it has succeeded in implementing the infrastructural e-services such as X-road, ID-card authentication, e-tax declaration, implementing paperless electronic document systems etc.) many surveys show that it lags in Open Government Data.

3.1 Definitions and Literature Overview

In the information age our lives depend on data and information. Based on UK's Open Government Data Portal, data is a value or set of values representing a specific concept or concepts. Data become "information" when analyzed and possibly combined with other data in order to extract meaning and to provide context. The meaning of data can vary depending on its context. Data is distinguished from the more general "information" because it can be stored, represented, and analyzed by computers in quantitative ways. Text in documents is often referred to as "unstructured" data to contrast it to the organized data found in computer databases.

3.1.1 Big Data, Open Data and Open Government Data

There are two general types of data: Big Data and Open Data. "Big data" refers to datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze (Manyika, et al. 2011). Such definition is intentionally subjective and incorporates a moving definition of how big a dataset needs to be in order to be considered big data. Open Data can be described in more specific terms. The concept of "Open Data" describes data that is freely available and can be used as well as republished by everyone without restrictions from copyright or patents (Braunschweig, et al. 2013).



Generally Big Data and Open Data can originate from private sector, public sector or other source. Open Data related to government is known by the term Open Government Data. This definition however is not conclusive and will be elaborated in the following section.

Public sector collects a lot of data in the fields of meteorological data, geographical data, business registries and others. Public sector information (PSI) is universally defined as “information, including information products and services, generated, created, collected, processed, preserved, maintained, disseminated, or funded by or for the government or public institution” (OECD 2008). It is important to notice that PSI can be, but is not always Open Data, because it may be linked to private information or may not be for free or licensed for re-use. For doing so, the government needs move towards “openness”.

In the past decade there has been a shift from a commitment prevalently focusing on Open Government’s goals of higher transparency and public accountability to an increasing pledge to Open Government Data with an agenda strongly driven also by innovation, efficiency and flexibility in government. (Robinson and Yu 2012)

The term Open Government Data (OGD) is broadly used to separate PSI from governments’ Open Data. There is no precise definition for OGD since “the term “Open Government Data” might refer to data that makes the government as a whole more open (that is, more publicly accountable), or instead might refer to politically neutral public sector disclosures that are easy to reuse, even if they have nothing to do with public accountability” (Robinson and Yu 2012). Joel Gurin in his book *Open Data Now* (2014) defines Open Government by the following characteristics: 1. government releasing data about its own operations (transparency); 2. government being open to input from citizens (participation); 3. government engaging citizens in finding solutions to problems, for example through hackathons and other challenges (collaboration); and 4. government releasing data that it collects on issues of public interest, such as health, environment, and different industries. The fact is that OGD is often used as a resource for the public benefit. The following illustration makes a clear distinction between OGD, PSI and Big Data (Illustration 2 Page 17).



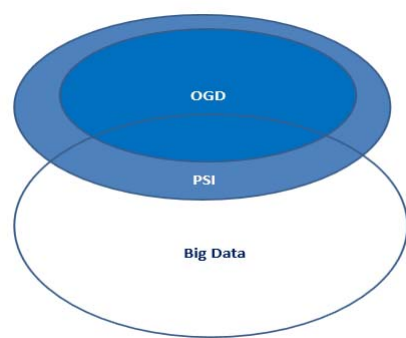


Illustration 2 - Related Definitions of Government Data (Ubaldi 2013)

It can be discussed, if the previous illustration is relevant for all countries, because not all countries' PSI fit into the definition of Big Data. For example Estonian government data, because of the country's smallness in population, might not consist of Big Data. The purpose of the following illustration is to clarify the distinction between Open Data, Big Data and Open Government (Illustration 3).

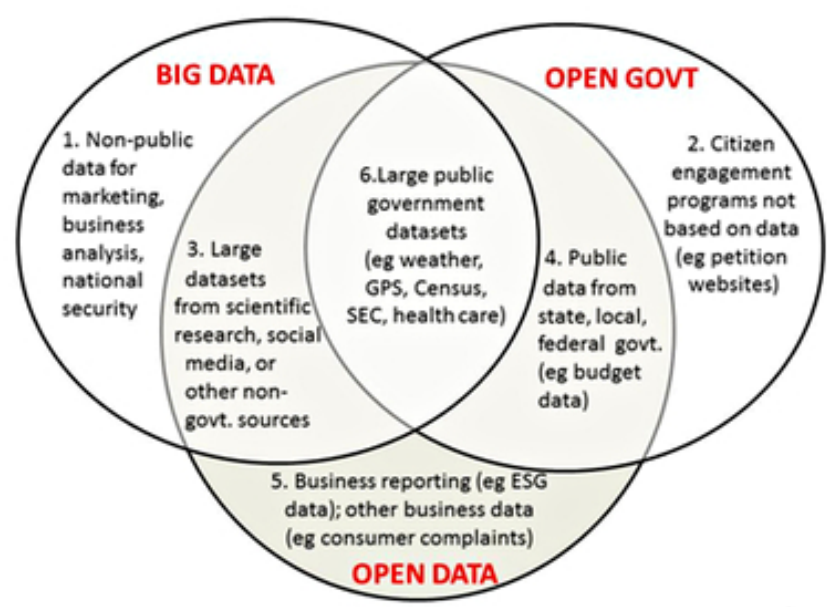


Illustration 3 - Data Categories (Gurin 2014)

Section one illustrates Big Data sets that are not open to the public, which can be data collected by private organizations or public for understanding customers' behavior better or for sustaining national security. Section two includes the part of Open Government work that focuses purely on citizen engagement while not having the main focus on publishing Open Data. Section three illustrates that Open Data does not necessarily have to originate from government – a lot of private organizations make big datasets available. Section four brings forward the understanding that Open Data does not have to be Big Data to have a positive impact: “Data from local governments,



for example, can help citizens participate in local budgeting, choose healthcare, analyze the quality of local services, or build apps that help people navigate public transport” (Gurin 2014). Section five includes private sector data that is not big and does not originate from the government. Section six illustrates the fact when the government turns Big Data into Open Data. The current piece focusses on OGD in the sections four and six. Estonian datasets are not as large as the Big Data thus most of the potential Estonian OGD falls into section four.

Illustration 3 leaves out data that may be connected with an individual, i.e. civilian whose data is part of all data, Big Data, Open Data and OGD (Illustration 4). An example of OGD overlapping individual’s data (“My Data”) could be Government spending where one can compare taxes paid via its salary to see where the money is spent by the government.

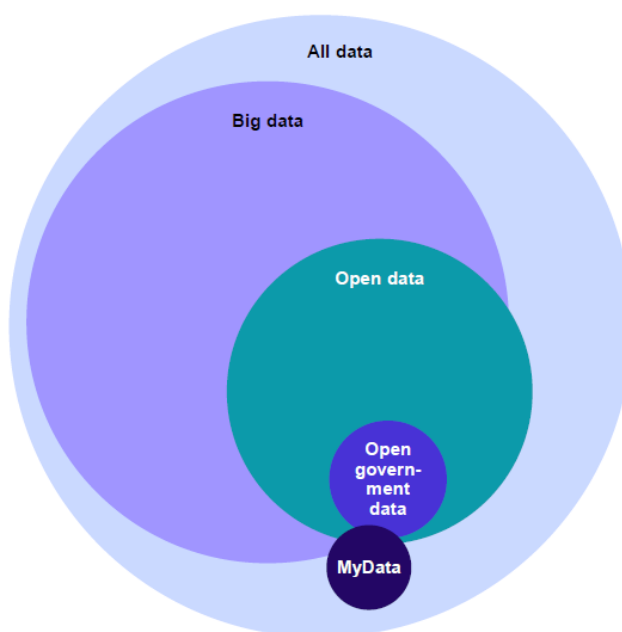


Illustration 4 - How Open Data relates to other types of data (Ubaldi 2013)

3.1.2 Why Open Government Data?

Governments collect a broad range of different types of data in order to perform tasks. The data being collected is significant because of the quantity and centrality of the data. Additionally, most of that government data is public data by law, and therefore could be made open and made available for others to use – especially because the taxpayers have paid for it.

There are eight broadly accepted principles that apply to OGD that also determine the possible benefits for its users (Public.Resource.Org 2007):



1. Complete - All OGD is made available.
2. Primary - OGD is as collected at the source, with the highest possible level of granularity, not in aggregate or modified forms.
3. Timely - OGD is made available as quickly as necessary to preserve the value of the data.
4. Accessible - OGD is available to the widest range of users for the widest range of purposes.
5. Machine processable - OGD is reasonably structured to allow automated processing.
6. Non-discriminatory - OGD is available to anyone, with no requirement of registration.
7. Non-proprietary - OGD is available in a format over which no entity has exclusive control.
8. License-free - OGD is not subject to any copyright, patent, trademark or trade secret regulation. Reasonable privacy, security and privilege restrictions may be allowed.

The European Commission (2013) states four main reasons why it supports OGD:

1. Public data has significant potential for re-use in new products and services;
2. Addressing societal challenges – having more data openly available will help us discover new and innovative solutions;
3. Achieving efficiency gains through sharing data inside and between public administrations;
4. Fostering participation of citizens in political and social life and increasing transparency of government.

There is lots of literature available about the usefulness of OGD. To date, governments, civil society organizations and private sector representatives, consider OGD as a building block for Open Government, as they see it as a key enabler of improved service delivery, transparency and public engagement and, as a result of better relations between governments and citizens (Ubaldi 2013). Most authors seem to agree, that “Open Data, especially OGD, is a tremendous resource that is as yet largely untapped” (Open Knowledge Foundation 2012). OGD is of interest in increasing amount of countries because there are many areas where it can be expected to be of value and more importantly, many great examples already exist. Hence various sources claim that there are many different groups and organizations who benefit from the availability of Open Data, including government itself.

According to a recent report, Open Data can generate more than \$3 trillion a year in additional value in key sectors of the global economy, including education, health, transportation, and electricity (The McKinsey Global Institute 2013). This, however does not validate the reasoning

why all countries should focus on OGD and this is not only because the benefit is not easy to capture by e.g. small countries, but also because there are many barriers related to releasing OGD.

3.1.3 Barriers of Open Government Data

For many countries there are many obstacles that are holding back the release of OGD. This includes two categories: legal and technical. In legal terms an individual, organization or another public institution must be allowed to get the data legally, to build on it, and to share it. Legal openness is provided by applying an appropriate (open) license which allows for free access to and reuse of the data, or by placing data into the public domain which is basically a task of governments’ policy makers. In terms of technical barriers, opening government data has five stars from simple release of data to complex Linked Data. “The term Linked Data refers to a set of best practices for publishing and connecting structured data on the Web” (Bizer, Heath and Berners-Lee n.d.). The five stars are well explained by Sir Tim Berners-Lee (2009):

| Nr of stars | Description | Example format |
|-------------|--|--|
| ★ | Available on the web, but with an open license, to be Open Data. | Image, scanned document, audio file |
| ★★ | Available as machine-readable structured data. | MS Excel table |
| ★★★ | As (2) plus non-proprietary format. | CSV ¹² |
| ★★★★ | All the above plus open standards from W3C ¹³ to identify and link to other data. | RDF ¹⁴ , SPARQL ¹⁵ |
| ★★★★★ | All the above, plus link data to data provide context. | Linked RDF |

Table 1 - Five starts of Linked Data

Today, most of the internet consists of documents and files that are not or are of very poor machine-readability, which is data with one or two stars. The term machine-readability is important for processing and re-using data that is produced by some organization or individual. For example formats like MS Excel and CSV are already good enough for re-using the data in another e-service. Such formats however are not enough for linking data to another dataset with

¹² CSV: Comma-separated values
¹³ W3C: World Wide Web Consortium www.w3c.org
¹⁴ RDF: Resource Description Framework
¹⁵ SPARQL: SPARQL Protocol and RDF Query Language



the purpose to increase the usefulness and semantics of overall data. Thus the data is not sufficiently expressive to enable individual entities described in a particular document to be connected to related entities. Four and five star “Linked Data uses RDF to make typed statements that link arbitrary things in the world. The result, which we will refer to as the Web of Data, may more accurately be described as a web of things in the world, described by data on the Web” (Bizer, Heath and Berners-Lee n.d.). An illustration of such inter-related datasets is presented as follows (Illustration 5).

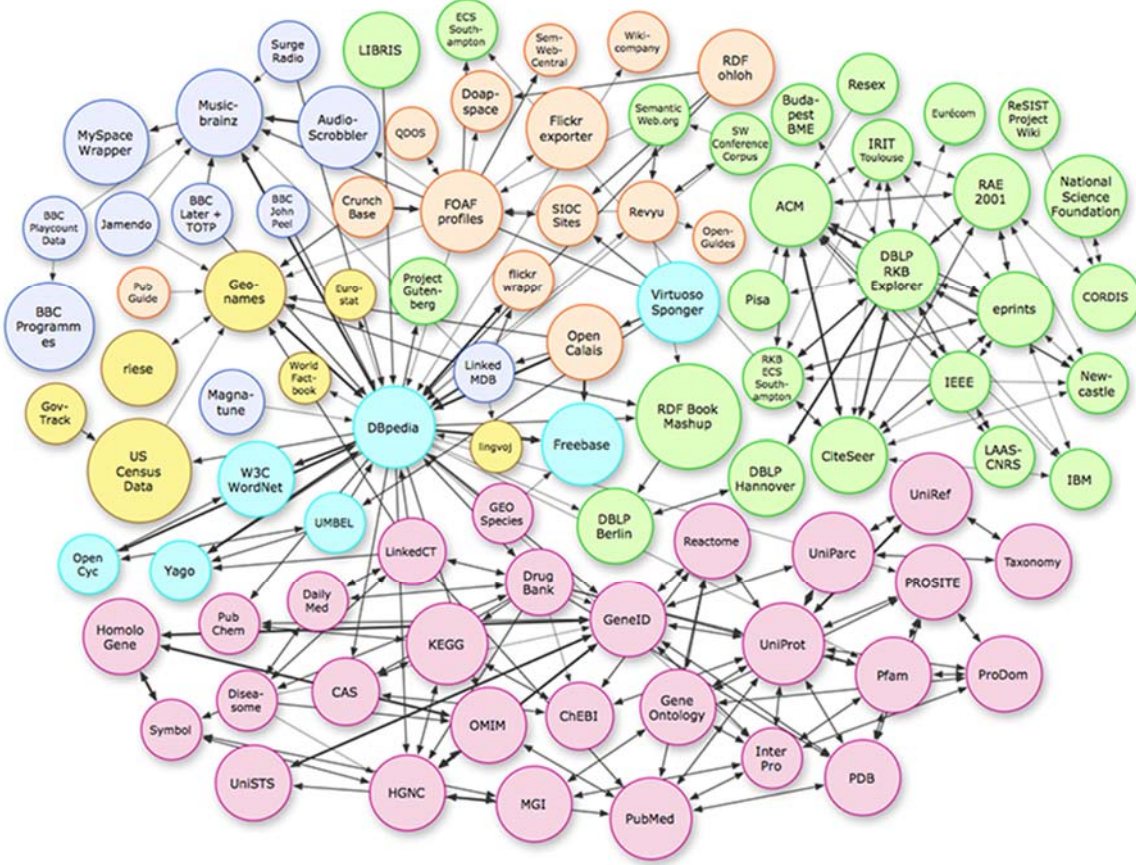


Illustration 5 - Linking Open Data (Bizer, Heath and Berners-Lee n.d., 5)

In terms of OGD, Linked Data means linking datasets in different government institutions to achieve interoperability between e-services in public and private sector. The topic of interoperability in public sector will be discussed in Chapter 4.

