opengovintelligence

OpenGovIntelligence

Fostering Innovation and Creativity in Europe through Public Administration Modernization towards Supplying and Exploiting Linked Open Statistical Data

D4.2 Evaluation Results - First Round

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Abstract:	This document shows the results of evaluation process of the six OpenGovIntelligence pilots. The evaluation is divided in four main areas. Only the first two areas are evaluated in year 1 due to the early stages the pilots are in. The first area evaluates using co-creation user workshops and meetings realized to collect inputs from pilots' stakeholders. The second area evaluates the OGI ICT tools which can be used for pilots' development. The third was not yet evaluated due initial mature of all pilots, but a pre-test of acceptance conducted using students. Also the fourth area, outcomes, were also not evaluated due the early stage of pilots development.
Keyword List:	Evaluation, Pilots, Co-Creation, OGI ICT toolkit, LOSD.

Consortium

	Role	Name	Short Name	Country
1.	Coordinator	Centre for Research & Technology – Hellas	CERTH	Greece
2.	R&D partner	Delft University of Technology	TUDelft	Netherlands
3.	R&D partner	National University of Ireland, Galway	NUIG	Ireland
4.	R&D partner	Tallinn University of Technology	TUT	Estonia
5.	R&D partner	ProXML bvba	ProXML	Belgium
6.	R&D partner	Swirrl IT Limited	SWIRRL	United Kingdom
7.	Pilot Partner	Trafford council	TRAF	United Kingdom
8.	Pilot Partner	Flemish Government	VLO	Belgium
9.	Pilot Partner	Ministry of Interior and Administrative Reconstruction	MAREG	Greece
10.	Pilot Partner	Ministry of Economic Affairs and Communication	MKM	Estonia
11.	Pilot Partner	Marine Institute	MI	Ireland
12.	Pilot Partner	Public Institution Enterprise Lithuania	EL	Lithuania

Revision History

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Executive Summary

OpenGovIntelligence (OGI) goes beyond traditional top down approaches and proposes the co-initiation, design, implementation and evaluation of innovative, data-driven public services. This services are exclusively address specific society's needs improving in that way the effectiveness of public sector's processes, but also promoting the citizen- centric character of these processes. The co-initiation and design of public services will tap into the exploitation of public sector statistical data transformed as Linked Open Statistical Data (LOSD), and also into the adoption/expansion/development of ICT tools that will enable the effortless creation and delivery of qualitative, data-driven public services.

The evaluation is divided in four main areas; the evaluation of the 1) co-creation-framework, 2) OGI ICT Toolkit, 3) acceptance and 4) Outcomes. The first two areas were evaluated in this first year report. The other areas can only be evaluated when the pilots are used in practice by a sufficient user-base. This will be evaluated in the other next two evaluation rounds.

The OGI co-creation framework evaluation revealed that the pilots collected information from their stakeholders, in particular civil society (people) and civil servants (government), but also from private sector (enterprises). The participation of these stakeholders helped to re-shape the initial objectives and pilots' plans. Also important insights into the main problems and solutions were created. Most pilots used Co-initiation and co-design, and in the next round focus on co-implementation and co-evaluation of OGI ICT Toolkit

The OGI ICT Toolkit was evaluated using a qualitative approach based on the ISO/IEC 25010:2011. Technical partners and pilots' leaders were interviewed and collected information about fundamental requirements and parameters for an ICT Toolkit development. Majority of the requirements and parameters already are successfully designed. Others will be implemented later. Considering the initial stage of development is not possible to perform a quantitative approach to check these parameter and requirements. The co-creation framework, OGI ICT Toolkit will be again evaluated in the next round of evaluations by using a combination of qualitative and quantitative approaches, together with acceptance and outcomes areas.

1   Introduction

This document reports on the evaluation activities and results gathered in the 6 pilot implementation of the OpenGovIntelligence (OGI) Project. This implementation is divided into four main parts. The first area is the evaluation of the co-creation user workshop and meetings. The second area concerns the evaluation of the OGI Information and Communication Technology (ICT) toolkit. The third area is the acceptance of the OGI ICT toolkit by users. The fourth area is the evaluation of the outcomes of pilots', which includes factors like transparency, time reduction and efficiency perception.

This report describes the development of first year of OGI project. This report describes the evaluation of the first (co-creation) and second area (OGI ICT toolkit). The third area, acceptance of OGI ICT Toolkit and the fourth area, outcomes, are out of the scope of this report. The number of users should rise and outcomes generated before this can take place. The evaluation of those areas will be included in the second and third round of pilots' evaluation.

1.1   Scope

The present document is the Deliverable 4.2 "D4.2 – Evaluation Results - First Round" (henceforth referred to as D4.2) of the OGI project. The main objective of D4.2 is to describe the pilot's results in this first year of OGI project and elicit the most important lessons and conclusions.

1.2   Audience

The audience for this deliverable is as follows:

- European Commission;
- Audience interested on exploitation of Linked Open Statistical Data (LOSD) on Data Cubes for public service delivery based on co-creation from external and internal stakeholders; and,
- OGI Project partners.

1.3   Structure

Further the introduction section, this report consists of four sections.

- **Section 2** presents the evaluation overview;
- **Section 3** contains the pilots' evaluation;
- **Section 4** is the OGI ICT Toolkit evaluation;
- **Section 5** shows the conclusions;
- **Section 6** has the references; and,
- **Section 7** provides appendices.

2 Evaluation Overview

The pilots are deploying the OGI ICT Toolkit to implement an application that can be used by others. To develop the pilots, the OGI ICT Toolkit will be used and tested and the co-creation framework is guiding the relationship between service providers and users. The results of the evaluation provides insights for further improvement of the OGI toolkit and for improving the evaluation instruments. This serves as input for the next two rounds of pilots plans and evaluations.

OGI project will be evaluated using six pilot projects, deep described at D1.1:

1. The Greek Ministry of Administrative Reconstruction (MAREG) (Greece);
2. Lithuania Enterprise (Lithuania);
3. Trafford Council (England);
4. The Flemish Government (Belgium);
5. The Marine Institute (Ireland); and,
6. The Estonian Ministry of Economics (Estonia).

The OGI environment provides an ICT toolkit comprising easy-to-use and user centric tools to facilitate the processing and use of Linked Open Statistical Data (LOSD). The pilots are executed to validate and prove the usability and effectiveness of OGI ICT toolkit to co-create and innovate ecosystems. The resulting app should be used by a variety of users which in turn should result in long term effects. Figure 1 summarizes the interdependencies and interconnections between the working packages (WP) of OGI project.
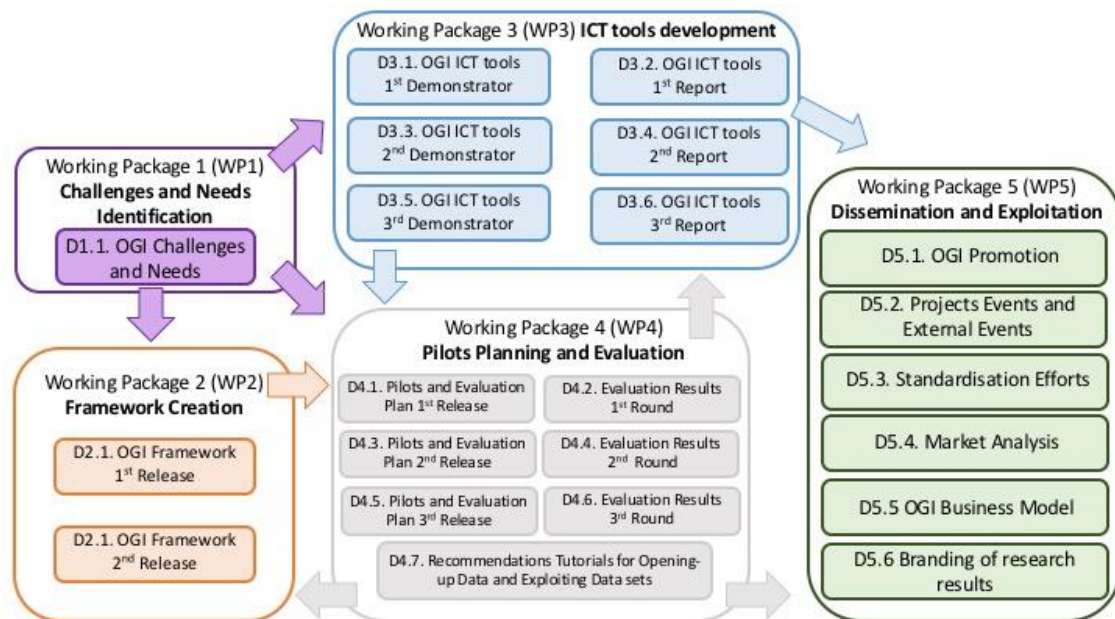
Figure 1- Interconnections and Interdependencies between OGI Working Packages and Deliverables

In an ecosystem, there are different stakeholders who view the pilots from their own perspectives. Developers might want to evaluate the pilots based on their ability to meet requirements, decision-makers might look at the impact of the applications on the number of users and return on investment, policy-makers in terms of societal impact like reducing administrative burden, the creation of transparency and its contribution to solving societal problems, and end-users for

satisfying their needs. Hence, evaluation needs to take into account the multiple stakeholders' perspectives.