The topic of Linked Data illustrates well the fact that in order to move towards OGD, the first step for government institutions is to publish the existing data into the web under Open Data licence so that everyone else could use it. Open Data licence should contain the eight OGD principles. Every



government institution can decide to publish its data to the public. It is however a task of state's government to motivate the institutions for doing it.

Jetzek, Avital and Bjørn-Andersen (2013) have determined the following factors that tend to restrain the developments in OGD:

1. Closed or inaccessible datasets;
2. Lack of comprehensive data policies;
3. Lack of validity, completeness and exhaustiveness of datasets;
4. Insufficient metadata, as well as lack of technical and semantic interoperability;
5. Lack of consistency in cross-border access regimes;
6. Lack of motivation within the public sector;
7. Lack of technical skills within the public sector;
8. Lack of data literacy and technical ability;
9. Too fragmented and disparate open data community.

Currently for example in Estonia there still are many datasets closed in the sense that they are either not for free, they are protected by intellectual property rights for restricted re-use or they are simply not available for the public because the data is not made available.

3.1.4 How to open Open Government Data

As difficult as it might seem, opening data is not that complex. Open Knowledge Foundation (2012) suggests the following:

1. Keep it simple. There is no need to open everything at once. Starting out by opening up just one dataset is fine, even a part of a dataset is OK. Here it is important to note that data of any type of Linked Data (one to five star) will do.
2. Engage early and engage often. Engage with actual and potential users and re-users of the data as early and as often as you can, be they citizens, businesses or developers.
3. Address common fears and misunderstandings. When opening up data you will encounter plenty of questions and fears. It is important to identify the most important ones and address them at as early a stage as possible.

Additionally, there are four main steps to making data open: 1. choosing datasets 2. applying open license 3. making data available and 4. making it discoverable. The step three may in the most simplest case be about generating an Excel, CSV or text file from a specific dataset. In more

advanced cases it can be an API¹⁶ that would simplify data-exchange interaction between an e-service and database. Step four includes putting the data on a website for others to download. The dataset can also be posted to some central data repository i.e. Open Data portal.

So opening data is not a complicated task and is usually within the hands of every public sector organization. In the following the development of OGD is presented.

3.2 Current Open Government Data situation

There are worldwide organizations such as Open Knowledge Organization to guide developments on OGD: “Over the past decade, the Open Knowledge Foundation has been the leading organization to pioneer OGD around the world.” (Open Knowledge n.d.). The organization has connected individuals and governments to enhance in government data release and reuse. It is basically a collaboration platform where individuals from different governments meet and make contributions to legal and technical advancements. Open Knowledge Organization has influenced governments including US, UK, France, Finland, and Brazil to reshape their policies. In order to overcome the problem of publishing data under Open Data policy, there are two basic options offered by Advisory Council for Open Data Commons¹⁷:

1. Public Domain Dedication and License - Puts all the material in the “Public Domain”;
2. Open Database License - Like the GPL¹⁸ requires public re-users of the data to share back changes (and attribute).

Advisory Council for Open Data Commons was created in February of 2009 as the body formally responsible for maintaining and developing the licenses and associated to Open Data. Its basic goal is to take forward the “Open Data Commons” work for the general benefit of the Open Knowledge Community.

Different countries have taken various steps to increase the amount of OGD accessible to the public. One of the frontiers in that field is the government of the USA.

3.2.1 Open Government Data developments in USA

In January 2009 Barack Obama released memorandum “Transparency and Open Government” which would imply more openness in the USA government. The memorandum can be summarized in three points: government should be transparent, government should be

¹⁶ API - application programming interface

¹⁷ Advisory for Open Data Commons: www.opendatacommons.org

¹⁸ GPL – General Public Licence

participatory and government should be collaborative (Obama, The White House 2009). As a result a “Memorandum for the Heads of Executive Departments and Agencies” was issued on December 8, 2009 establishing deadlines for action and covering the following steps to be taken: 1. publish government information online, 2. improve the quality of government information, 3. create and institutionalize a culture of Open Government, 4. create an enabling policy framework for Open Government (Orszag 2009). In addition another important document was released in May 9, 2013: "Executive Order - Making Open and Machine Readable the New Default for Government Information". Openness in government strengthens our democracy, promotes the delivery of efficient and effective services to the public, and contributes to economic growth (Obama, The White House 2013). Among other directions, the order consisted of a task to publish Open Data Policy “to advance the management of Government information as an asset, consistent with my memorandum of January 21, 2009”.

An example of the advancements in the field on OGD is a Data.gov website, launched by the Obama administration in May 2009. Tremendous amounts of government datasets open and available for anyone for free are published in the site and the numbers are increasing continuously. In May 2014 the amount of datasets available was 104,779. These developments have resulted creation of new businesses and innovative e-services. Some example of e-services in USA nutrition sector will be provided in Chapter 4 .

Similar OGD developments have also started in Europe.

3.2.2 Open Government Data developments in Europe

The initial movements related towards OGD can be considered from the release of European Directive 2003/98/EC. The directive focuses on the re-use of public sector information, otherwise known as the PSI Directive. It encourages EU member states to make as much public sector information available for re-use as possible and focuses on the economic aspects of re-use of information rather than on the access of citizens to information. The directive addresses material held by public sector bodies in the member states, at national, regional and local levels, such as ministries, state agencies, municipalities and also organizations funded by public authorities. The directive covers written texts, databases, audio files and film fragments; it does not apply to the educational, scientific, broadcasting and cultural sectors. The ePSIplatform¹⁹ was set up as a result of this directive. In June 2013, a revision of the Directive (2013/37/EL) was adopted by the

¹⁹ European one-stop shop for Public Service Information re-use: www.epsiplatform.eu

European Union legislator. Member states was given 2 years to transpose the provisions of the revised Directive into national law by January 2015. The proposal for a revision of the Directive proposed to further open up the market for services based on public-sector information:

1. Including new bodies in the scope of application of the Directive such as libraries (including university libraries), museums and archives;
2. Limiting the fees that can be charged by the public authorities at the marginal costs as a rule;
3. Introducing independent oversight over re-use rules in the Member States;
4. Making machine-readable formats for information held by public authorities the norm;

Previous to the creation the directive 2003/98/EC the area of publishing public sector information was left to member states to regulate.

To facilitate OGD, the European Union has released Open Data Portal²⁰, which is the single point of access to a growing range of data from the institutions and other bodies of the European Union. By providing easy and free access to data, the portal aims to promote the opening data of institutions and other bodies of the EU. A number of countries have also created portals on public data. Additionally, in 2013-2020, the European Union supports the Open Data initiatives in all Europe with SMART 2012/0107. The services to be provided are:

1. Data preparation, transformation and publication services
2. Training services in the area of Open Data in particular to favor the uptake of Linked Open Data technologies by public bodies within the European Union
3. IT advisory and consultancy services in the area of Open Data, and in particular on Linked Open Data technologies.

(European Commission n.d.)

Making the PSI data available is strongly influenced and restricted by another European directive – Data Protection Directive, also known as Directive 95/46/EC. It covers the protection of individuals with regard to the processing of personal data and the free movement of such data. Thereby, if a database consists of personal data or data related to an individual, it is the risk of data publisher when publishing the data, to be convicted of an offence against data privacy. Another similar restrictive directive is Copyright Directive (Directive 2001/29/EC) that restricts

²⁰ EU Open Data Portal: open-data.europa.eu



making information and other types of produced outputs safeguarded and can be used against making data available for others.

Nevertheless many European countries have been successful in OGD movement. United Kingdom being the best example.

3.2.2.1 United Kingdom

In December 2009, the United Kingdom government published the report “Putting the Frontline First: Smarter Government”. The report conducted an action plan and concluded that government has to radically open up data: “Having demonstrated the value of government action, our task now is to develop government to work in partnership with individuals and communities to deliver the services people want in the way they want them, and to preserve them in the face of all the challenges this new era presents” (Chief Secretary to the Treasury 2009). Another political milestone towards United Kingdom’s OGD was by the Prime Minister David Cameron: “This is a complete revolution in transparency – and it's going to have a profound impact” (Cameron 2011). With the intentions to make United Kingdom more competitive and transparent, an institute called The Open Data Institute (ODI) was founded in 2012 with the initial investment plan £10 million over 5 years from United Kingdom’s government (The Open Data Institute 2012). The ODI is an independent organization founded by Professor Sir Tim Berners-Lee with the aim to be “catalyzing the evolution of open data culture to create economic, environmental, and social value” (The Open Data Institute n.d.).

The best Open Data portal in Europe is United Kingdom’s Open Data Portal²¹. Publicly launched in January 2010, it contains more than 9,000 data sets.

3.2.2.2 Denmark

Danish Open Data initiative started in 2009 when Data Catalog²² was launched. 2010 was the year of economic potential studies, publication of technical and legal guidelines, and introduction of the open data license. In 2011, Denmark deepened the economic studies on specific industries and the initiative became part of the e-Government strategy. After that the Open Data initiative became part of Denmark’s Open Government Partnership. A community of about 100 members, from different professional backgrounds, came together and started meeting on a regular basis.

In October 2012, Denmark’s Minister of Finance announced: “Out with costly parallel registration by public authorities. And in with growth, innovation and jobs. These are the consequences of an

²¹ UK’s Open Data Portal: data.gov.uk

²² Danish Open Data Catalog: www.digitaliser.dk

agreement between Local Government Denmark and the Danish government to improve and link public registers of basic data and to make data available to the private sector” (Denmark Ministry of Finance 2012). In that time the basic data included private addresses, companies' business registration numbers, or the cadastral numbers of real properties providing new opportunities for innovation and growth, for example in the real estate sector, insurance sector and in the telecommunications sector. Smaller companies would also be able to test new ideas without first having to invest huge sums in the data required to create their product. “When the data has been released it can be used to develop completely new types of digital products, solutions, and services, which will benefit our companies as well as society at large. It is a vital part of Denmark's digital raw material that we are now releasing, which will create growth and jobs in Denmark.” (Denmark Ministry of Finance 2012)

3.2.2.3 Finland

Helsinki, Finland is probably the best example of OGD. Helsinki Region Infoshare²³ publishes all of its data in formats that make it easy for software developers, researchers, journalists and others to analyze. In four years of operation, the project has produced more than 1,000 “machine-readable” data sources such as a map of traffic noise levels, real-time locations of snow plows, and a database of corporate taxes. In 2013 Finland gained EU reward in “Citizens” category for being the most innovative “Metropolitan area in Finland – releasing open data to involve citizens in decision-making” (European Commission 2013). Surprisingly, Finland is using OGD to create better public services e.g. Datademo²⁴ is trying to get developers to aim their creative energies toward general goals city leaders think are important.

3.2.3 Open Government Data developments in Estonia

In terms of OGD in Estonia, the most influential legislation document is The Public Information Act, established since November 2000. It aims to ensure the access to information intended for use by the general public, based on democratic and social rule of law and open society, and to create opportunities for the public to monitor performance of public duties. The Act provides rules for:

1. Access to public sector information with conditions, procedures and methods, and ground rules for refusal of access;
2. Limited access to public information for the part that are not regulated by other acts;

²³ Helsinki Region Infoshare: www.hri.fi

²⁴ Datademo: www.datademo.fi

3. The establishment and management of databases and monitoring inventory management;
4. Supervision over the access to information on the organization of state.

The Act does not apply to:

1. State secret or classified foreign information subject to declassification of such information;
2. Access for records in the National Archives and archives in local municipalities excluding providing the rules for access;
3. The letter of formal notice and explanation of the request response in accordance with law memorandums and requests for explanations if responding requires the information captured in the analysis and synthesis or the collection of further information and documentation;
4. Restrictions on access to information, access to specific conditions, procedures, and methods of access if they have specific legislation or an international agreement regulates otherwise.

The application of Public Information Act is supervised by Estonian Data Protection Inspectorate. Additionally, the inspectorate supervises that the Personal Data Protection Act and the Electronic Communications Act are complied.

These regulations have required the state institutions to publish data that is within the area where The Public Information Act regulates. The reality has proven to be much worse. One of the problems underlying the fact why the public sector information is not open and accessible is that there is no direct supervisor. The Estonian Data Protection Inspectorate is mostly concerned with checking the violations on Personal Data Protection Act and to some extent focused on checking if the public sector institutions have on their website a link that says “Electronic Document Register”, but do not however audit the content availability and technical formats. One proof about the reality of OGD current situation was a Garage48 hackaton in February 2011 that focused on public services. Many new e-services were left unbuilt because the public information was simply not available for free. This event caused huge media coverage and a question was raised if Estonia really is an “e-Estonia”.

The Estonian development in Open Data community goes as far as 2010 when the first Open Data roundtable was held (Open Data Estonia 2011). Since then an agreement was established to produce Conception of Estonian Open Data re-use by the Ministry of Economic Affairs and Communications. The ministry has initiated creation of the Open Data Green Book and until today there is no official document. Meanwhile the European Union directive 2013/37/EL make

Estonian governmental institutions to improve the quality of availability of PSI. By 2015 Estonian public institutions have to enable the PSI in machine-readable form.

Estonia has since early 2000's been successful in implementing electronic records management systems (ERMS) and published public information through these systems into multiple web environments. The European Union Directive 2013/37/EL has influenced Estonia to improve the quality of PSI. The directive will require public institutions to release the part of PSI that is required by law in machine readable formats.

There are some examples of Open Government Data manufacturers in Estonia whose portals are dispersed around different websites:

- The Land Board Geoportal²⁵
- Environment Information Centre²⁶
- Statistical Office²⁷
- National Digital Library national publications DIGAR²⁸

Estonia has established Open Data portal²⁹, which however was not reachable throughout writing the piece at hand. By the example of other researched countries, the portal is a key for making PSI available and to ensure visibility of the data. Such portal would give a quick overview of available data to generate ideas for innovative e-services. The fact that Estonia has once released such portal still shows that some movements have started towards OGD, which is a positive indication.

3.3 Estonian Open Government Data comparison to other states

In 2012, Capgemini Consulting conducted an analysis of 23 select countries across the world, which by that time had initiated Open Data programs, and rated them on a set of parameters. The benchmarking was conducted in three categories:

1. Data Availability – breadth and granularity of data, latest refreshed data, ease of re-use;
2. Political Leadership – government initiative and support;

²⁵ The Land Board Geoportal: geoportaal.maaamet.ee

²⁶ Environment Information Centre: www.keskkonnainfo.ee

²⁷ Statistical Office: pub.stat.ee/px-web.2001/dialog/statfile2.asp

²⁸ National Digital Library national publications DIGAR: digar.nlib.ee

²⁹ Estonia's Open Data portal: opendata.riik.ee

3. Data Portal Usability – user interface, search functionalities and participation from user community.

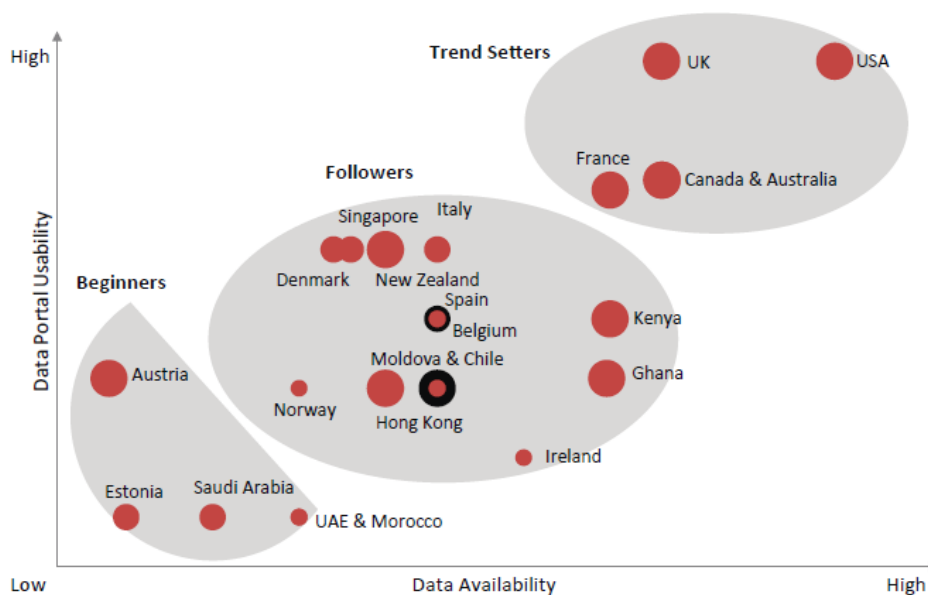


Illustration 6 - Open Data Benchmarking (Capgemini Consulting 2012)

Based on the survey (Illustration 6), Estonia fell into the category named “The Beginners”. Countries falling in the “Beginners”, category were countries that are still in the initial stages of their Open Data journey. Data portals in such countries are characterized by the lack of good quality, updated data. They also have a complete absence of community participation on their respective portals. The Open Data portals of these countries are rudimentary, with limited functionalities, making it difficult to search and utilize the data that they have opened up. All of the five countries in this category completely overlook the importance of releasing high value datasets with none of them sharing datasets for geospatial, meteorological and environmental information. Besides Estonia, around 22% of the researched countries ended up in this category.

Another benchmarking is provided Open Data Barometer³⁰ which is prepared by the ODI and the World Wide Web Foundation³¹. The Barometer ranks the UK as the most advanced country for Open Data readiness, implementation and impact, scoring above the USA (2nd), Sweden (3rd), New Zealand (4th), Denmark and Norway (joint 5th). Among 77 countries researched, Estonia was ranked in a relatively high position - 14th.

³⁰ www.opendataresearch.org

³¹ www.webfoundation.org



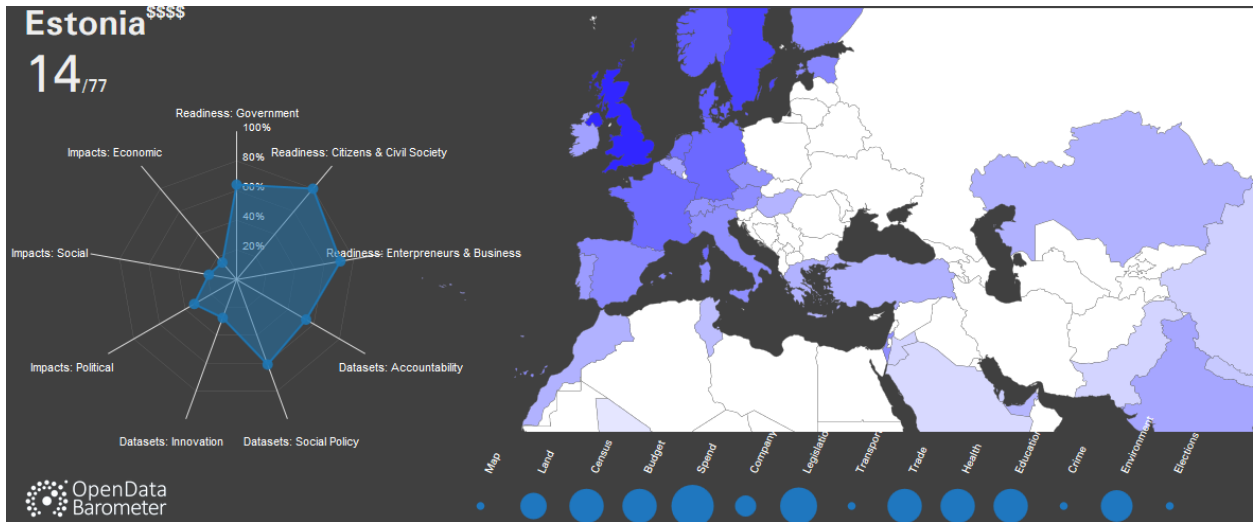


Illustration 7 - Estonian ranking in Open Data Barometer (Web Foundation 2013)

The ePSIplatform, which is perhaps the most reliable source to measure the re-use of OGD in European countries. The PSI Scoreboard is a crowdsourced tool to measure the status of Open Data and PSI re-use throughout the EU. Although it does not monitor government policies, it aims to assess the overall PSI re-use situation. This includes the Open Data community's activities. The Illustration 8 was generated in 11th of May 2014.

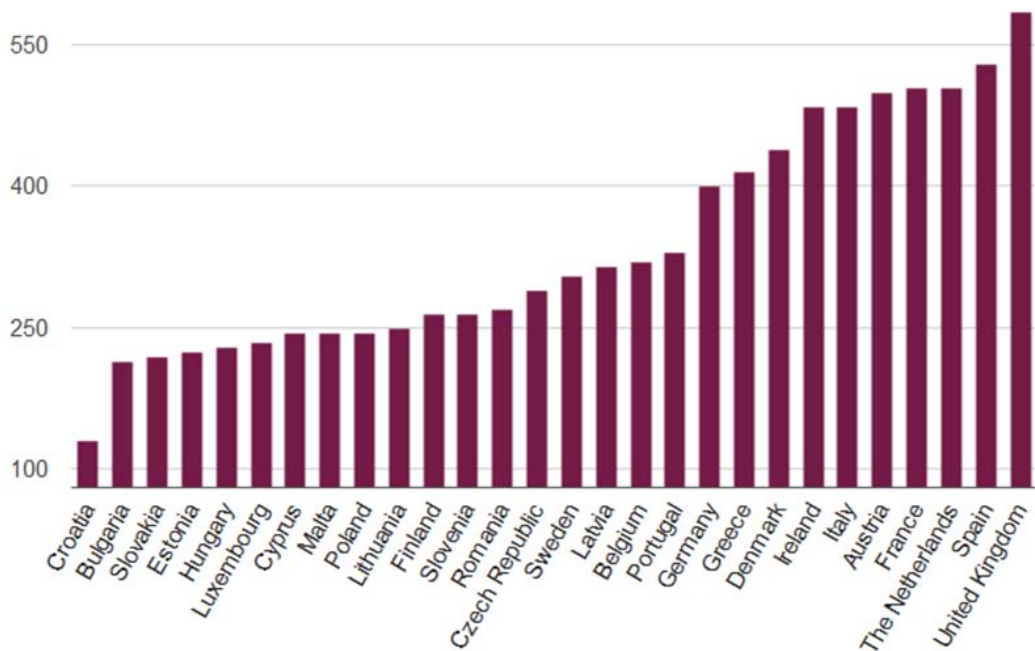


Illustration 8 - PSI Overall Score in Europe (European Public Sector Information Platform 2014)

The ePSIplatform’s score for Estonia is 225 which positions Estonia to 4 of the least developed countries in terms of OGD.



Even though the concept of Open Data has been around for more than a decade, the formerly presented researches show that the developments in Estonia have been slow. Behind the slowness there can be many reasons, one of the generally used being “Estonian government institutions have adopted the attitude of providing all the services by themselves, thus eliminating the need for opening up data for others to build applications on it” (Open Data Estonia n.d.). Has the passive attitude been effective or is the Estonian top-down e-service development misleading us on the way to create better, effective e-services? To answer this question first a broader understanding about current situation in building of health related e-services is required. Thus, in the following chapter, problems concerned with IT developments and public e-services will be researched to clarify the situation regarding the existing e-services.



Chapter 4

HEALTHCARE E-SERVICES IN ESTONIA

The chapter provides overview of healthcare situation in Estonia from the perspective of current state of e-services, difficulties related to the development and implementation. To provide the general picture, the efficiency of e-services and their developments in the field of achieving interoperability is discussed. Secondly, current situation of e-service developments in Estonian healthcare sector is discussed to illustrate why eHealth in Estonia has been in a slow development and costly. To show the benefits that OGD can provide, some examples of nutrition e-services using OGD are presented before analysis of Estonian public sector nutrition e-service is presented.

4.1 e-Estonia

The success of Estonia as a successful ICT country is known all around the world. It has succeeded in implementing the infrastructural e-services such as X-road, ID-card authentication. Moreover there are many e-services, like e-tax declaration, implementing paperless electronic document systems and e-voting that related to reducing the state's bureaucracy. In that sense Estonia has become the role-model and consultancy agent for many countries still in the initial steps of e-Governance. It is however not exactly clear how many e-services Estonia has developed. Estonian State Portal³² lists about 500 e-services in three categories: a citizen, an entrepreneur and an official. Some e-services are intelligibly not listed because they might be connected to a specific municipality. Interestingly, in the portal there are no links to e-services related to healthy nutrition. Overall, such a huge amount of e-services raises a point of concern in the usefulness of all of these e-services. There haven't been many researches regarding the general awareness, adoption rate and satisfaction towards the existing e-services in Estonia.

³² Eesti Riigiportaal: www.eesti.ee

4.1.1 Efficiency of the public e-services in Estonia

Based on a research by AS Emor (2012) the total use of Estonian e-services is a major cause of dissatisfaction because service use was considered too complicated and too much time consuming. In the following, some conclusions made in the report are presented:

General findings:

- E-Services, which had the highest in satisfaction level were in the field of social and health sectors – Applying for European Health Insurance Card and of Digital Prescription;
- People that were not satisfied with the existing e-services expected the simplification of the use of e-services: the majority of the respondents considered service use to be too complicated and too much time consuming. The second concern was poor user support and guidance;
- General awareness of the various state and local municipalities on the availability of e-services was low: less than a third of respondents thought oneself as well informed about the various e-services available. Thus, indicating a need of various e-services for the wider introduction.
- Overall satisfaction with public sector e-services had been shrunk: When the 2010th year of the overall assessment of the matter in accordance with 75% satisfied with the services of internet users, the 2012th year of 67%. Nevertheless, the overwhelming majority agreed that e-services offered by the state and local municipalities' had spared their time and money and allow greater access to information. Satisfaction was related to the people who considered themselves aware of various public sector e-services and use the state portal.

The general conclusion here is that the state has developed e-services which might not have reached its target group – the citizens. The state should invest into the awareness creation and into providing support and guidance. These questions lead to a more general question of how well the state is in implementing e-services.

4.1.2 Interoperability

Open Government Data is closely related to Linked Data (discussed in Chapter 3). In Estonian state level there is currently ongoing project about interoperability of Estonian state information systems. The basic concept is presented with Illustration 9 (page 35).



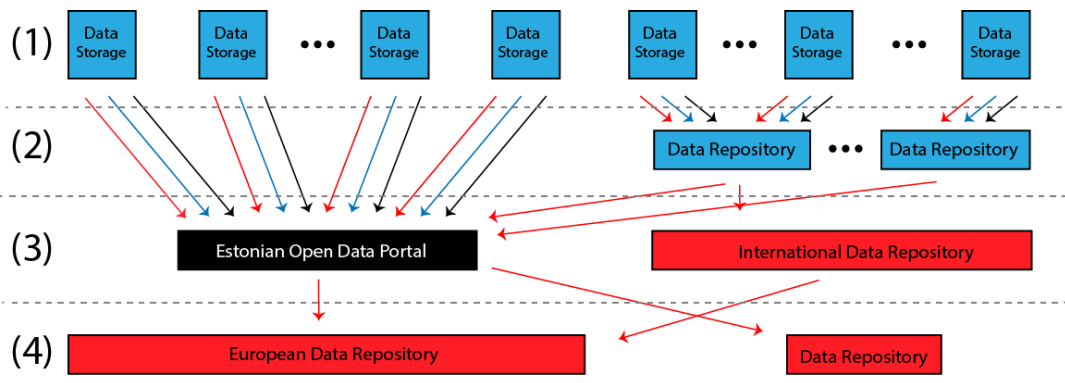


Illustration 9 – Conceptual interoperability between systems (Valner 2014)

Based on the concept, the public sector institutions are each maintaining their own data repositories (level one). Data repositories are usually databases that contain different datasets. Many institutions have multiple databases and datasets within the organization’s infrastructure. The public organizations will have mandatory data to be shared to other data repositories, such as data repositories for a specific sector (level two), (e.g. healthcare would have separate data repository) or National Open Data Portal on level three. The data repositories consisting of data from some type of public sector data can be shared further to international data repository or National Open Data Portal on level three. Datasets in National or international data repositories can be shared further to European data repositories or some additional locations on level four. The Illustration 9 contains arrows in three types: red, blue and black. Red represents data that is mandatory to share based on legislation, specified by government or e.g. EU. Black is data that can be shared at free will and blue is data that is shared at free will together with data specifications (RDF) for taking benefit of Linked Data.