2.1 Evaluation Methodology

Based on the stakeholders' perspective four areas to be evaluated were derived. These areas were presented in D4.1 and contain the following;

1. The first area is the co-creation framework (co-initiation, co-design, co-implement and co-evaluation). This is relevant for those who are innovating and for developers who want to derive the requirements.
2. the second OGI solution platform (ICT building blocks and cubes design). This is primarily relevant for developers who build applications.
3. the third the acceptance of OGI ICT toolkit. Users should accept and use the toolkit. The more users the more impact can be generated.
4. the fourth are the outcomes (estimative money savings, time reduction, efficiency perception of service delivery and transparency). The outcomes are of relevance for the decision-makers, but also for the society. At the end, the purpose is to create societal value.

Those four area are summarized on the Figure 2. The area about OGI solution platforms contains the development of the building blocks contributing to the platforms and the use of the platforms and its building block for developing the apps in the pilots. Both are closely connected to each other and therefore are integrated together.
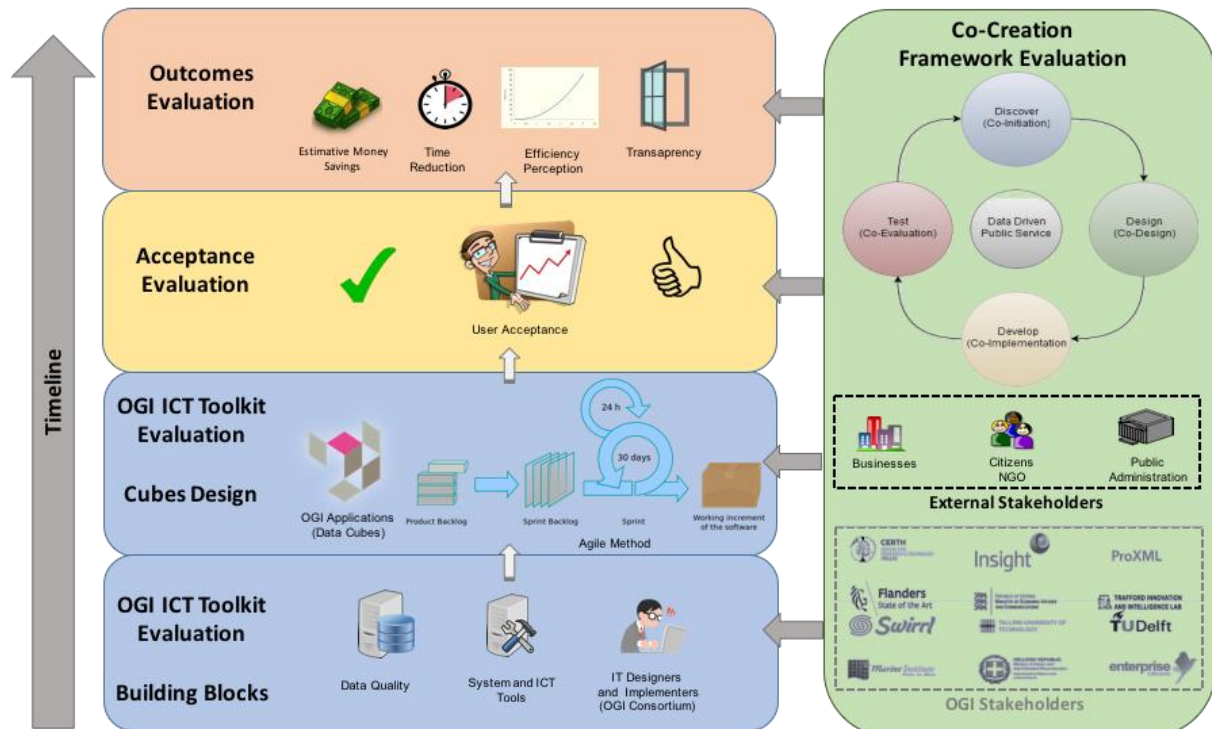
Figure 2 - Evaluation dimensions

The co-creation framework is described in detail in Deliverable D2.1, in the WP2 Framework Creation. The OGI tool kit is also described in detail in Deliverable D3.1, in the WP3 ICT Tools Development. Furthermore, this report is linked to D1.1 OGI Challenges and Needs, as part of the WP1 Challenges and needs identification. Those interconnections are visualized in Figure 1.

Pilots are organized in three main iterations in which each time the OGI toolkit will be more advanced and further developed. This agile way of working enables relatively short cycle-times and quick improvements. Furthermore, functionalities can be evaluated:

1. The first (initial) iteration resulted in an early version of the evaluation of OGI services and tools. This feedback will be used to further improve the OGI toolkit

2. The second iteration will be uses to develop a more advanced version. Again, this feedback will be used to further improve the OGI toolkit;

3. The final iteration of pilots will o benefit from the lessons learned in the first two pilot iterations.

Figure 3 illustrates the tasks involved in planning for and conducting a pilot and shows the OGI phase during which each of these activities might occur. The timeframe is presented at Section 2.2. Although this is presented in a waterfall manner, this is only for communication and planning purposes and the actual way of working is agile embracing user-oriented development.
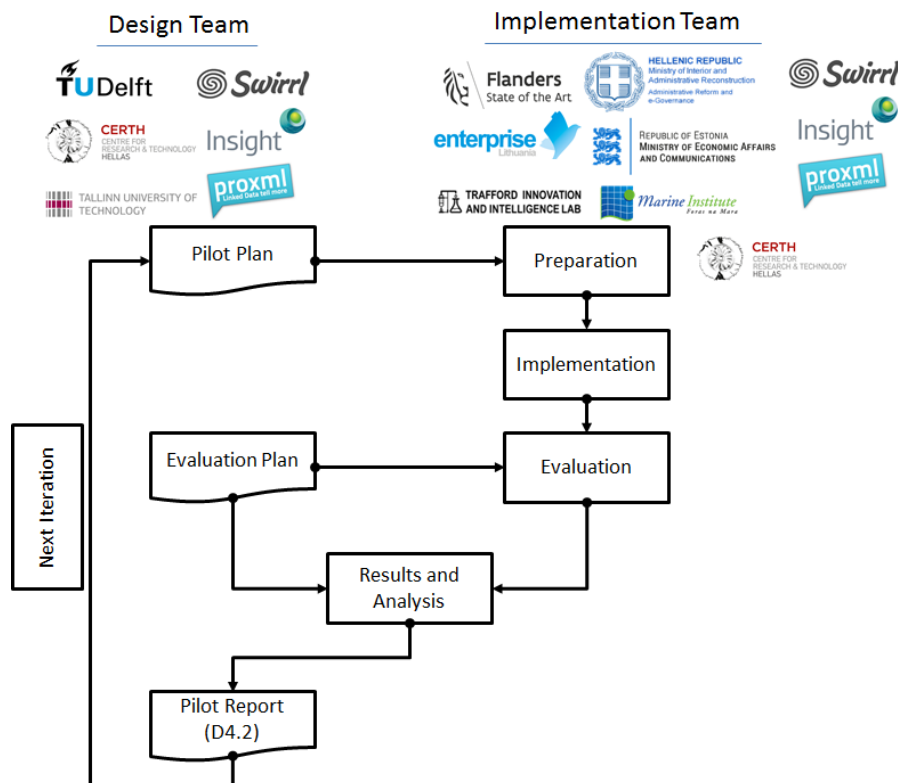
Figure 3 - High Level Processes of Pilot Plan

The pilot design team is responsible to create the pilot and evaluation plan (Deliverables 4.1, 4.3 and 4.5) as well as pilot report (Deliverables 4.2, 4.4 and 4.6). This team consists of the research and development partners in the OGI consortium. The pilot implementation team is responsible to execute the pilot projects based on the plan created by pilot design team described on this report D4.1. Pilot implementation will be divided in three main actions:

1) **Preparation**: the part that deals with collecting needed information from the pilots to fill the implementation template;

2) **Implementation**: the part that executes the implementation of the OGI toolkit and co-creation framework on the pilots by technical partners; and,

3) **Evaluation**: the part that measures the success of outputs and outcomes after implementation of OGI toolkit and co-creation framework.

The findings of the evaluation part of the second step (this report D4.2) will be analysed by the OGI Consortium. The result of this analysis will be used to create the pilot plan for the next iterative cycle (as example from this report D4.2, the next pilot plan D4.3). The objective is to identify challenges and needs to improve the implementation and evaluation of OGI toolkit and OGI innovation ecosystem framework at OGI pilots.

2.2 OGI Pilots' Timeline

Figure 4 - Pilots' Timeline

3   Pilots Evaluation

3.1   Pilot 1 – The Greek Ministry of Administrative Reconstruction (MAREG) Greece

3.1.1 Pilot description and expectation

The Greek Ministry of Administrative Reconstruction pilot is coordinated by the Greek Ministry of Administrative Reconstruction (MAREG) and has as initial objective to improve the monitoring and management of Government Vehicles used by all Greek Public Agencies. The data that the Ministry of Administrative Reconstruction possesses for this monitoring and management originate from different sources and have not been yet been properly defined, structured and combined in order to be converted to meaningful information, which will be facilitated internal decision making and increase transparency towards the public.

In terms of initial pilot construction, we have outlined the following for our first iteration.

Initial target groups:

1. Decision makers of MAREG

2. Public Agencies operating Government Vehicles

Initial functionalities

1. As a user I want to be able to have an overview of all Government Vehicles operating in Greece based on descriptive statistical measures
2. As a user I want to have an overview of all Government Vehicles operating in each Public Agency
3. As a user I want to have an overview of Government Vehicles per Municipality
4. As a user I want to have an overview of Government Vehicles per Prefecture
5. As a user I want to have an overview of Government Vehicles per Region
6. As a user I want to search municipalities according to their population and have an overview of the Government Vehicles operating in them
7. As a user I want to search municipalities according to their altitude and have an overview of the Government Vehicles operating in them

For a detailed description of MAREG and Greek pilot, please check report D1.1 and D4.1.

3.1.2 Pilot Co-Creation Framework Evaluation

MAREG invited pilot's stakeholders for this workshop with the objective to introduce them to the pilot's objective and extract from participants' useful inputs for Greek pilot and OGI ICT toolkit development. Important to highlight, all the workshops performed on this evaluation process were conducted using the Delbecq et al. (1975) methodology. Below, the list of Greek workshop objectives:

- Optimize monitoring and management of Government Vehicles
- Facilitate internal decision making
- Minimize operational costs related to Government Vehicles
- Increase transparency on data related to Government Vehicles

From this, the following questions were purposed to participants.

Table 1 - Co-Creation User Workshop Questions

Question number	Question
1	Describe the main problems encountered in your interaction with the Ministry of Administrative Reconstruction regarding Government Vehicles?
2	What do you think are the causes of these problems?
3	What are the proposed solutions to these problems?
4	How do you think the current pilot could help towards these solutions by using linked open data?
5	What useful information would you like to be produced by combining the data sets available?
6	How will this information facilitate your daily work?
7	What services do you think could be available to the public?
8	What data could be openly available to the public?

As the Greek pilot is mainly addressed to internal government users and it aims to facilitate internal decision making, use cases mostly refer to user's need for accurate information on Government Vehicles. This section presents two examples of such needs for reporting:

- The Ministry of Administrative Report needs to reply to a parliamentary question about the number of Government Vehicles that operated by all Public Agencies. He/She needs to have direct access to accurate data about the actual number of Government Vehicles, as well as statistical measures, such as their average cubic capacity, or their average fuel consumption per kilometre.

- Public Agency X requests the permission to acquire a new four-wheel drive 2.000 cc car. User Y of the Department in charge of Government Vehicles needs to get a detailed overview of how many Government Vehicles operate in each Public Agency, as well as a summary of their technical specifications (e.g. average cubic capacity).

After 30 minutes of ideation, participants were invited to explain their perspectives, bringing ideas and solutions for the issues identified on the questions at Table 1.

Table 2 - Summary of Ideas and Solutions from participants

Problems	*Solutions*
Data Quality	Open API Solutions, Automatic dataset updates, Manual data cleansing
Data Integrity	Involve government agencies
Data is not open	Open API solutions, common license template
Data sets are not linked	Use OGI Tools to link datasets
Reports from data needed	Use visualization tools and link datasets to derive reports

The main data set which contains descriptive data about Government Vehicles consists of data that were collected casually by means of a spreadsheet template that was sent to all Government Vehicles beneficiaries and were not extracted from an Information System. This spreadsheet template did not follow any standards, nor had any specific guidelines, which resulted in ad hoc data entry by users. This is the most serious problem recognised at the workshop and different solutions were suggested for it by participants.

The problem of data integrity was also connected with the method of data collection, as well as with the non-existence of an Information System available to end-users, who would also contribute in data updates. In the current situation, Government Vehicles data needs to be updated manually by users of the Ministry of Administrative Reconstruction. The OGI project will therefore serve as an opportunity to review available datasets.

The problems of data not opened and not linked to each other, as well as the lack of standardised reports that would facilitate internal decision making are also connected with the absence of an Information System for Government Vehicles and shall be addressed by the OGI project.

The list of organisations in order in English is presented below:

1. Ministry of Administrative Reconstruction (MAREG) – OGI Research team;
2. Ministry of Administrative Reconstruction (MAREG) – Government Vehicles Department;
3. Ministry of Infrastructure, Transport and Networks;
4. Hellenic Police; and,
5. Ministry of Finance – Public Property Management Directorate.

3.1.3 OGI ICT Toolkit Evaluation

3.1.3.1   Data Sets

Below the list of data sets used on the Greek Pilot:

1. Data describing Government Vehicles

Below the list of data sets that will be used in the future:

2. Data on the lifecycle of Government Vehicles
3. Data on the operation and maintenance of Government Vehicles
4. Statistical data on Greek Public Agencies and their personnel

5. Statistical data on Greek Municipalities, Prefectures and Regions (describing their population, their topography, their climate etc.)

A sample of data sets in both not linked (CSV file) and linked (RDF) are stored here: https://drive.google.com/open?id=0B0_fFuauifo0M1V2REl2OG13QTQ.