Today, the creation of e-service that combines data from multiple sources, is difficult because the databases of public institutions (level 1) are in isolation. Usually there is only one or two e-services built behind a specific database. Sharing data into data repositories will enable downloading the data from sources of multiple datasets (levels 2, 3 and 4). On the other hand, if an e-service developer wants to use multiple datasets in combination, it can become challenging task because the datasets are not linked to each other. In Illustration 9 the type of data that is released without Metadata is illustrated with black arrows. This is where RDF is needed, to link different types of datasets released from different data storages.

Today, Estonian state is mostly interested in accelerating the data sharing illustrated with red arrows – to achieve interoperability between data storages that are the core of most e-services. For example these are data about addresses of companies – currently maintained separately by each



public organization. Thus, achieving interoperability between datasets could reduce cost in the longer run and increase efficiency in public and private sector. For example interoperability between systems in healthcare can dramatically improve how patient information is handled, combining data from different sources, making test results rapidly available online and giving doctors quick access to critical information. A doctor could suggest a meal receipt together with amount of calories for obese child's mother to implement a supportive diet. The nutrition data could be used simultaneously in many other (private and public) e-services in addition to the Patient Portal. The prospect of access to such information will increase awareness of health and does in fact offer opportunities for people to take greater control of their health risks and to decrease their healthcare costs.

The concept of interoperability is a complex on-going project that has been lasting for many years and it is a part of EU Interoperability Strategy (European Commission 2010). The task of achieving multiple-stars Linked Data compatibility requires first standardization of data in a globally accepted format that could be linked to many other international datasets. The goal is time-consuming and challenging because it requires 1. international collaboration on EU-level, 2. a lot of financial and human resources in every public institution and 3. cross public sector collaboration identifying the datasets that could be linked and 4. working together achieving the goals.

Today, compared to other countries, Estonia already has released many public sector e-services, which means that data is already in some digital format. Thus releasing OGD should be a task of identifying the PSI that could be published as OGD and making data available. In that sense, many countries have been much more successful.

4.2 eHealth situation in Estonia

Much of the healthcare developments are related to the Estonian National Health Plan "The National Health Plan 2009-2020" (Estonian Ministry of Social Affairs 2008).

The Estonian National Health Plan is designed to ensure that the people of Estonia live longer, happier, healthier lives. This is something that can only be achieved if everyone works together: not just the people who live in the country, but also the state, local governments and the private and third sectors. (Ministry of Social Affairs 2014)



The overall objective of the Estonian National Health Plan is healthy life expectancy by decreasing premature mortality and illness rates. This is an important reference document for health promotion work across Estonia. The plan outlines five thematic areas:

1. Social cohesion and equal opportunities;
2. Children healthy and secure development;
3. Health supportive environment;
4. Promoting a healthy lifestyle;
5. Ensuring the sustainability of the health system.

The aging population and the rising expectations of the population will increase the demand for healthcare services. While at the same time number of working age people is in the decreasing, the health financing becomes more complex. This puts pressure on the financial sustainability of the overall system and health care quality. One option is to focus on better ICT implementation. Since our society is moving towards service-orientation, a lot of resources has been invested into eHealth (E-tervis³³). At the center of E-health are e-services which are defined in the current piece as follows:

E-services are all kinds of services and activities that are value-adding by nature and reside in electronic environment. E-services can be of very different types: one-time data services, long-term process-handling services, services for e-democracy (voting, election). In most cases, the e-service requires internet. E-service providers can be companies, organizations or individuals.

European Commission (European Commission n.d.) characterizes eHealth as follows:

1. eHealth includes tools and services, which are used in association with ICT, which can improve prevention, diagnosis, treatment, monitoring and management;
2. eHealth is beneficial to the whole society, improving availability and quality of healthcare, and making the quality of healthcare services more effective;
3. eHealth includes information and data sharing between patients and health service providers, hospitals, health professionals and health information networks; electronic health records; telemedicine services; portable patient-monitoring devices, operating room

³³ Estonian eHealth Foundation: www.e-tervis.ee



scheduling software, robotized surgery and blue-sky research on the virtual physiological human.

A more comprehensive and systematic introduction of eHealth solutions helps to make the healthcare system more efficient, improve the efficiency of prevention through the public health, raising awareness of the patient and also helps to reduce costs of resources used. eHealth solutions will help to save patient's time. (Estonian State Control 2014)

Goals of the European Commission (European Commission n.d.):

- To improve citizens' health by making life-saving information available – between countries when necessary – using eHealth tools;
- To increase healthcare quality and access by making eHealth part of health policy and coordinating EU countries' political, financial and technical strategies;
- To make eHealth tools more effective, user-friendly and widely accepted by involving professionals and patients in strategy, design and implementation.

The objective of the eHealth related e-services is to innovate the existing services, increase the transparency, quality of care, and provide an opportunity to analyze existing processes and make better investments in healthcare. Innovation is a major task in terms of organizational change, especially in large organizations. In the following the topic is elaborated.

4.2.1 Organizational Change

While innovation is typically perceived as a single point event, it is a process. In terms of developing new systems, the end-goal should never be development of the new solution alone. The time consuming IT development process requires both the existence of the prerequisites as well as the ongoing operation and adaptability. For example, an innovative organization unable to adapt to technological changes in the environment, may stagnate obliviously. The successful implementation of new technology requires a willingness to implement changes at any level. This is a precondition to ensure the continuation of innovation.

Public sector IT projects are always of political type. To improve the existing system setup, it is usually never so much a question of technology as it is “soft” part because there are many decision-makers and other affected interrelated stakeholders (Illustration 10, Page 39).



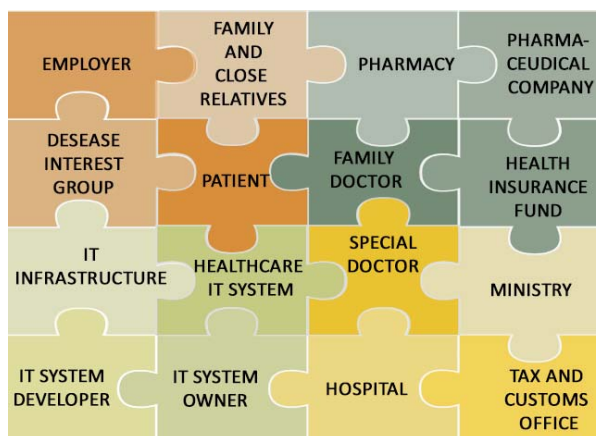


Illustration 10 – The interrelated stakeholders in medical sector (Estonian Development Fund 2011)

Developing a new solution involves thereby a task of organizational change where the success relates to existing coalitions, culture (values, behavior, trust), the extent of resistance etc. Hence, the IT system developer is faced with complex challenges faced by one of the signs of existing large bureaucratic organization - the desire to maintain the *status quo*. Besides, meeting the demands of one group of stakeholder does not create value for other parties. The habit of using one system results in the resistance against using others.

For example, there is the Estonian healthcare system as a result of the development of early stimulation of a large number of incompatible IT solutions. Placing further investments to an increasingly fragmented systems increases costs and postpones the achievement of an efficiently functioning system. Inversely, the possibilities of investing into new technology, the successful introduction of the healthcare system as favorably as possible guarantees sustainability and competitiveness. Both are essential for organizations operating in the environment of transformation and flux.

eHealth development has taken 15 million euros, instead of the initially planned 2.8 million euros (Estonian State Control 2014). The problems encountered in the development and implementation of eHealth. Thus in the following the subject of IT development will be discussed.

4.2.2 IT development

E-health project in Estonia involves four main projects: Electronic Health Record, Digital Image, Digital Registration and Digital Prescription. The three first are developed by the Estonian eHealth Foundation³⁴, a digital recipe created Estonian Health Insurance Fund³⁵. Some examples of IT

³⁴ Eesti E-tervise Sihtasutus: www.e-tervis.ee

³⁵ Eesti Haigekassa: www.haigekassa.ee



development outcomes in Estonian healthcare are presented based on National Audit Office of Estonia (2014) in the following:

1. The National Audit Office is of the opinion that the Electronic Health Record has not taken off as planned, because not all data are entered in the system, although this has been required by law since 2008;
2. Digital Registration, which was completed in 2008, has never started to work. There is still no central system for making an appointment with a doctor in which a patient can pick a suitable time to see any doctor at any hospital;
3. Digital Image is still not a database in which all medical images are stored;
4. The National Audit Office is of the opinion that there is no way to know how long it will take to complete the pending projects.

In fact, Digital Prescription has been the only e-service of the four main e-health projects that has been launched in full. It was developed by the Estonian Health Insurance Fund. The project had become successful since the fund had been interested in its implementation. In addition to the main eHealth projects, a number of other services have been developed, e.g. E-Consultation, Statistics Module and E-Ambulance. Electronic Health Record and other E-health applications would help save time of doctors, nurses and patients. Additionally it would save the health insurance money, since all the data is in one place and there is no need to make additional visits or surveys. One way to use ICT in healthcare is telemedicine, which means simplified health services from a distance. E-health is seen as one way of improving the performance of the healthcare services to support the basic goals.

According to the report of the Development Fund (2011) the prerequisites to support innovation in the healthcare system are:

1. Understanding the development of information technology;
2. Systematic action to identify new opportunities;
3. The efficiency of the IT application (usefulness) characterizing the presence of metrics.

The difficulties in healthcare sector IT development is caused by many factors that characterizes the universal flaws of public sector as a client. In fact there is fundamental difference in IT development projects in public versus private sector. While public sector in Estonia is mostly buying the IT developments from private sector organizations, the problem lies in the fundamental



level. Illustration 11 presents the usual phases which normally every project in public sector goes through incrementally. What usually happens is that public organizations take a lot of time to prepare for the IT developments in phase one and two. Typically the outcome from these phases are large documents containing specific needs for the external IT development company. What happens next is that the development company might take years to build the system according to the public sector requirements without specifying or confirming any further details. Since the phase three takes long time, the requirements of the system are likely to change. Finally, when the system is ready to be tested it might not be anything that the public sector organization had in mind. This is where usually a lot of tax-payers money is wasted.

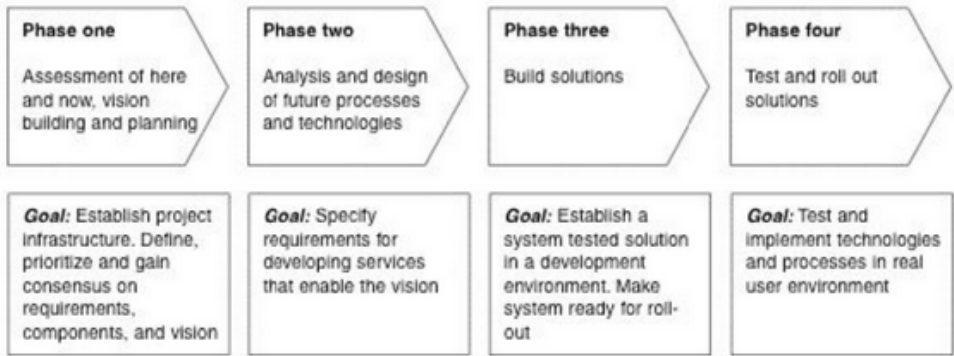


Illustration 11 - Typical IT roll-out process (Cameron and Green 2004)

In contrast to public sector IT projects, the private sector and especially new startups are constantly gaining feedback from the environment. By this the private sector manages to keep their development costs down and make changes as soon as market indicates the necessity. The activity of constant learning is known as Build-Measure-Learn Feedback Loop by Eric Ries (Illustration 12).

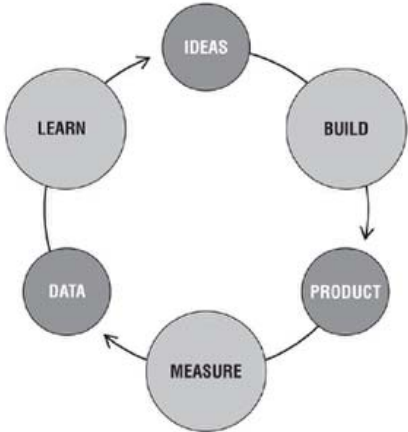


Illustration 12 – Build-Measure-Learn Feedback Loop (Ries 2011)



Eric Ries (2011), the author of Lean Startup, suggests to build products by constantly verifying the reaction of the potential users. The process is continuous and frequent thereby eliminating waste of too many resources and the chance of successful end result is higher.

Additionally, in the case of private sector e-service development, there are less stakeholders involved compared to the public sector e-service development. The private sector, when developing an e-service only has to deal with what the market wants whereas in the case of public sector being the client the situation is slightly different. In the initial phases of planning and analyzing the public sector (as a client) generates tasks for the private sector organization. The private sector only has to follow the requirements of the client and not worry if these are what the organization (and other users related) actually want.

It is here time to conclude that the reasons why the medical sector e-services have not properly been launched may be because the rules that define the success of an e-service in a marketplace are not applied in the public sector e-service creation. E.g. by the time the implementation phase is achieved, it is too late to change the poor decisions in the earlier stages.

Other issues were related to the interoperability between the existing systems.

4.2.3 Interoperability

The healthcare sector is using multiple IT systems to operate and collect various data. This has caused fractioned landscape of databases, registers and e-services.