3.1.3.2 OGI ICT Toolkit Screenshots

The next figures present the screenshots of OGI ICT toolkit using data sets from the Pilot.
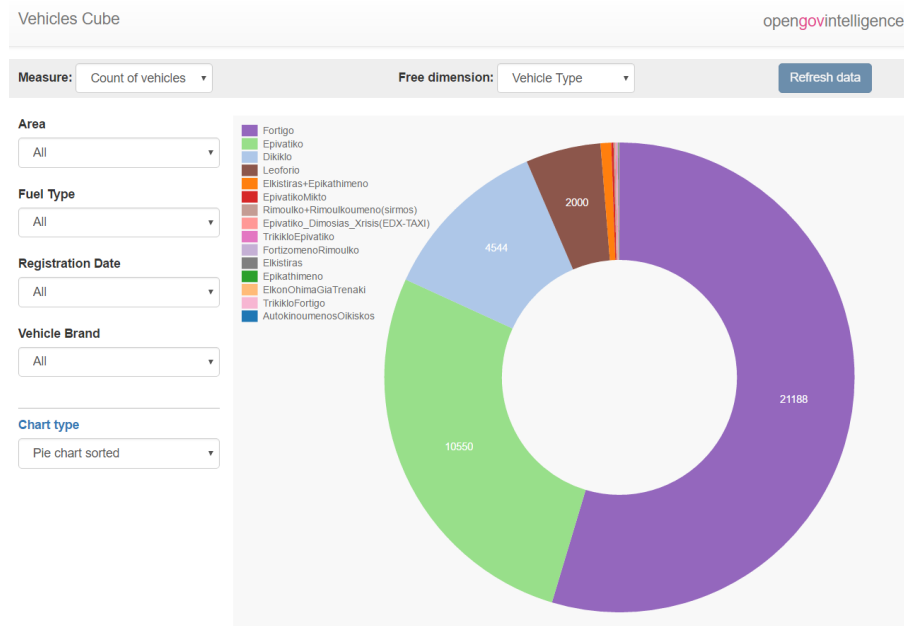
Figure 5 - Pie Sorted Graph Vehicle Type
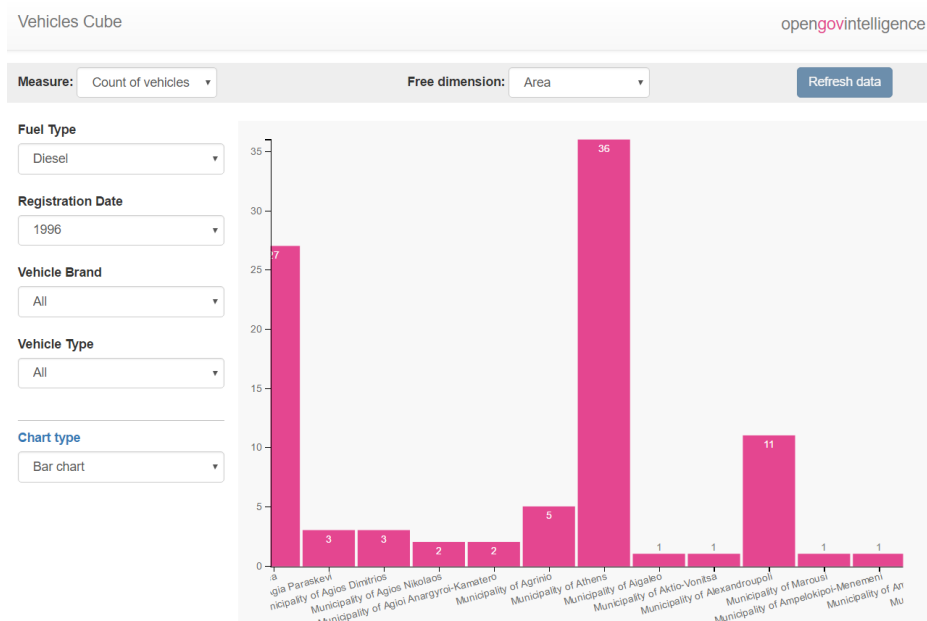
Figure 6 - Bar Graph Filtered by Area (Municipality)

3.2 Pilot 2 – Enterprise Lithuania (Lithuania)

3.2.1 Pilot description and expectation

Enterprise Lithuania will use OGI ICT Toolkit to extend service provided by Lithuanian pilot. The objective is to identify the needs of business for exploiting LOSD, developing new user-friendly tools for businesses to help them benchmark their business ideas in the overall context of Lithuania business, providing tools for enabling businesses create applications using LOSD, and helping businesses create value from LOSD.

For a detailed description of Enterprise Lithuania and Lithuanian pilot, please check report D1.1 and D4.1.

3.2.2 Pilot Co-Creation Framework Evaluation

From this, the following questions were purposed to participants.

Table 3 - Co-Creation User Workshop Questions

Question number	Question
1	What type of data (open data) is available to be used? What are the forms to access them?
2	What are the Data quality issues on your data sets or accessing data sets already opened?
3	What are the legal barriers to use and access the data sets?
4	What are the needs of Lithuanian Pilot users, how could this service benefit them?
5	Which functionalities, features and datasets could be useful for pilot users?
6	

Two user scenarios were defined.

1. "Julie has a children's clothes shop in Vilnius and she is doing so well that she decides to expand her business to another city. She needs to know where is the best place to open another shop and where is the highest concentration of children, the city with the highest income and where is the lowest competition. She knows that the data is available in the Lithuanian one-stop-shop for business. She uses the LOSD tool and finds out that the best place to expand, according to the statistical data, is Siauliai city."

2. "John has small IT company (IT services for medium and large companies) in London and he wants to open new branch in Lithuania. He needs to know where is the best place to open branch and where is the highest concentration of young people (21-35 years old) [from

data set – "Resident population at the beginning of the year (by age groups)"], what is average earnings [from data set – „Average earnings (monthly (2015))"] and municipality with highest rate of foreign direct investment [from data set –"Foreign direct investment per capita at the end of the year"]. He knows that the data is available in the Lithuanian one-stop-shop for business. He uses the LOSD tool and finds out that the best place to expand, according to the statistical data, is Vilnius city municipality. But John wants more information (e.g. about education (by sectors), unemployment rate (by sector), etc.). He uses smart feedback tool to inform the Lithuanian one-stop-shop for business about his needs to analyse additional criteria (new data sets). After few days Lithuanian one-stop-shop for business adds new criteria (new data sets) and informs John by email about these improvements".

The summary of problems and solutions from participants is presented on the table below.

Table 4 - Summary of Ideas and Solutions from participants

Problems	Solutions
Data Sets are nor Linked	Encourage government to open more data sets. Funds to support initiatives must be addressed to municipalities.
Data Quality	Quality of data does not reflect reality due a list of issues as example lack of collection, storage and centralised databases.
Civil Servants Capacity Building (Skills and experience)	Civil servants are not prepared to deal with LOSD and opening-up data sets.
Data Integrity	Involve government agencies to work together for better interoperability between databases and data sets.
Data Format (not open)	Opening-up more data sets in programming formats such as Application Programming Interface (API)
Lack of Metadata and low quality of data sets description	Metadata is still missing. Effort on creating metadata to give context on data sets.
Interactive Functionalities on Online Platform (Data Vis, Table for comparison, etc.)	Management level has no skill to develop properly data analytics and data visualisation projects. Government can create an environment helping them to data driven decision-making.
Reports from data needed	Use visualization tools and link datasets to derive reports

Considering the answers from participants, Lithuanian pilot can be considered on an initial maturity stage on opening-up and linking data sets. This clearly influence on the needs from stakeholders. Demands like low number of data sets opened represent a big issue on creating "good" quality of LOSD. Without open data, is not possible to create LOSD and even harder to create more interactive functionalities on a potential online platform, such as OGI ICT toolkit can provide.

The lack of metadata influences on the level of transparency and accountability. If new business people cannot understand what or where is the data sets, they are unlikely to create data-driven

decision-making. The provided examples of user scenarios represent this type of case. People looking for data, but cannot find or identify the relationship between them.

The list of participants is presented below:

- Government of the Republic of Lithuania;
- Information Society Development Committee under the Ministry of Transport and Communications (ISDC);
- Vilnius city municipality administration;
- Infobalt
- Kaunas University of Technology
- Mykolas Romeris University
- E TRADE, UAB
- Lithuanian Free Market Institute

The workshop also had a questionnaire evaluating the performance of workshop and feedback to the mediators, in this case, Enterprise Lithuania. It is summarized at Section 7.1.1.

3.2.3 Pilot OGI ICT Toolkit Evaluation

3.2.3.1   Data Sets

Below the current list of data sets used on the Lithuanian Pilot:

- Resident population at the beginning of the year (by age groups);
- Average earnings (monthly (2015)); and,
- Foreign direct investment per capita at the end of the year.

More data sets can be opened and linked taking in consideration the future needs of Lithuanian pilot. The sample of data sets are here: https://drive.google.com/open?id=0B0_fFuauifo0NmIzZFdqeTVDWjg

3.2.3.2   OGI ICT Toolkit Screenshots

The next figures present the screenshots of OGI ICT toolkit using data sets from the Pilot.

Figure 7 - Table with bar chart functionality

Figure 8 - Table with colour cell functionality

3.3   Pilot 3 – Trafford Council (England)

3.3.1 Pilot description and expectation

Trafford's Innovation and Intelligence Lab are working on using linked open statistical data to help support decision making relating to worklessness. They are working closely with Swirrl, who are handling the more technical aspects of modelling and storing the linked data. The goal is to build a tool that will bring together data from a range of sources to help understand the factors that contribute to, or are impacted by, worklessness. Representatives from the Department for Work and Pensions; Trafford's Economic Growth Team and the Greater Manchester Combined Authority are also involved.

For a detailed description of Enterprise Lithuania and Lithuanian pilot, please check report D1.1 and D4.1.

3.3.2 Pilot Co-Creation Framework Evaluation

Trafford Council provides services to around 226,000 people. It is part of Greater Manchester and works actively with other neighbouring councils to share ideas, innovations and in some cases services. A priority for Trafford is economic growth: to support businesses, to create jobs and to tackle unemployment and the social challenges that brings.

Trafford is a leader in the UK in bringing digital innovations into its working processes. It was identified by the UK government as one of the 'Open Data Champions16': a group of local government organisations within the UK doing the most to promote and exploit open data. Trafford Council has established an 'Innovation and Intelligence Laboratory'17 to bring together data and information specialists from many organisations who work on challenging problems for the public sector in Trafford. The Innovation Lab has four priorities: Mental Health, Aging Population, Unhealthy Weight and Worklessness.

The purpose of the workshop was to:

1. Raise awareness of the Trafford OpenGovIntelligence project;
2. Understand the current service provision and delivery environment;
3. Identify opportunities and challenges for future service delivery;
4. Engage stakeholders and end users in developing the project, including setting the project objectives; and,
5. Develop a single multi-agency project delivery plan with key milestones, roles and responsibilities.

One scenario was selected to be part of OGI Trafford pilot. It will concentrate on worklessness, within these priority areas, the objectives are to:

- help to reduce demand on services
- help to redesign services
- improve people's awareness and understanding of the area
- help to attract or retain investment

Trafford is responsible for a varied area, incorporating both deprived inner city communities, rich commuter-belt communities, Trafford Park – the largest industrial estate in Europe employing around 35,000 people in 1400 companies, (and also 'Old Trafford', the home of Manchester United football club). The pilot will focus on innovate generation and application of data from a range of sources to tackle the problems of worklessness:

- measuring and attempting to match demand for and supply of skills, gathering data from job-seeking individuals and from businesses
- seeking to use data and digital technology to find new approaches to assisting workless people
- profiling the economy, skills base and assets of the area to identify potential improvements, and to help attract new companies to invest in the area

The pilot will include investigation of new methods of data collection from local businesses and citizens. The pilot will both generate requirements for and evaluate and exploit tools to be developed in OGI for combining, analyzing and visualizing statistical data. Trafford is the lead council for the topic of worklessness in the Association of Greater Manchester Authorities, so innovations arising from the project will have their impact enhanced by a direct route to replication in other areas.

The follow questions were made to the audience:

Table 5 - Co-Creation User Workshop Questions

Question number	Question
1	Can you tell us a bit about your role in the project?
2	What do you feel are the key aspects of your pilot in the project?
3	Which audience do you want to reach with your pilot?
4	How are you going to reach your target audience for the pilot?
5	How are you going to ensure user engagement?
6	How are you going to publicise it?
7	What do you feel are the main advantages of using multidimensional statistical data?

The summary of problems and solutions from participants is presented on the table below.

Table 6 - Summary of Ideas and Solutions from participants

Problems	Solutions
Not live data in reports	Interactive tool feeding in the most up-to-date information
Multiple reports required	Window view with wide selection of data behind it enabling the user to select multiple data sets
Spatial misalignment	Long-term – the success of the project could influence change in how data is collated
Accessing 'other' data	There will be multiple data sets available across a range of themes (work, housing, health, skills etc.)
Knowing who to go to for 'other' data	By acting as a first-point for all data, people will be able to build relationships across agencies and sectors as they use each other's data
Demand on InfoTrafford team	By making data more accessible and available, this will upskill people to be able to self-serve
Qualitative over quantitative	Available and accessible data will provide a balance to 'local knowledge'
Demand for information on policy staff	It will be quicker to respond to queries (and should enable more self-service by senior officers)
Time delay in official release of data	Long-term – the success of the project could influence change in when data is released
Comparing appropriate data	The tool will make this easier and will explain when this is not possible. Long-term – it encourages more open data in standardised formats

Taking in consideration the capacity building from Trafford Pilot, mainly the Innovation and Intelligence Lab and the tradition to opening-up data sets, lead this pilot on a mature stage of technical area. For example, demands like "new functionalities" and "high level of report automation" reveals high expectation of this pilots' stakeholders.

However, Trafford is starting a new project based on the OGI co-creation framework. It takes time to learn and put on practice the co-creation procedures. For example, identifying all stakeholders, user workshop for referendum of ideas, objectives, inclusion of new demands from stakeholders, collection of new data sets, opening-up and linking them are processes that take more time than regular top-down approach, even based on data-driven services that Trafford Innovation and Intelligence Lab is used to perform.

After the co-creation process, Trafford pilot will concentrate on worklessness. The Initial objectives discussed are in regular format and **italics** added from co-creation user workshop. Within these priority areas, the objectives are to:

- help to reduce demand on services – *using open shared data to direct more effective service interventions and enhance partnership collaboration, reducing duplication*

- help to redesign services – *enabling efficient resource planning through evidence-based decision-making*
- improve people's awareness and understanding of the area – *increasing local insight by providing an accessible, agile and easy-to-use data and information tool*
- help to attract or retain investment – *targeting the use of public sector people, funding, assets and resources to reduce worklessness and increase skills*

The list of participants:

1. Trafford Council – Economic Growth and Prosperity;
2. Trafford Council – InfoTrafford;
3. Trafford Council – Partnerships and Communities;
4. Department for Work and Pensions; and,
5. Greater Manchester Combined Authority.

3.3.3 Pilot OGI ICT Toolkit Evaluation

3.3.3.1   Data Sets

Existing data sets from the Department for Work and Pensions, from the Office for National Statistics and other central government sources, alongside data from Trafford Council itself, will be combined with new data sources collected through the activities of the Innovation Lab. These will include:

- Benefit claimant counts;
- Employment;
- Income;
- Educational qualifications;
- Registered businesses;
- Gross value added; and,
- Infrastructure (such as transport).

The link to all data sets is here: https://data.gov.uk/data/search?q=trafford

3.3.3.2   OGI ICT Toolkit Screenshots

The next figure presents the screenshots of potential OGI ICT toolkit interfaces and functionalities using data sets from the Pilot.
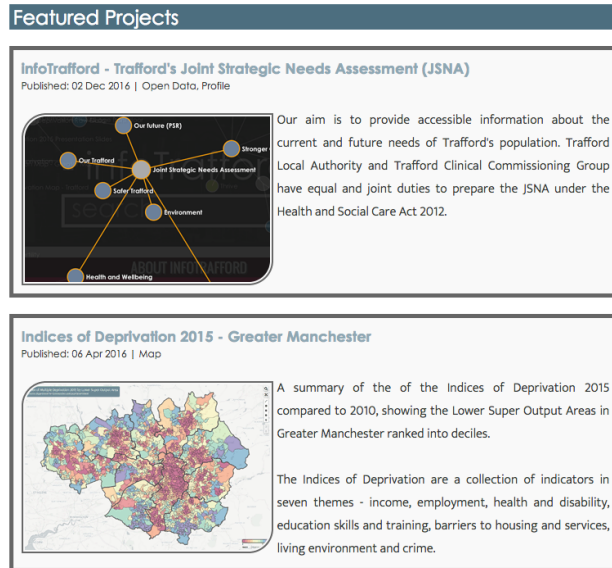
Figure 9 - Potential projects to be developed by Trafford
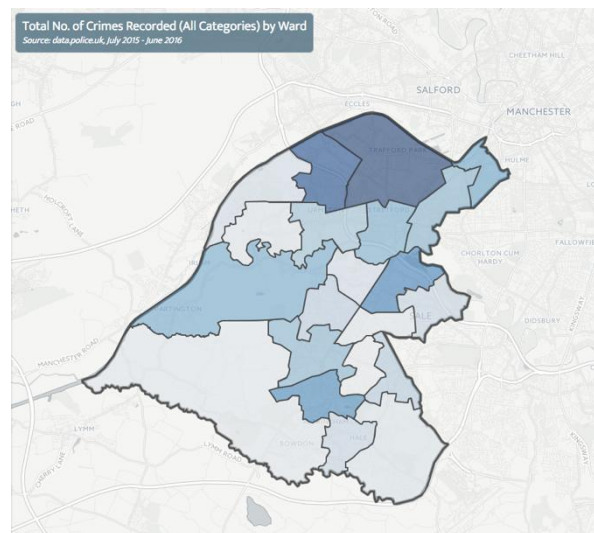
Figure 10 - Heat Map Total number of Crimes Recorded all categories in Trafford

3.4 Pilot 4 – The Flemish Government (Belgium)

3.4.1 Pilot Description and Expectation

The Flemish Government will use OGI ICT Toolkit to enhance their environmental policy making in terms of timely publication of the actual state of affairs related to environment, evaluations of the permits policy, and develop tools to benchmark the pollution of companies to others working in the same economical domain.