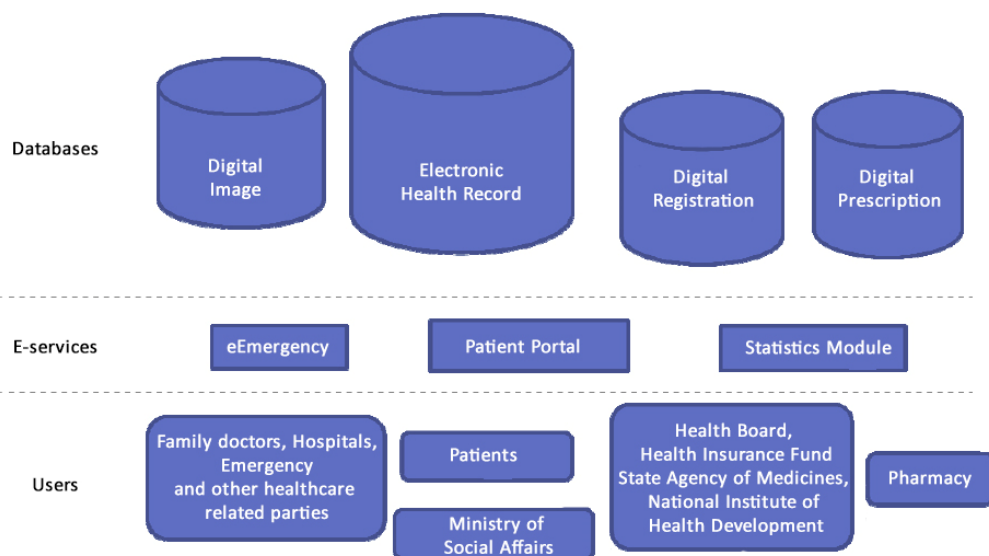


Illustration 13 - databases, e-services and users in Estonian health care (National Audit Office of Estonia 2014)



According to National Audit Office of Estonia (2014), Estonian state institutions are still not able to benefit from the data of Estonian healthcare system because data are missing or are not of sufficient quality. eHealth data is not yet being used for compiling statistics, monitoring, making financing decisions and health policy-making in general. The actions have therefore not met the objective of creating opportunities that data being collected could be used in medical science to improve the level of national and departmental statistical purposes, healthcare management and research. The only exception is the opportunity made possible with e-health data for Social Security Administration³⁶ to determine the degree of disability and permanent incapacity. Another problematic aspect was that the data is intended for use in treatment and they are not accessible for other parties (state agencies, organizations, etc.). Therefore, the development of eHealth services in Estonia have not established expected cost reduction in service providers and administrative burdens on state agencies. The systems are not communicating and exchanging relevant data resulting in inefficient work in healthcare sector. If the systems were communicating, the data inserted into one system could be used immediately in many other e-services and this would mean increased interoperability. In healthcare sector, the focus of interoperability is less on OGD. The developments have taken long time and a lot of resources have been spent and it is not sure how much more will be spent. Based on the facts discussed formerly, the developments of interoperability in state level are in the beginning phase. Publishing basic data requires less additional developments of the existing solutions. This leads to the basic question if the state should leave some data for private sector product development.

4.3 Examples of OGD impact in nutrition sector

The USA Department of Agriculture (USDA) has released USDA National Nutrient Database for Standard Reference which consists of nutrient information on over 8,000 foods (USDA National Nutrient Database for Standard Reference 2011). The site (Appendix B) allows to search by food items, groups, or lists to find the nutrient information for food items. One can either search the nutrition data on the site or download the data files and documentation in several different formats for use on computer.

Search programs for the PC are also available for download on the site. The data files can be downloaded as text files or database formats for building own databases. For building databases all documentations and user guide are provided and constantly updated.

³⁶ Sotsiaalkindlustusamet: www.sotsiaalkindlustusamet.ee



USDA National Nutrient Database data has been compiled from published and unpublished sources. Published data sources include the scientific literature. Unpublished data include those obtained from the food industry, other government agencies, and research conducted under contracts initiated by USDA's Agricultural Research Service (ARS).

The database consists of food descriptions, food groups, nutrients' data etc. The whole database consists of data that would be difficult to obtain for any private organization. The data can be used in various ways for building complex e-services and other IT solutions. Overview of e-services using the USDA National Nutrient Database is presented in the following:

SuperTracker (Appendix C) is created by The Center for Nutrition Policy and Promotion within the USDA. The purpose of SuperTracker is to help Americans put the dietary guidelines for Americans into action. Traditionally, the dietary guidelines for Americans provide nutrition guidance for healthy Americans of ages two years and older. The Dietary Guidelines for Americans 2010 contains guidance for individuals at increased risk of chronic disease due to the rising concern about the health of the American population. (USDA 2013)

SuperTracker offers all sorts of functionalities: users can compare foods, track physical activity target and daily calorie limits, plan daily meals, create recipes etc. For users relatively comprehensive user guide is provided. SuperTracker is an e-service provided by the government.

The service is not usable in smart devices since it does not support responsive design.

SuperTracker is only a web e-service and thus there are also no phone applications available.

EatThisMuch (Appendix D), also known as "the automatic meal planner" creates meal plans with personalized nutrition targets, food preferences, and budget, and then sends them to the users every week with a grocery list. Using data from USDA, it can cater to most diet types, including Atkins, paleo, vegan, zone, and many more via the extensive options menu. Compared to SuperTracker the biggest difference is that it adds costs to the products and thereby people can plan their food budget. Another difference is that it provides social media sharing and autosuggestion of foods for mealtimes so that people will get new ideas of what to cook since recipes are provided in the description. The e-service is suggested by two major portals: The Washington Post and Lifehacker. Hence, there are many new users coming from general news portal. Since the company is still new, EatThisMuch is still developing his mobile applications, however the website is responsive to mobile devices.



Nutritionix (Appendix E) – in addition to using data from USDA Nutritionix establishes relationships with restaurants and food manufacturers so they can provide nutrition information directly to their database. Nutritionix opened API (Illustration 14) to allow nutrition and fitness app developers to access database of up-to-date nutrition information. Variety of restaurants and meal producers have started to insert their data so that users can build e.g. Subway sandwiches to see how many calories they contain. Nutritionix is a private organization that is among 30 other national brands working with the USDA to help promote the dietary guidelines for Americans.



Illustration 14 - Nutritionix as API provider

Foodily (Appendix F) is a web and smartphone based application for discovering and sharing recipes. The system works, so that each recipe features calculations on total calories, calories per gram, saturated fat, unsaturated fat, carbohydrates, sugar, protein, cholesterol, sodium and fiber. Each result displays the number of calories per gram in the dish as well as the percentage of total calories for each nutrient. Foodily's selling point is that it draws from a vast network of recipes (over 2 million) online. So even though the USDA database only has 8000 food products, the Foodily e-service provides tremendous options for its users to cook a decent food with controlled calories and balanced nutrition. In addition to web portal, it has both iPhone and Android applications available. In 2012, Foodily received 5 million dollars from Index Ventures to improve the e-service.

Yummly (Appendix G) aggregates hundreds of thousands of recipes from around the web and allows to filter results by type of food, course, and ingredient and break down recipes by diet, allergy, nutrition, price, cuisine, time, taste, and sources. One can also edit and save any recipe with ingredient substitutions and adjustments based on preferences. Yummly recalculates the

recipe to reflect the new ingredient amounts. So for example if there is a need to cut a recipe down to one portion, Yummly recalculates the ingredients need for a smaller version of a dish.

There are plenty of other e-services using the USDA database as web solutions, Google Play applications or Apple Store applications.

4.4 Estonian nutrition e-service NutriData

Provided by Estonian National Institute for Health Development, NutriData (Appendix H) is a program for following healthy and balanced nutrition. The program is for those interested the health and nutritional information and is designed for self-education purposes. Using the data provided in the page is at peoples own risk. The information is not a substitute for professional advice, diagnosis, or treatment recommendation.

NutriData allows its users to analyze the energy and nutrient content with age- and gender-based national recommended dietary allowances. For creating a menu for analysis, first a user account is required. The e-service is only in Estonian language and it is compatible with the following browsers: IE 7, or newer, Firefox 3 or newer, Chrome. It does not have responsive design for mobile use neither there are mobile applications available in Google Play or Apple Store.

In order to access the e-service, first thing is to find it. The NutriData e-service is not listed under Estonian State portal in the category “Health and Healthcare”. Neither can it be found under the Ministry of Social Affair website. To find it, first one must go the website of Estonian National Institute for Health Development³⁷. There a link to another nutrition portal is listed: www.toitumine.ee. Only from there NutriData can be found. The direct URL for going to NutriData site is: tap.nutridata.ee.

4.4.1 Functionality

When logged in, users can create their own mealtime by selecting food product or recipes from the national nutrient database, maintained by Estonian National Institute for Health Development. In addition, users can add new products together with nutrition values to their account. These however will be only seen by the user itself. Hence, the database is limited to most users with the data that Estonian National Institute for Health Development has entered. Additional limitation of the system is that there are no possibilities to follow a friend or other users to get new ideas for nutrition. There is also no forum and nutritionist for general advice.

³⁷ Estonian National Institute for Health Development: www.tai.ee

The e-service is not only targeted for citizens because under profile in addition to “Standard user” there is also selection for “Company dealing with providing catering”.

Although the e-service is free for anyone to create account and use, there are restrictions for using the data.

4.4.2 Terms of Use

Anyone can create an account in NutriData, however, by using the data from the NutriData program, one must consider copyright and intellectual property rights. All information on the e-service are protected by intellectual property laws in the EU Directive 2001/29 and the WIPO copyright treaty³⁸. All data and texts may not be copied or otherwise reproduced, including photocopying, recording, or by any other method of recordings, if not explicitly referred to the original data source (Institute for Health Development n.d.).

In addition to the former, it is not possible to get data from the National Institute of Health Development nutrient database in machine-readable form for free. NutriData’s nutrient data can be issued by National Institute of Health Development in MS Excel format - this is done on data agreement basis and fixed fee of 320 EUR.

4.4.3 Database

The database is updated once per year and in average 200 new food products are added per year. The data can be viewed, however not exported to a machine-readable form. The navigation is built up in a way that the food products cannot be compared – only one product per time can be viewed. In the database there are 1656 products and 1062 recipes.

4.4.4 User support

The portal offers guidance with two introductory videos, where a woman introduces the functionality. There is also a web form for asking questions about the portal in case of technical issues or for asking specific questions regarding nutrition data. The site has no concrete user manual. Only a link can be pressed for general unindexed information. In addition there is no section regarding frequently asked questions by the users. There is a contact number for asking questions about the program.

³⁸ WIPO copyright treaty - World Intellectual Property Organization Copyright Treaty

Chapter 5

RESULTS AND RECOMMENDATIONS

The chapter presents results regarding the quantitative research made in Estonian Nutrition Sector and by combining the results with research made on OGD in previous chapters, recommendations for a way forward of OGD in Estonia is provided.

5.1 Results

The objective of the questionnaire was to clarify the awareness-level and usage of public sector e-services in nutrition sector. The level of awareness especially amongst people interested in healthy nutrition was expected to provide useful input for drawing general conclusions in the following chapters.

5.1.1 Background information of the sample

Amongst the overall 115 responses, most of the responses came from women (92.2%) resulting only nine men participating in the questionnaire. The most frequent age of the respondents was between the age-group 16-25 (32.2%) (Illustration 15). The least representative age-groups were people 15 years old and less and people 65 years old or more. In both of these groups there was only one respondent.

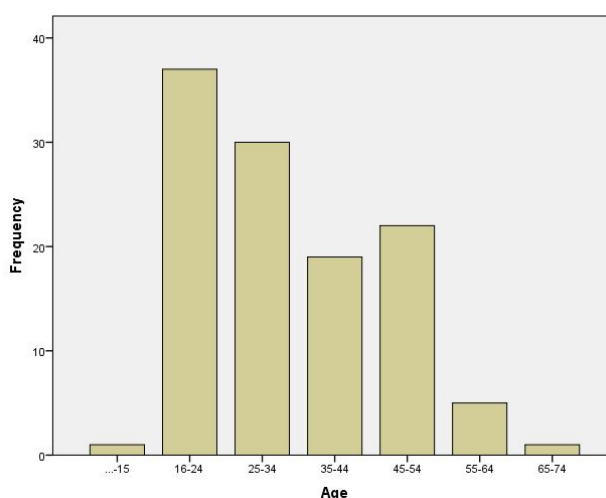


Illustration 15: Distribution of respondents based on age



Most of the respondents had started to have interest in healthy nutrition only recently: 13.9% during the last and 34.8% had started to have interest in healthy nutrition during last two years (Illustration 16).

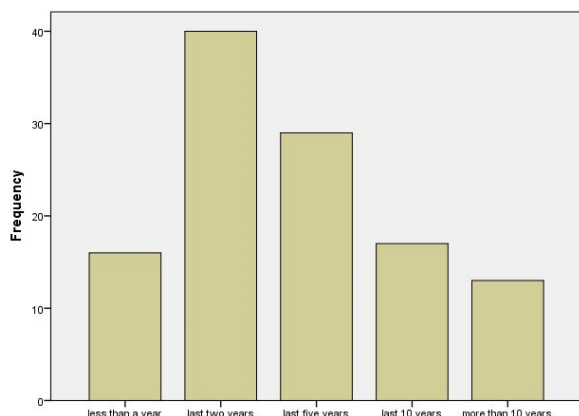


Illustration 16 – Distribution of respondents based on time-period of having interest against healthy nutrition

The total percentage of people becoming interested in healthy nutrition during the last 5 years or less was 73.9%. This fact is an indication of increase of the popularity against healthy nutrition.

5.1.2 Information availability, sources being used, the usage of e-services

A question about sources being used for information about healthy nutrition gave answers as follows: the most popular reply was “Using Internet-based search-engines such as Google” (100). Second favorite answer was “Social media” channels such as Facebook (89). Other options were “Direct contact (friends, family)” (63), “Publications (newspapers, magazines)” (60) and “TV” (38). The option “other” was selected eight times and thus was least popular option. The additions to “Other” were replied being books (1), school (2), forums (1) and science articles (1) and personal trainer (1).

To conclude, 53% out of 100% overall sources being used to search for information about healthy nutrition, internet is the most popular option with combination of “Using Internet-based search-engines such as Google” and “Social media” (Illustration 17, page 50).