For a detailed description of Enterprise Lithuania and Lithuanian pilot, please check report D1.1 and D4.1.

3.4.2 Pilot Co-Creation Framework Evaluation

Instead of workshops, the Flemish pilot made a series of interviews with stakeholders due the high numer of people involved. The drivers of the interviews were:

- What is the link of your business with the environmental permits?
- What kind of data from the permit would you like to have in a structured format?

There were two types of questions, business related and data related. It is presented on the table below.

Table 7 - Questions made to the audience

Question number	Questions
Business Related Questions	
1	Do you give permissions?
2	Do you advise about permits?
3	Do you have enforcement tasks?
4	Do you yourself manage a base registry and what is the link with permits?
5	What would be the added value of a basic registry of environmental permits for you business?
Data-Related Questions	
6	What administrative data do you want to have? (decision date, issuer, type of procedure)
7	What kind of data would like to have on an exploitation level (emissions, time series of permitted and effectively emitted emissions, Environmental impact assessment reports)
8	What kind of spatial data would you like to have that is created during the permitting process?

Table 8 - Summary of Ideas and Solutions from participants

Problems	Solutions
No central register of permits	Legislative action to see that all permitting authorities register permits. Documents as well as structured data; Building a basic register centrally to which data can be sent.
No publication of emission data in LOSD format	Publishing data via LOD technology; Reuse of existing data sets, as example European Environment Agency; Adding new vocabularies on existing vocabularies.
No re-use of data gathered during permission processes	Legislative action to see that all permitting authorities register permits; Documents as well as structured data building a basic register centrally to which data can be sent.
No re-use of data from base registries	Re-use of data from base registries; Starting program to publish base registries also via LOD technology.
No base registry build-up	Legislative action to see that all permitting authorities register permits; Documents as well as structured data building a basic register centrally to which data can be sent.
No possibility of linking permission data with emission data	Publishing data via LOD technology; Reuse of existing data sets, as example European Environment Agency; Adding new vocabularies on existing vocabularies.
No possibility of linking permission data with enforcement data	
No possibility of linking permission data with data of new permissions for same exploitation	
No possibility of benchmarking for legal persons	Providing online analysis possibilities for for example benchmarking
No possibility of data analysis	Providing online analysis possibilities
No possibility of data-driven policy-making	Providing online analysis possibilities
Data in general is locked in silo's	Publishing data via LOD technology; Reuse of existing data sets, as example European Environment Agency; Adding new vocabularies on existing vocabularies.
Data is not very accessible	Publishing data as LOD under open data licence: Providing analysis and reporting tools; Starting LOD program to publish data in LOD way and as part of process of the organisations. Not as extra work.

Considering the issues and solutions purposed by participants on the Belgium pilot, we can point out that this pilot is on a mature stage of technical aspects. For example, while data is not accessible because IT departments silos and lack of legislation to cooperate, we can identify capacity building with high level of skills due the demands such as desire to "link" and "data-driven service" to "benchmark" individual cases on an "automated way".

However, as Trafford pilot, the Flemish government is starting this project from the scratch if co-creation framework is considered. The pilot partners reunited all the stakeholders and identified that face a bigger problem. More data sets were identified and probably will be opened and linked to enable the creation for functionalities and services demanded by all stakeholders. As example, there is no way to create dashboards with real-time data sets without connecting and linking them before.

The list of participants is below:

- **Administrations on the federal level**
    - o Public health administration
- **Administrations on the Flemish level**
    - o Department of environment nature and energy,
    - o Agency for forest and nature,
    - o The heritage agency,
    - o The environmental planning and permit department.
    - o Public waste agency of Flanders,
    - o Flemish energy agency,
    - o Flemish land Agency,
    - o Flemish agency for regulation of the energy market
- **Administrations on the province level**
    - o PVV (Organisation representing the 5 provinces together with people representing every individual province).
- **Administrations on the community level**
- **Vereniging van Vlaamse Steden en Gemeenten (VVSG)**
    - o Organisation representing the 308 communities together with people representing the communities of Gent, Genk, Antwerp, Leuven and Kortrijk.

3.4.3 Pilot OGI ICT Toolkit Evaluation

3.4.3.1   Data Sets

The data sets are already in RDF format and with metadata. The link to access data seta are at: https://id-ontwikkel.milieuinfo.be/dataset/imjv#id

Figure 11 - Metadata of Belgium Pilot Data Set

3.4.3.2 OGI ICT Toolkit Screenshots

The next figure presents the screenshots of OGI ICT toolkit using data sets from the Pilot. The platform is on a different address of other pilots:
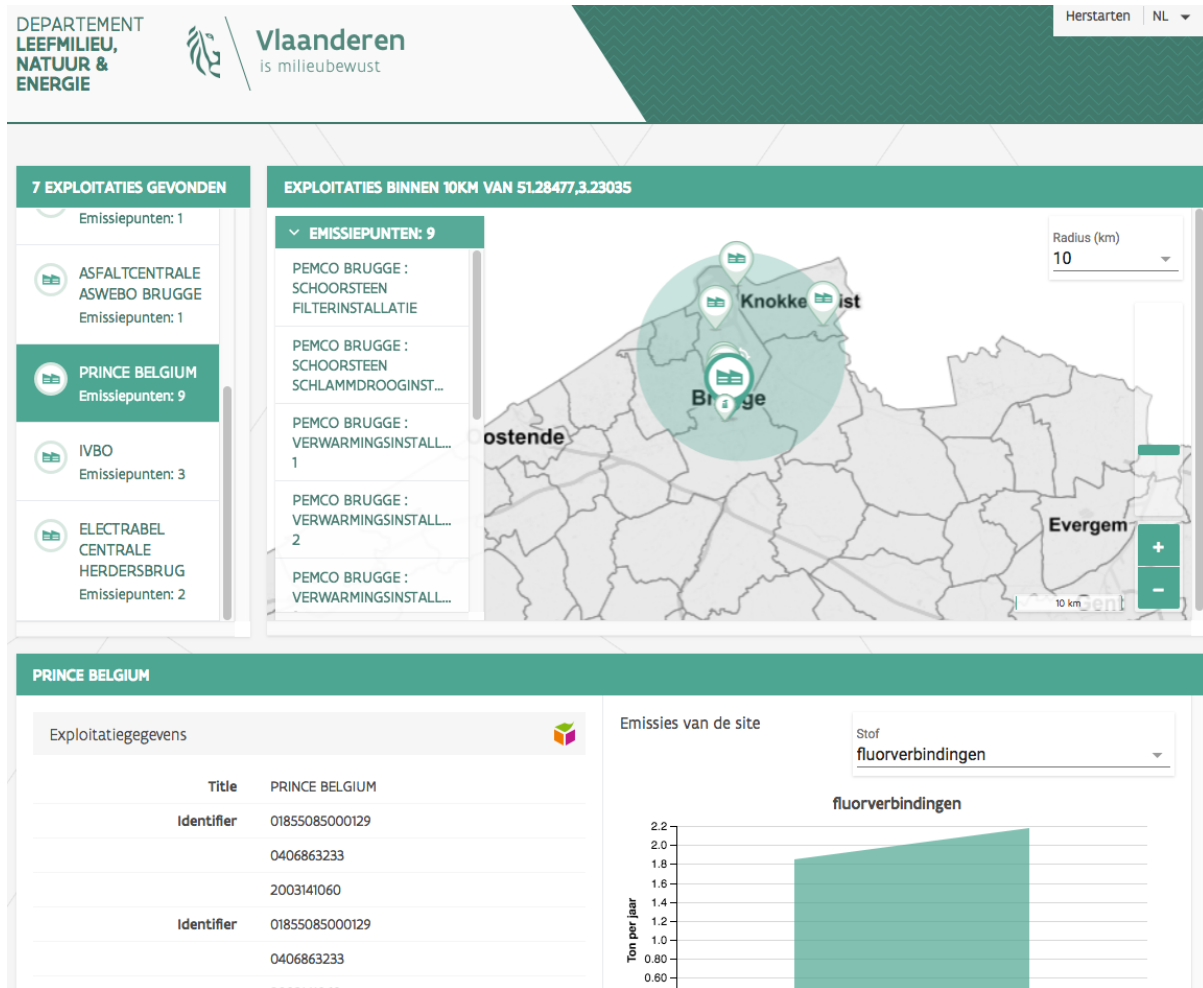
3.5 Pilot 5 – The Marine Institute (Ireland)

3.5.1 Pilot description and expectation

The Marine Institute pilot, in Galway (Ireland), aims to support three business cases scenarios:

1. Marine renewable energy
2. Maritime search and rescue; and,
3. Maritime tourism and leisure.

The function of the pilot will be to take non-linked tabular Comma-Separated Values (CSV) data hosted by the Marine Institute and convert it to Linked Data formats using Data Cubes. Using Linked Data Resource Description Framework (RDF) the new structured data management will enhance the value of the marine data asset for the scenario purposes by structuring and enriching the data with vocabularies and semantic value to aid the requirements of the scenarios.

The building of a Linked Data Dashboard to include data visualisations such as charts, maps and widgets of marine Linked Data will support decision making scenarios for actors making a renewable energy investment decision, a search and rescue expert in rescue and recovery and a maritime sports enthusiast in their maritime sport.

For deep description of Marine Institute and Irish pilot, please check report D1.1 and D4.1.

3.5.2 Pilot Co-Creation Framework Evaluation

A number of significant barriers to co-creation of data-driven services in the Marine sector were identified by stakeholders. These barriers can be divided into two higher level categories (Data Infrastructure, and User Challenges), each of which contain a number of sub-categories. Examples of barriers from these categories and sub-categories are provided below.

The initial options proposed by workshop participants opened the possibility space for the creative thinking in the next phase of the workshop, which involved participants working with specific user scenarios and generating key needs and requirements of stakeholders involved in co-creation of services in the Marine sector.

These sceanrios involved hypothetical users including citizens, public administrators, data scientists, engineers, and other stakeholders. The During this section of the workshop, participants highlighted an extensive range of 1) Informaiton needs, and 2) Decision-making needs. Informaiton needs, refers to types of information or data which are needed for co-creation in the Marine sector. In relation to decision-making needs, participants were asked to generate a list of key tools, services, affordances or other types of supports which would aid in decision-making.

The scenarios purposed to participants were:

1. **Engineer Ed** is considering developing a wave energy converter and would like access to real-time data on wind, waves and currents generated by multiple public organisations through one web-based location in order to predict the performance of his device and to monitor its safety once it is deployed in the environment. Ed needs to know when a high energy wave event is happening in order to provide decision support to Technician Tony. When Ed and Tony are in agreement that the environmental conditions are in danger of

causing damage to their ocean energy converter, they need to be able to shut it down in order to protect it. In support of the data, it would be useful to Ed to have easy access to supporting information (such as the Offshore Renewable Energy Development plan) from the data access site. This is useful for Ed and Manager Mike when they are choosing potential locations in which to deploy their ocean energy converters. Deputy David also uses this supporting information in the portal when lobbying the minister to encourage central government policy on marine renewable energy development.

2. **Captain Cillian** is a racing sailor looking to gain a competitive edge in his races on Galway Bay. He'd like to be able to access tide predictions, wind data and current speeds in a format which he can upload into his sailing computer so he can plan his races. On shore Commodore Colm would like to receive the locations of each of the sailing vessels in the races he organises so he can better plan safety operations associated with those races. Public Administrator Patricia examines race activity data and service usage in order to plan and inform policies in relation to boat racing activities.

3. **Sergeant Steve** is coordinating a search and rescue operation. He needs to know both the current conditions in the waters around the coastline, where his teams can access the shorefront and where an object which has been dropped into the water is likely to be since it entered the sea. Garda Grainne is a member of Steve's team. She should be able to return information, such as geo-located photographs, to Steve so that he can be kept up to date of the search team's location and conditions. In addition to the public authorities, Volunteer Val is a member of the public involved in searching the coastline. The volunteers should have access to the same apps and much of the same data as the authorities, but some information may not be available to the volunteers. Inspector Ian and Coastguard Chris review the information collected by the app after each rescue to build up dataset which allows them to develop local search and rescue policies.

4. **Drone pilot David** enjoys flying his device in coastal areas. He occasionally spots strange patterns on the water surface and would like help in identifying what these are. He would like to submit them to a web portal where an expert can tell him what he's seeing. Biologist Brenda logs in to the web portal to see if there is anything of interest to her. She sees one of David's photos from a flight earlier today. Brenda can use any identification she makes to alert authorities of any potential harmful algal blooms. Other experts can confirm Brenda's identifications and engage in further analysis of other images uploaded on the system. These expert identifications and alerts may be used alongside model outputs and processed satellite images to inform policy on keeping open or closing aquaculture sites.

Participants generated a total of 40 barriers in relation to Data Infrastructure. The following sub-categories emerged from the full Data Infrastructure set: Accessibility, Awareness and Engagement, Connectivity, Data Management, Lack of integration and collaboration, Policy Issues, Quality Issues, and Service and Resources Issues. Table below provides a sample of barriers in each sub-category.

Table 9 - Sample Data Infrastructure Barriers

Sub-category	Barrier
Accessibility Issues	Lack of intuitive service design, such that training is not required Lack of open access data – can everyone who wants to access the data get to it?
Awareness and Engagement Issues	Lack of knowledge by experts as to what data is available Inadequate citizen data management expertise in people when collecting data on the environment including knowledge of controlled vocabularies, metadata, GIS, data enrichment value etc.
Connectivity Issues	Loss of data/connectivity during e.g. storms, which is often the time when the client wants to collect data Failure of adequate internal/ broadband availability nationwide
Data Management Issues	Lack of focus on which data to prioritize and assign investment and resources to; Lack of data sustainability, when projects end is the data still managed? Is it accessible?
Lack of integration/collaboration	Lack of integrated data infrastructure access; Unnecessary duplication of data by different agencies
Policy Issues	Legislative barriers and lack of legislation; Conflict between the multitude of European directives on the marine environment (e.g. MSFD, WFD, Shellfish, Habitats, EMFF) in terms of a harmonised data standard for information describing the marine environment.
Quality Issues	Lack of data quality control; Lots of gaps in data, no guarantee of quality.
Service and Resource Issues	Real-time data dimension; No marine alerter system for stakeholders.

Participants generated a total of 45 barriers in relation to User Challenges. The following sub-categories emerged from the full User Challenges set: Awareness and Engagement, Collaboration, Education and Training, Finance, Motivation, Needs Analysis, Policy Issues, Quality Issues, Resistance and Conflict, and Service and Resource Issues. Table below provides a sample of barriers in each sub-category.

Table 10 - Sample User Challenges Barriers

Sub-category	Barrier
Awareness and Engagement Issues	• Lack of public awareness to the data systems available • Understanding value of data to society
Collaboration Issues	• Lack of opportunities for users to engage with data developers/ technologists (stakeholder involvement in development) • Tunnel vision e.g. focus on organizing an event not on surrounding issues
Education and Training Issues	• Lack of adequate user experience in the relevant technologies • Lack of adequate ongoing training
Finance Issues	• Lack of funding for the "processing" of the data • Lack of financial resources
Motivation Issues	• Lack of public drive to get government to change • Lack of public drive to get government to provide the financial resources needed to ensure a robust system is in place
Needs Analysis Issues	• Going beyond mash-up is hard, need to identify services/ needs etc. • Lack of engagement with end users to develop targeted services
Policy Issues	• The silo effect, focus on the individual needs of a department, not looking at the bigger picture • Lack of vision at a high level
Quality Issues	• Lack of data quality standards • Lack of quality control of data and data delivery
Resistance and Conflict	• Resistance to using anything other than the old tried and trusted methods • Conflict between the different stakeholder stalling progress
Service and Resource Issues	• Lack of will at state level to push/implement broadband network • Difficulty of creating a data collection method that is sustainable and iterative

While these and other barriers highlighted many challenges, the expert group identified many options which could help to overcome these barriers. In thinking about and generating options, participants were asked to address three core stages of the co-creation process: Service Creation (ideas), Service Engineering (requirements, design) and Service Management (delivery, evaluation). Participants were asked to place their option beneath one or more of these headings, depending on the nature of the option, and it's relevance to overcoming barriers in one of more stages of co-creation. Again, participants worked across the higher-level categories of Data Infrastructure and User Challenges, which were divided into a set of sub-categories.