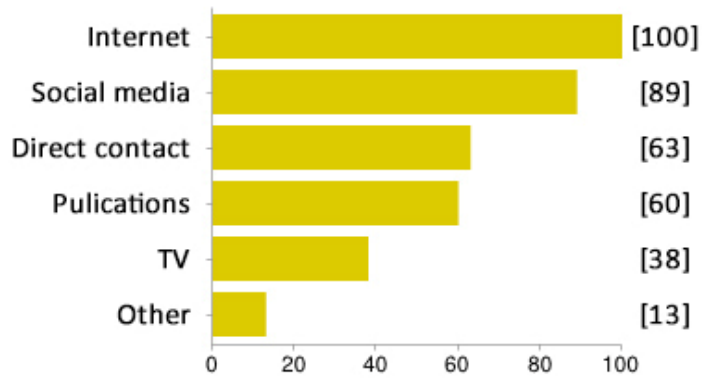


Illustration 17 – Sources for information about healthy nutrition

In regards to healthy nutrition, people tend to be more interested in general health (82%), getting new ideas about recipes (76,5%) and expansion of knowledge out of general interest (64%) (Illustration 18). 55 respondents were interested in making improvements into training schedule. Eight respondents added to the option “Other” such interests as balancing the weight, selecting the best nutrition plan, etc.



Illustration 18 – Interest areas in regards to healthy nutrition

In the following a question was asked: “Do you think the state of Estonia informs and educates people in a healthy nutrition sufficiently?” Twelve answers was given neutral as “Cannot say”, two answered “Yes” and six answered “No”. The most popular answers resulted being “Preferably yes” (40) and “Preferably no” (55) (Illustration 19, page 51). The conclusion here is that based on people who are interested in healthy nutrition, 53% find rather that Estonia is rather not educating people enough to eat healthy food in against to 40% of people who think the opposite.



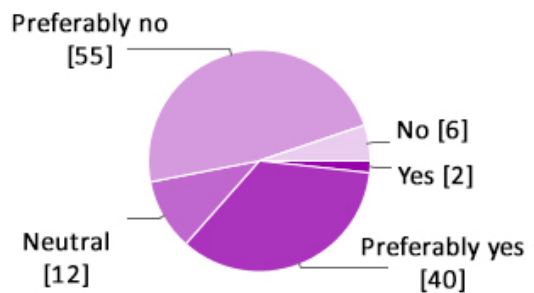


Illustration 19 – The sufficiency of education provided by the government

The next question was targeted to understanding how people perceive themselves being aware of different type of information and e-services regarding healthy nutrition (Illustration 20). Thus a question if the respondents perceive themselves as well informed was asked resulting more than half (58,2%) answering “Yes” or “Preferably yes”. Only two answered “No” and 15 respondents could not decide.

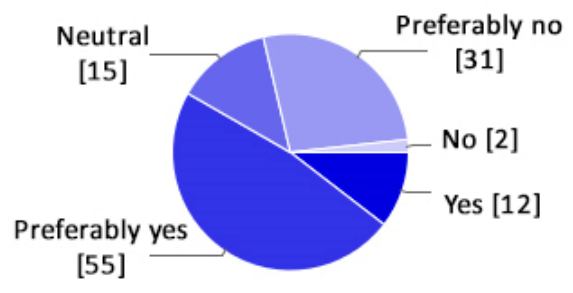


Illustration 20 – Perceived awareness level of nutrition e-services

To know what people think of e-services as aid to improving nutrition habits there were surprisingly no replies selecting the option “No”. 92 (80%) were sure that an e-service can improve nutrition habits and 23 respondents replied “Maybe”. This indicates general receptivity and willingness towards using internet-based tools for improving nutrition behavior.

In the following two questions were asked in relation with each other. First it was asked whether respondents currently use e-services in connection healthy nutrition. 40% of replies were “Yes” and 60% “No”. A continuing question was asked – “If yes, which e-services are you using?” The replies were given in free text, but it gave good basis for categorizing and making conclusions. 14 respondents mentioned NutriData, which was the most popular answer, followed by “toitumine.ee”(8), Facebook community pages (6), Kaalustalla (6), Kaaluabi (6), Erik Orgu (5), Paleo (3) , Forums (3), Blogs (3). Rest of the responses were mostly phone applications or fitness related websites. Based on the responses given, it was later reassured that relevant options were



proposed for the questions in the following part because most of the popular e-services were represented also in the following questionnaire.

Also the following two questions were asked in sequence-relation. To reach to understanding of those who currently do not use any e-services – the following question was asked: “In case you do not use any healthy nutrition e-services, would you find time and would you be willing to use an e-service that meets your demands?” The results were “Yes” (46%), “Maybe” (30%), “No” (6%) and “I meet my demands using the existing e-services” (21%) (Illustration 21).

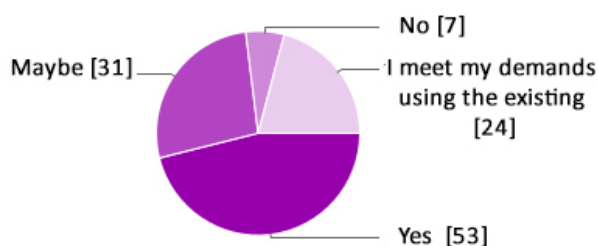


Illustration 21 – If users would use an e-service that meets their demands

The respondents that answered “Yes”(53) or “Maybe”(31) were asked to specify under what condition they would be willing to use the another e-service. Since the question was in the form of free text, a respondent could write multiple conditions. The respondents who answered “Yes” mostly mentioned that they would use a system that is:

1. Easy to use (9);
2. Free of charge (8);
3. Variety of choice and easy to cook recipes (7);
4. Personal contact in the form of nutritionist or doctor (5);
5. Responsive or an application in a smart device (4);
6. Free of advertisements (2).

Additional answers were related to specific form of diet (Paleo diet, Gluten or Lactose free), personal trainer involvement etc. Among the respondents who replied “Maybe” had similar requests adding new desires such as more details, pictures of the food and usage of e-service without the requirement for registration.



5.1.3 Awareness and usage level of current e-services.

In following the questionnaire focused on existing e-services. The objective was to get general information about Estonian nutrition e-service NutriData and compare to other popular Estonian nutrition e-services. A multiple variety question assessing the awareness-level and popularity of existing e-services was asked in three-option scale:

- Aware, in use – the respondent is aware of the existence of the e-service and active user;
- Aware, not in use – the respondent is aware, but not using the service actively;
- Unaware – the respondent does not know anything of the existence about the e-service.

Based on the results (Illustration 22), NutriData is mostly used e-service in Estonian nutrition sector by people interested in healthy nutrition. In terms of awareness-level the most well-known e-service was Kaaluabi – known to 94 (82%) of respondents, the active usage was only by 10 persons out of 115. The second best e-service in terms of awareness level was Kaalustalla – known to 68%. Third and fourth place shared its popularity – “Sööme ära!” together with NutriData was known by 56%.

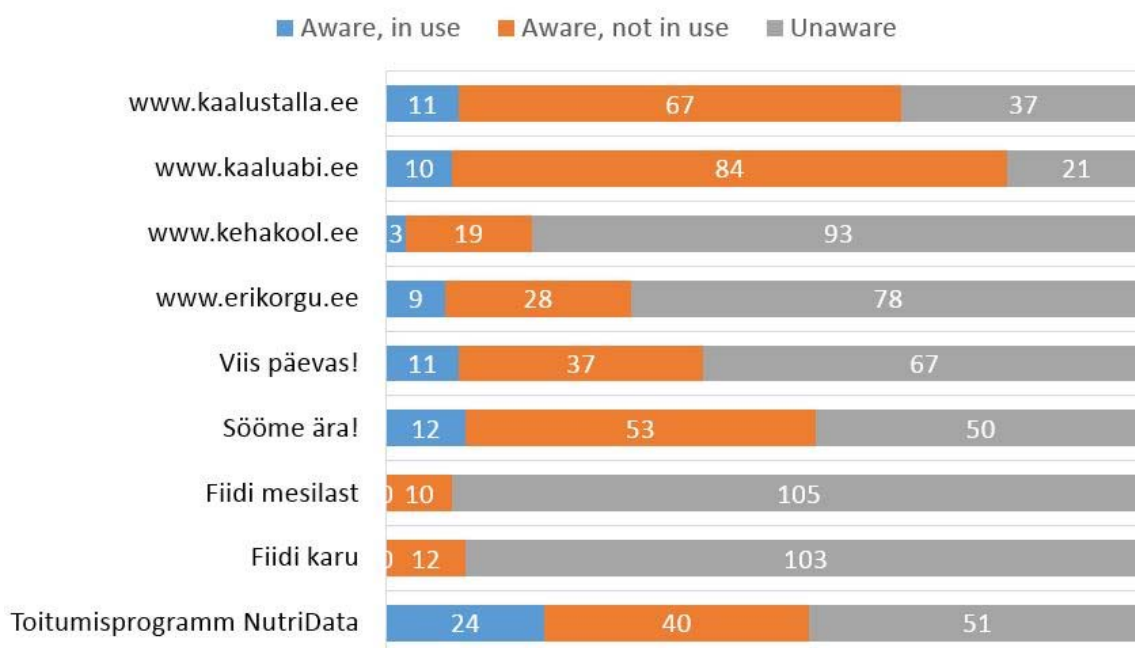


Illustration 22 – Proportion of respondents being aware of various nutrition e-services (in numbers)

The results provide comparison between public sector and private sector solutions. In broad, the awareness level tends to be wider towards private sector organizations e-services whereas the usage-level is more frequent in public sector e-services. In the following a comparison is made between the most popular in-use (NutriData) and well-known (Kaalubi) e-service.



The both e-services have one common characteristic – data. Kaaluabi is using the same database as NutriData. Their biggest difference is that NutriData is for free and Kaaluabi is not. This brings to the conclusion that the amount of users in Kaaluabi (10) is not so small actually (Illustration 23). There are plenty of other differences such as forum, sharing of recipes etc. in Kaaluabi e-service which is not included into NutriData.

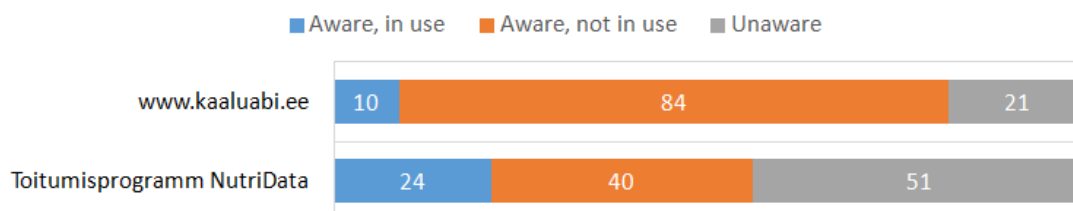


Illustration 23 – Comparison between NutriData and Kaaluabi

In the next step, only responses from people that were using NutriData at the time or knew about existence of such system, were investigated.

5.1.4 Specific questions regarding NutriData.

Two multiple choice questions were asked directly concerning NutriData:

1. If you are using or have used NutriData, what you like about the e-service?
2. If you have used NutriData, but are no longer using it, what do you not like about the e-service?

The first question was analyzed only based on answers from the respondents that previously had selected that they use NutriData, which was 24 respondents. The most popular reply was “It is for free” out of 24 respondents 21 selected this option (Illustration 24, page 55). The second mostly picked answer was “Sufficiently informative and provides reasonable overview” out of 24 respondents 16 selected this option. Third most popular answer was “User-friendly” and fourth was “There is enough data” (7). The least popular replies were “There is enough instructions and support” (6) and “It completely meets my needs” (3).



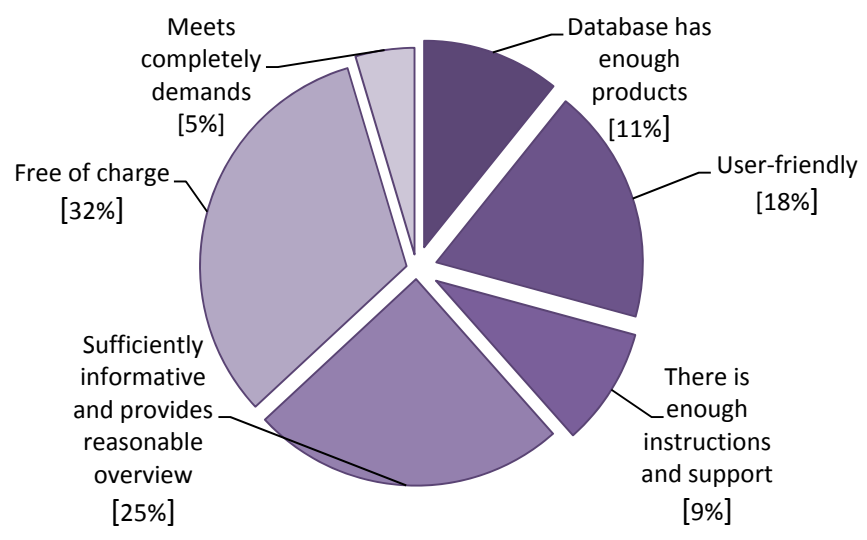


Illustration 24 – Opinions about advantages of the NutriData e-service

The results of the second question were analyzed based on respondents who knew about the system, but did not use it at the time. The most popular reply was that they have never used it – surprisingly 30 replies out of 40 respondents were given (Illustration 25). The second reply was “The database does not contain sufficient amount of information” (5) and third was “The usage is too complicated” (3). The least popular replies were: “It does not meet my demand in terms of information” (2), “Low level of awareness creation” (1) and “Does not support smart devices” (1).

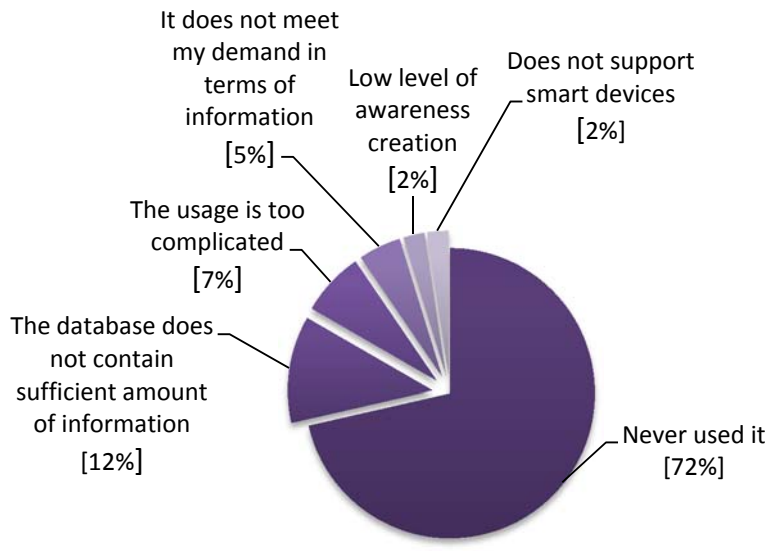


Illustration 25 – Opinions about disadvantages of the NutriData e-service

To conclude, the results of the second question revealed the fact that even though, the vast majority of respondents know about the public sector e-service NutriData, they have never



actually used it. Next, we will look into more detail how often the people who claimed to use NutriData actually use it.

For this purpose, the questionnaire was also consisting from a question asking all the respondent to mark how often they use the nutrition e-service. The 24 respondents that had previously selected NutriData as their currently used nutrition e-service, the results were: 2 -3 times a week (8), Every other week (6), Once a month (4), Once in a quarter (2), Few times a year (3) (Illustration 26).

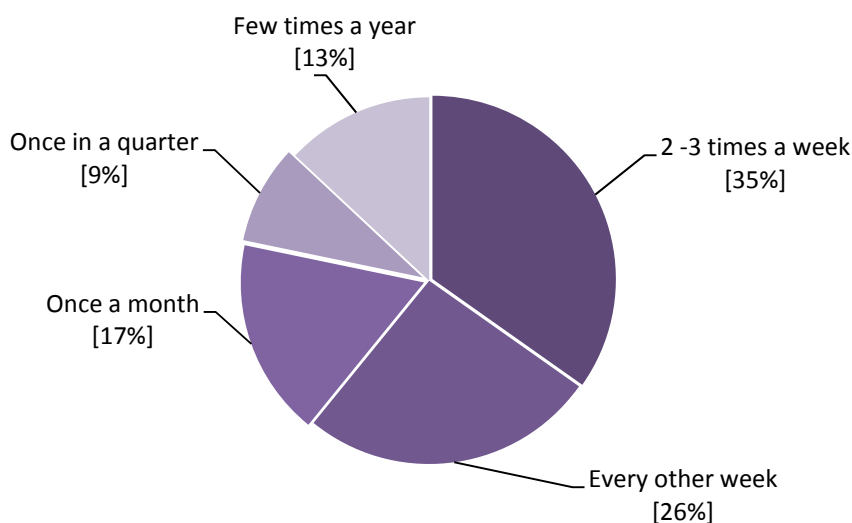


Illustration 26 – Frequency of using NutriData e-service

Thereby only 14 respondents of 24 NutriData users use it occasionally as frequent users.

5.2 Conclusions and recommendations

The results of the questionnaire show that the usage of NutriData is not very popular. As the examples in the Chapter 4 showed, the release of USDA National Nutrient Database allowed private sector to build different types of e-services satisfying different set of needs by using the same database. The e-services created with OGD do not only provide better e-services with same database, but they link data to other sources like estimated prices of the grocery products (EatThisMuch), e-services of more than two million choices (Foodily), usage of e-services on different devices (on application stores) and even there are e-service providers that focus on collecting more nutrition data from food producers and catering services and even make the collected nutrition data available as API-s for other developers (Nutritionix). The benefit is not only a better e-service, but increasing number of people using such e-services that are advertised



on news portals like The Washington Post (EatThisMuch). Such examples prove the fact that OGD is a resource for the public benefit and key enabler for improved e-service delivery. Moreover, such an approach has allowed to bring the complexity of balanced nutrition into the masses by becoming part of achieving the state's national goals.

In the context of the piece, OGD in Estonian nutrition sector could influence fulfilling two out of five strategic goals of the Ministry of Social Affairs' National Health Plan's strategic goals: 1. Health supportive environment and 2. Promoting a healthy lifestyle. As the National Health Plan (2014) says: "The Estonian National Health Plan is designed to ensure that the people of Estonia live longer, happier, healthier lives. This is something that can only be achieved if everyone works together: not just the people who live in the country, but also the state, local governments and the private and third sectors."

Estonia however, is focused first on linking and creating interoperability between specific datasets which is a challenging and time-consuming task because most of the technology standardization in terms of Linked Data is still under development. There are no globally accepted standards on how linking should be done and thus a lot of collaboration between ministries and EU countries is needed to pursue such a challenging task especially because currently there in Estonian public sector there is no clear political force, nor resources to motivate voluntarily dealing with OGD and Linked Data. Before this can be done, first awareness creation is required not only for the database owners, but also to the heads of the public institutions to have their support in terms of resources. Since the subject of OGD and Linked Data is difficult to grasp for a high-level executive, the rate of success is strongly connected to the support of political level. The political level is also directly related to creation of OGD supportive legislation. So far, the only legislation in Estonia concerned with OGD is what the European Commission has released to all member states – the European Directive 2003/98/EC and the revision of the directive 2013/37/EL.

Thereby before focusing on Linked Data and interoperability, there should first be a clear strategy towards OGD which, in the context of Estonia, would require separation between e-services that are created by public sector vs leaving datasets open for others. The first step towards OGD strategy would be finding resources to establish stable version of Open Government Data Portal. The portal could initially consist of only individual datasets or part of datasets in the most basic formats such as MS Excel, CSV (see Section 3.1.3, page 20). The following step would be giving a strong political signal – as the cases of most successful ODG countries in USA, UK, Denmark, Finland show (Section 3.2 page 23), for a country to start releasing OGD, a first step is to support

the opening of data on a high political level. For ensuring the progress of OGD developments in Estonia, the leading role for success should be established by forcing the Estonian Data Protection Inspectorate to hold supervision and provide consultation to public sector organizations regarding publishing PSI. As discussed in Chapter 3 (see Section 3.1.4, page 22) initial releasing of datasets can be done in simple ways. Estonian Open Data Community could provide support by facilitating events where the creation of pilot e-services using OGD would be addressed and also to help identifying datasets that should be opened. Why not start with new efficient e-services in nutrition sector?

5.3 Summary

Based on the results found in the current chapter there is tendency in public sector to create e-services which people are not informed about or for some reason are not using.

The questionnaire was initiated with an objective to verify if people that are interested in healthy nutrition are well-informed about Estonian public sector e-services. In order to make the comparison, the questionnaire was built up including both public and private sector e-services in the healthy nutrition field. Within the results, there were some realizations to be brought out as follows. First, more respondents thought that Estonian state has not been providing sufficient amount of education in the field of healthy nutrition. Secondly, respondents believe firmly that e-services can change the behavior towards healthier nutrition. Thirdly, based on the research, private sector has been more successful in creating awareness in the various e-services, especially in those that contain the same data as NutriData e-service. Last but not least, 44% of all respondents did not know about the existence of NutriData. An important factor to remember here is that the respondents all confirmed during the questionnaire that they are interested in healthy nutrition and 80% believed that an e-service can improve nutrition behaviour. Thus the outcome is surprising how little people actually know about NutriData. Out of the 40 non-active users who know about the existence of NutriData, 75% have never used it. So totally only 30% (34) of all respondents (115) who all are interested in healthy nutrition have ever used NutriData program. In addition 10% of all respondents use NutriData as frequent users (few times a week to every other week). The most frequent reasons for not using NutriData were: 1. the insufficiency of data, 2. complexity of the user-interface and 3. did not meet the expectations.

This leaves for conclusion that, in addition to growing need for e-services, there is also growing requirements of the user. For example, an e-service that saves time and money to take specific action should not be compared to an e-service that is meant to achieve better health. Releasing

government data leaves options open for both – public sector can still provide e-services to achieve its goals and private sector can build e-services that meet the requirements of different target-groups. The result would be an increase in the efficiency of using existing data for social benefit.



Chapter 6

CONCLUSION

The chapter presents conclusions regarding the thesis at hand.

The piece conducted a research on application possibilities of OGD in Estonian Nutrition sector. To provide answer to the research question it proposed first hypothesis that opening government data would create more e-services. Internet-based research was made and examples were researched based on solutions developed on USA Department of Agriculture, which has released National Nutrient Database for Standard Reference for anyone to download and create new e-services. In addition to various set of solutions that were developed on USA database and actively used, another example was found in Estonia using the same data as Estonian National Nutrition e-service. Based on the research made, OGD is usually released under Open license, which is noticeable for the users of the site. In addition if a dataset is made available it is usually also delivered to a national Open Data repository site, like Open Government Data Portal, where the potential developers would see it. These facts proved that releasing nutrition data in the form of OGD would create more e-services in Estonia.

Secondly, since two more hypothesis were established for answering the research question, an internet-based quantitative questionnaire was conducted including 115 respondents interested in healthy nutrition. As discussed in Section 2.2, the sample was expected to be well informed about different healthy nutrition-related sources, because they had voluntarily beforehand started to follow healthy nutrition Facebook Community Group. When questions regarding Estonian public sector e-service were asked, the reality proved to be different: the public sector e-service NutriData was known only by 56% and other proposed public e-services had even lower awareness level. Private sector e-services were more known to the users: Kaaluabi (82%) and Kaalustalla (68%). This proved the second hypothesis about people not being well informed about public sector nutrition e-services to be true. Third hypothesis was answered with a combination of multiple questions. First, 80% of all respondents agreed that e-services can improve nutrition

behavior and 20% responded “Maybe”, so there was no one saying “No”. The continuing question found out that only 40% of respondents were using an e-service at the time. Third question regarding if the respondents would be willing to use a new e-service, 46% were saying “Yes”, 30% “Maybe” and 21% replied the e-services they use meet their demands. Thus the third hypothesis – if the people interested in healthy nutrition would be willing to use new e-services proved right too.

To answer the research question, how can OGD facilitate creating efficient e-services in Estonian nutrition sector, we will first have to look at the current situation. The additional facts that were revealed from the questionnaire were that even though 56% of all people interested in healthy nutrition knew about the e-service NutriData, only 30% had ever used it. More importantly, only 10% can be categorized as frequent users. Thus the current situation, in terms of efficiency (awareness and usage level) of the public sector e-service is low. The conducted questionnaire also showed that private sector is currently already better at creating awareness of the e-services.

OGD can facilitate the creation of efficient e-services in nutrition sector because 1. it enables new private sector organizations to enter with low cost, 2. by releasing data with OGD principles, the data is more visible for possible e-service developers so there will be more e-services created, 3. private sector nutrition solutions are better-known 4. people interested in healthy nutrition are interested in using new e-services.

The current piece at hand proved the fact that OGD is a resource for the public benefit and key enabler for improved e-service delivery and may even become part of achieving the state’s national goals. Thus OGD should not be ignored even in the small country such as Estonia.

The piece suggests that there should be a clear strategy towards OGD where the initial step would be finding resources to establish stable version of Open Government Data Portal. The portal could initially consist of only individual datasets or part of datasets in the most basic data formats. The second step would be giving a strong political signal towards OGD and forcing Estonian Data Protection Inspectorate to hold supervision and provide consultation to public sector organizations regarding publishing PSI. Estonian Open Data Community could provide support by facilitating events where the creation of pilot e-services using OGD would be addressed. Thus creating efficient e-services is directly related to government because government is the main facilitator of OGD, owns the data and is in forefront of creating the required legislations.

Your move, government.



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LIST OF ILLUSTRATIONS

| | |
|--|----|
| Illustration 1 - The Work Process Model | 14 |
| Illustration 2 - Related Definitions of Government Data (Ubaldi 2013) | 17 |
| Illustration 3 - Data Categories (Gurin 2014) | 17 |
| Illustration 4 - How Open Data relates to other types of data (Ubaldi 2013) | 18 |
| Illustration 5 - Linking Open Data (Bizer, Heath and Berners-Lee n.d., 5) | 21 |
| Illustration 6 - Open Data Benchmarking (Cappgemini Consulting 2012) | 30 |
| Illustration 7 - Estonian ranking in Open Data Barometer (Web Foundation 2013)..... | 31 |
| Illustration 8 - PSI Overall Score in Europe (European Public Sector Information Platform 2014)..... | 31 |
| Illustration 9 – Conceptual interoperability between systems (Valner 2014)..... | 35 |
| Illustration 10 – The interrelated stakeholders in medical sector (Estonian Development Fund 2011) | 39 |
| Illustration 11 - Typical IT roll-out process (Cameron and Green 2004) | 41 |
| Illustration 12 – Build-Measure-Learn Feedback Loop (Ries 2011)..... | 41 |
| Illustration 13 - databases, e-services and users in Estonian health care (National Audit Office of Estonia 2014)..... | 42 |
| Illustration 14 - Nutritionix as API provider | 45 |
| Illustration 15: Distribution of respondents based on age..... | 48 |
| Illustration 16 – Distribution of respondents based on time-period of having interest against healthy nutrition | 49 |
| Illustration 17 – Sources for information about healthy nutrition | 50 |
| Illustration 18 – Interest areas in regards to healthy nutrition | 50 |
| Illustration 19 – The sufficiency of education provided by the government | 51 |
| Illustration 20 – Perceived awareness level of nutrition e-services | 51 |
| Illustration 21 – If users would use an e-service that meets their demands | 52 |
| Illustration 22 – Proportion of respondents being aware of various nutrition e-services (in numbers)..... | 53 |
| Illustration 23 – Comparison between NutriData and Kaaluabi..... | 54 |
| Illustration 24 – Opinions about advantages of the NutriData e-service..... | 55 |
| Illustration 25 – Opinions about disadvantages of the NutriData e-service | 55 |
| Illustration 26 – Frequency of using NutriData e-service | 56 |



APPENDICES

Appendix A – Questionnaire

Küsimustiku eesmärk on uurida, kas inimesed on teadlikud ja kasutavad küsimistikus esile toodud keskkondi ja teenuseid, kas nad on nendega rahul ja kas neid huvitaks uued keskkonnad. Uuringu teostaja on värske sotsiaalvõrgul põhinev algatus "Toiduguru".

* *Kohustuslik*

Sugu *

- Naine
 Mees

Vanus *

- ...-15
 16-24
 25-34
 35-44
 45-54
 55-64
 65-74
 75-...

Kui kaua oled olnud huvitatud tervislikust toitumisest? *

- alla 1 aasta
 viimased 2 aastat
 viimased 5 aastat
 viimased 10 aastat
 rohkem kui 10 aastat

Millis(t)e allika(te) kaudu täieneb Sinu igapäevane tervisliku toitumisalane teadlikkus? *

- Internetis ise googeldades
 Sotsiaalmeedia (näiteks Facebook)
 Otsekontaktid (sõber, ema, vanemad)
 Ajakirjandus
 Televisioon
 Other:

Mis Sind huvitab või huvitaks (kui seni pole huvitunud) tervisliku toitumisega seondult? *

- Üldine tervislik seisund (parem elukvaliteet)
- Retseptid
- Treeningplaani täiendamine
- Silmaringi laiendamine
- Ei ole huvitatud
- Other:

Kas Sinu arvates Eesti riik teavitab-harib inimesi piisavalt tervisliku toitumisega seondult? *

- Jah
- Pigem jah
- Ei oska öelda
- Pigem ei
- Ei

Kas informatsiooni tervisliku toitumise ja sellega seotud keskkondade kohta on Sinu arvates piisavalt? *

- Jah
- Pigem jah
- Ei oska öelda
- Pigem ei
- Ei

Kas Sinu arvates võib elektrooniline keskkond aidata inimest tervislike toitumisharjumuste muutmisel? *

- Jah
- Ei
- Võib-olla

Kas kasutad mõnda elektroonilist tervisliku toitumise keskkonda/rakendust nagu näiteks mobiilsed rakendused, mõni andmebaas vms? *

- Jah
- Ei

Kui "jah", siis millist?





Juhul, kui Sa ei kasuta tervisliku toitumise keskkondi, siis kas leiaksid aega ja oleksid nõus kasutama mõnda keskkonda, mis vastaks Sinu vajadustele? *

- Jah
- Võib-olla
- Ei
- Kasutan olemas olevaid keskkondi ja olen nendega rahul

Kui vastasid eelnevale küsimusele "Jah" või "Võib-olla", siis palun iseloomusta lühidalt keskkonda, mis vastaks Sinu vajadustele.



Kas oled teadlik mõnest alljärgnevast tervisliku toitumise keskkonnast/kampaanialehest? *

| | Olen teadlik ja kasutan | Olen teadlik, aga ei kasuta | Ei ole teadlik |
|---|--------------------------|-----------------------------|--------------------------|
| www.kehakool.ee (Kehakool OÜ) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Toitumisprogramm NutriData (Tervise Arengu Instituut) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Viis päevas! (Tervise Arengu Instituut) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fiidi karu (Tervise Arengu Instituut) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| www.kaalustalla.ee (Fitnessteam OÜ) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| www.erikorgu.ee (Better Life OÜ) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fiidi mesilast (Tervise Arengu Instituut) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| www.kaaluabi.ee (Kaalubi OÜ) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



| | Olen teadlik ja kasutan | Olen teadlik, aga ei kasuta | Ei ole teadlik |
|---------------------------------------|--------------------------|-----------------------------|--------------------------|
| Sööme ära! (Tervise Arengu Instituut) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Kui sageli Sa kasutad mõnda neist keskkondadest? *

- 2-3 korda nädalas
- Üle nädala
- Kord kuus
- Kord kvartalis
- Mõned korrad aastas
- Ei kasuta

Kuidas hindad sealt saadava informatsiooni kasulikkust? *

- Kasulik
- Pigem kasulik
- Neutraalne
- Pigem igav
- Igav
- Ei huvita

Millistel põhjustel ei kasuta Sa eelpool nimetatud keskkondi/kampaanialehti? *

- Liialt informatiivne
- Liialt ebainformatiivne
- Kasutamine on liiga keeruline, ebamugav
- Puuduvad piisavad juhtnöörid ja kasutajatugi
- Puudulik või vähene teavitustöö
- Tegu tasulise lahendusega
- Registreerumine tüütu
- Keskkond pole saadaval minu poolt eelistatud seadmel
- Minu vajadustele vastavaid tervisliku toitumise keskkondi interneti vahendusel ei pakuta
- Other:

Kui kasutad või oled kasutanud toitumisprogrammi NutriData, siis mis Sulle selle keskkonna juures meeldib? *



- Piisavalt informatiivne ja ülevaatlik
- Kasutajasõbralik
- Piisavad juhtnöörid ja kasutajatugi
- Tegu tasuta lahendusega
- Vastab täelikult vajadustele
- Andmebaas sisaldab piisavalt tooteid ja retsepte, mille hulgast valida
- Ei ole kasutanud
- Other:

Kui oled kasutanud toitumisprogrammi NutriData, aga enam ei kasuta, siis mis Sulle selle keskkonna juures ei meeldi? *

- Liialt informatiivne
- Liialt ebainformatiivne
- Kasutamine on liiga keeruline, ebamugav
- Puuduvad piisavad juhtnöörid ja kasutajatugi
- Puudulik või vähene teavitustöö
- Tegu tasulise lahendusega
- Registreerumine tüütu
- Keskkond pole saadaval minu poolt eelistatud seadmel
- Ebapiisav toodete ja retseptide andmebaas
- Ei ole kasutanud
- Other:

Sisesta oma mailiaadress, kui soovid olla üks esimesi värsket "Toiduguru" sotsiaalvõrgu keskkonnaga tutvujate seas (kasutame Sinu aadressi ainult uue keskkonna aadressist teavitamiseks)



Appendix B – USDA Database



National Nutrient Database for Standard Reference
Release 26

- [NDL Home](#)
- [Food Search](#)
- [Nutrients List](#)
- [Ground Beef Calculator](#)
- [Contact Us](#)
- [SR26 Documentation](#)
- [Help](#)

FOOD GROUP

- Baby Foods (2)
- Baked Products (1)
- Breakfast Cereals (1)
- Fast Foods (14)
- Fats and Oils (2)
- Legumes and Legume Products (5)
- Pork Products (11)
- Poultry Products (1)
- Sausages and Luncheon Meats (2)
- Soups, Sauces, and Gravies (5)

Enter one or more terms and click 'Go' for a new search

44 foods found: Click on a food name to view details

1 2 Next

| NDB No. ▲ | Description ▲ | Food Group ▲ |
|-----------|-----------------------------------|-----------------------------|
| 10864 | Pork, bacon, rendered fat, cooked | Pork Products |
| 42130 | Turkey bacon, cooked | Poultry Products |
| 07254 | LOUIS RICH, Turkey Bacon | Sausages and Luncheon Meats |
| 07921 | Bacon and beef sticks | Sausages and Luncheon Meats |
| 10130 | Canadian bacon, unprepared | Pork Products |
| 10857 | HORMEL Canadian Style Bacon | Pork Products |
| 16104 | Bacon, meatless | Legumes and Legume Products |
| 43212 | Bacon bits, meatless | Legumes and Legume Products |
| 04609 | Animal fat, bacon grease | Fats and Oils |



Appendix C – SuperTracker

SuperTracker  United States Department of Agriculture

[Home](#) | [Food-A-Pedia](#) | [My Plan](#) | [Track Food & Activity](#) | [My Reports](#) | [My Features](#) [CREATE PROFILE >](#) [LOG IN >](#)



SuperTracker:

My foods. My fitness. My health.

- Get your personalized nutrition and physical activity plan.
- Track your foods and physical activities to see how they stack up.
- Get tips and support to help you make healthier choices and plan ahead.

Food-A-Pedia >
Look up nutrition info for over 8,000 foods and compare foods side-by-side.
 [Go](#)

Food Tracker >
Track the foods you eat and compare to your nutrition targets.
 [Go](#)

Physical Activity Tracker >
Enter your activities and track progress as you move.
 [Go](#)

Get Started >
Find out what and how much to eat. Personalize your experience by creating your profile, and get a plan tailored for you.
[Create Your Profile](#)



Appendix D – EatThisMuch



[How-To Guide](#) [Recipes](#) [FAQ](#)

[Login](#) [Sign up](#)

Breakfast



604.7 calories

| | |
|-----------------------------------|-----------|
| ✕ Oatmeal Cottage Cheese Pancakes | 1 serving |
| ✕ Creamy Mango Smoothie | 2 serving |

Meal 2



555.1 calories

| | |
|---------------------------|-----------|
| ✕ Ham and cheese sandwich | 1 serving |
|---------------------------|-----------|

Meal 3



793.2 calories

| | |
|----------------------------|-----------|
| ✕ Broiled Tilapia Parmesan | 1 piece |
| ✕ Garlic green beans | 2 serving |

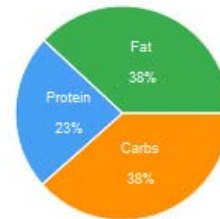
New

Save menu ▾

Add a dish

Meal options

Percent calories from...



Customize

Cumulative Stats:

189.9g Carbs
 (163.8g net carbs)
 83.6g Fat
 115.7g Protein
 1953 Calories
 Estimated \$7.08




Appendix E – Nutritionix

Restaurants Foods Submit Your Data API Blog











Go to **Subway** Nutrition Calculator 

How are these results?  

'subway' search results

Showing Results 1 to 15 out of 150

| | Serving | Calories | Carbs | Sodium | Fiber | Protein | |
|---|------------|----------|-------|--------|-------|---------|---------------------------|
|  6" Sunrise Subway Melt from Subway | 1 Sandwich | 430 | 48 | 1610 | 4 | 32 | more info |
|  6" Subway Club® from Subway | 1 Sandwich | 310 | 46 | 850 | 5 | 23 | more info |
|  6" Subway Melt® from Subway | 1 Sandwich | 370 | 47 | 1180 | 5 | 23 | more info |
|  Footlong Subway Seafood Sensation from Subway | 1 Sandwich | 820 | 100 | 1420 | 10 | 26 | more info |
|  Footlong Subway Club® from Subway | 1 Sandwich | 620 | 92 | 1700 | 10 | 46 | more info |
|  Subway Club® Meats from Subway | 78 g | 90 | 2 | 570 | 0 | 15 | more info |



Appendix F – Foodily

FOODILY

bacon

Log in

29292 bacon recipes

Only show:

MY FAVES

VEGETARIAN




QUICK

PALEO

LOW-FAT

TOP-RATED

GLUTEN-FREE

Share generously:   



Grilled Chicken Bacon Sliders



The Pioneer Woman

♥ 1599



Site ratings: N/A

Cook time: 15 mins



Sweet Potato Clam Chowder With Bacon



Cat Cora

♥ 448



Site ratings: N/A



Hearty Potato & Cheddar With Bacon Soup



Wolfgang Puck

♥ 2119



Site ratings: N/A

Cook time: 30 mins



Appendix G – Yummly

The screenshot shows the Yummly website interface. At the top, the Yummly logo is on the left, followed by a search bar containing 'bacon'. To the right of the search bar are navigation links: 'Browse', a fork icon, a Yummly icon, a grid icon, a plus icon, 'Create an account', and 'Sign in'. Below the search bar, there are filter sections: 'With Ingredients' and 'Without Ingredients', each with a 'Find an ingredient' input field. The 'Occasions' section lists various seasons and holidays with their respective recipe counts. The 'Time' section has a slider for 'Any time'. The 'Tastes' section is partially visible. The main content area shows 36,907 recipes, sorted by 'Relevance'. Two recipe cards are visible: 'Bacon Corn Hash' by Smitten Kitchen (307 recipes, 4.5 stars, 45 mins, 6 ingredients) and 'Bacon Brittle' by Food52 (28 recipes, 4.5 stars, 35 mins, 7 ingredients).

Yummly™ **Browse** **Create an account** **Sign in**

FILTERS Reset

With Ingredients

Without Ingredients

Occasions

- Fall (1,347)
- Summer (1,186)
- Winter (771)
- Spring (708)
- Game Day (689)
- Thanksgiving (677)
- Christmas (594)

[See more](#)

Time

Any time

Tastes

36,907 RECIPES Blogs Only Images Only

Sort by: Relevance

Yum 307

Bacon Corn Hash

thick-cut bacon, salt, red potato, scallions, ground black pepper and corn kernels

Smitten Kitchen ★★★★★

45 mins, 6 ingredients

Yum 28

Bacon Brittle

bacon, baking soda, unsalted butter, water, granulated sugar, coarse sea salt and **1 MORE**

Food52 ★★★★★

35 mins, 7 ingredients



SUMMARY IN ESTONIAN

Käesoleva magistritöö “Avaliku sektori avaandmete rakendamise võimalustest Eesti toitumise valdkonna näitel” eesmärk on uurida avaliku sektori avaandmete rakendamise võimalusi Eesti toitumise valdkonnas.

Esmajoones defineeritakse magistritöös erinevad andmetüübid ning analüüsitakse erinevate riikide arenguid avaliku sektori avaandmete valdkonnas. Erinevate riikide arenguid võrreldes selgub, et Eestis on avaandmetega vähe tegeletud. Seejärel uuritakse viimase aja arenguid konkreetsemalt Eesti tervishoiu valdkonnas kus on ilmsiks tulnud palju ebaõnnestumisi uudsete avaliku sektori e-teenuste väljaarendamisel. Tuues näiteid olemasolevatest e-teenustest toitumise valdkonnas illustreeritakse avaliku sektori avaandmete kasulikkust ning eeliseid. Viies läbi küsimustikul rajaneva uurimuse, mis on suunatud tervislikust toitumisest huvitatud inimestele selgub, et toitumisvaldkonda puudutavate avaliku sektori e-teenuste osas on inimeste teadlikkus ning kasutamine madal.

Tuginedes empiirilisele internetil põhineva uurimusele, avaliku sektorile korraldatud üritustelt avaldatud informatsioonile ning eelpool nimetatud küsimustikule esitab käesoleva magistritöö autor ettepaneku, et Eestil peaks olema selge strateegia avaliku sektori avaandmete kasutuselevõtu osas. Ettepanekuna pakub töö autor kiiremas korras avaandmete portaalile vajaliku ressursi leidmist, tugeva poliitilise surve avaldamist ning Eesti Avaandmete Kogukonna kaasamist avaliku sektori avaandmete pilootprojektide loomiseks.

Kokkuvõtvalt võib öelda, et avaliku sektori avaandmed aitavad kaasa tõhusate e-teenuste loomisele, sest need aitavad uutel ettevõtetel alustada äriaga väiksema ressursikulu eest, andmete avalikustamine toob andmed rohkem nähtavaks võimalikele e-teenuste arendajatele, erasektori toitumise valdkonna e-teenuste lahendused on tervislikust toitumisest huvitatud kasutajatele rohkem tuntud ning inimesed on huvitatud uutest toitumise valdkonna e-teenustest.



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supervised by Monika Saarmann,

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Tallinn 2014