Participants generated 72 options for overcoming barriers to Data Infrastructure, 15 of which relate to Service Creation, 32 of which relate to Service Engineering, and 25 of which relate Service Management. In some cases, options were suggested by participants to be relevant to more than one stage, and thus are recorded as such in this report. Options within each of these three stages of co-creation were further divided into sub-categories. Tables 3-5 below provide a sample of options within each stage.

Table 11 - Service Creation - Sample options for overcoming barriers

Category	Option
Collaboration	• Encourage government agencies to work on a common data sharing framework • Build up groups when starting and create multi-agencies - get-togethers and get inputs
Education and Training	• Training for public servants in relation to data protection • Open data training for government
Finance	• Focus finance away from policy towards data as the key value in service development • A data sharing unit to identify cost savings and efficiency across the public service
Policy	• Enact data sharing and governance legislation • Build a long term sustainability plan into project applications
Services and Resources	• A government level data storage service • Develop a platform with plasticity to change in the future as user needs mature

Table 12 - Service Engineering - Sample options for overcoming barriers

Category	Option
Accessibility	• Formats - making datasets available - update data to new format • A system that can be accessed by most appliances, smart phones, iPads, radar chart plotters
Collaboration	• Co-ordinated field of data sharing with authorities • Key data "collectors" meet with a view to discuss and collaborate in future to "standardize" data collection and management
Quality	• Quality is a must so the intermediate and end user know the limits of the data used to create products • Use standardized date "flagging"/ annotation schemes (from e.g. UNESro) to identify data quality
Services and Resources	• A government level data storage service • Develop a platform with plasticity to change in the future as user needs mature
Tools	• Gather weather information via weather stations and ODAS buoys • Develop linked data transformation transformers and data mapping tools

Table 13 - Service Management - Options for overcoming barriers

Category	Option
Collaboration	• Access to servers/ hardware requires appropriate resources - collaborations can aid this • Build a system used by all (the team) entities e.g. a) input race data b) input incidents data c) input road closure data
Education and Training	• Citizen data management user guides and public sector domain data collection training • Training for public servants in relation to data protection
Policy	• Ensure that each public body has a data management plan which is adequately resourced • Identification of and promotion of best practice service standards to break data silos
Services and Resources	• A central document is collated on existing resources/databases/services like a systematic review as a start point • Investigation of new IoT methods for data collection (e.g. sig fox, LoRa) to minimise downtime
Tools	• Back up sensors that can be used in the event of a breakdown at critical times • Create software to identify bad data and broken sensors

Participants generated 48 options for overcoming barriers to User Challenges, 20 of which relate to Service Creation, 16 of which relate to Service Engineering, and 12 of which relate Service Management. Again, in some cases, options were suggested by participants to be relevant to more than one stage, and thus are recorded as such in the tables. Options within each of these three stages of co-creation were further divided into sub-categories. Tables 6-8 below provide a sample of options within each sub-category.

Table 14 - Service Creation - Options for overcoming barriers

Category	Option
Awareness and Engagement	• Technology road shows on the coder dojo model known as the technology dojo for public • Promote data availability/ service availability, create awareness
Education and Training	• Provide ongoing training for all users of public data • Educate government employees and public about what directives are about and why they should care
Needs Analysis	• Find out what exactly user needs + who are the potential users • Avoid unnecessary cost by knowing or being able to access info on what data is already available

Table 15 - Service Engineering - Options for overcoming barriers

Category	Option
Awareness and Engagement	• Technology road shows on the coder dojo model known as the technology dojo for public • Promote data availability/ service availability, create awareness
Education and Training	• Induction courses when new employees start • Publish guidelines on best practices for methodologies. Maybe using non-technical language where possible
Needs Analysis	• Run service design workshops including end-users • Develop services/ apps from identified and documented user requirements (not because we can!)
Policy	• E.U. directive to encourage government drive
User-Friendly	• Creates simple mobile apps • Provide the user with an engaging, simple, and robust experience to move them on to their services

Table 16 - Service Management - Options for overcoming barriers

Category	Option
Awareness and Engagement	• Require a dissemination plan for all public projects • Identify forums for promotion of data services which will reach a wide audience
Collaboration	• Bringing businesses in as partners
Education and Training	• Training for people (possibly older people on using apps)
Infrastructure	• Real time services fail - is there backup
Policy	• State support to a single data structure

Finally, participants were asked to generate a set of co-creation contributions, again based on the four scenarios. Participants were asked to list specific contributions that each actor or co-creator in the scenarios could make, thereby highlighting opportunities for potential co-creation by means of a pooling of resources, expertise, and ideas.

In total, participants generated 77 co-creation contributions, across the following categories: Data provision, Expertise, Interpretation and Analysis, Modeling and Simulation, Networking and Promotion, Policy Input, Software Input, and Visual Data. The co-creation contributions suggested by partiicpants here, addressed all aspects of the co-creation stages discussed during the earlier options stage. That is, the contributions in Table 12 below, which provides a sample of contributions from each category, as well as reference to the specific scenario from which they were derived, contains contributions which address various aspects of service creation (ideas), service engineering (requirements, design), and service management (delivery, evaluation).
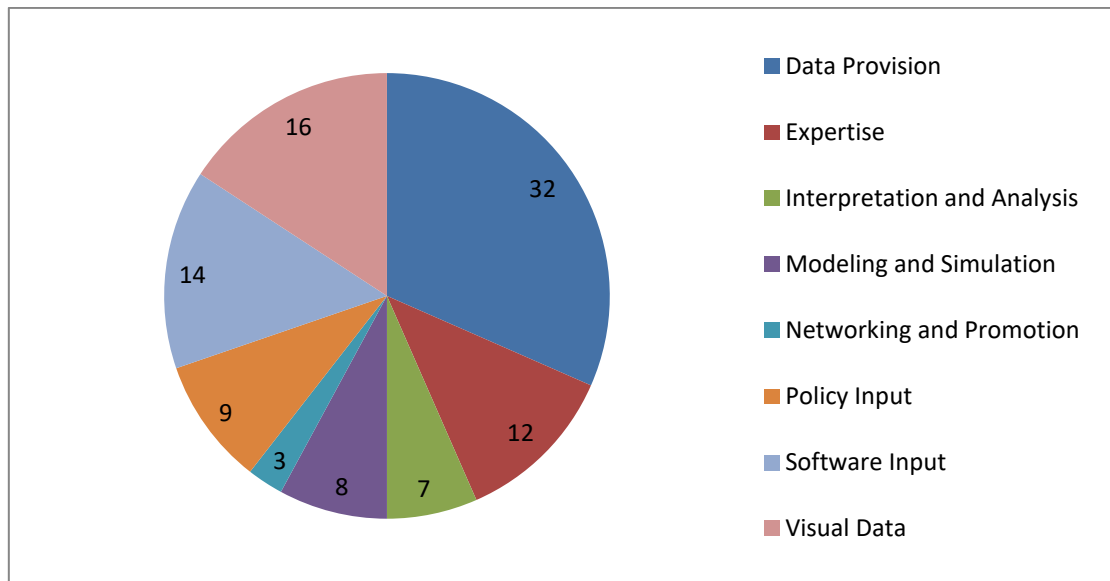
Figure 12 - Percentage breakdown of co-creation contributions

Participants also engaged in discussion around the broader challenges of effective and fruitful co-creation. It was highlighted that such complex scenarios, with multiple actors and contributions, may require an incremental approach, beginning with a core and concrete starting point – a foundation for additional actors and contributions to build upon.

This discussion then addressed the importance of validating and refining during development of co-created services, with regular input from multiple actors and users. Given the core focus on co-creation, this aspect was considered to be of great importance to participants.

Another point raised during the course of the discussion, consistent with some of the barriers highlighted earlier, was the importance of accessibility and user-friendliness. It was suggested that the platform on which the service is build must be easily accessible by citizens, for both contribution of data and feedback.

Finally, and perhaps most crucially, the question of how to provide an environment that allows all of the actors in a complex system, each with varying interests and levels of skills, and each providing various kinds of information, to work together to co-create a service. This, it was agreed, is something which will require deep thinking and consideration at each stage of the process.

Table 17 - Sample co-creation contributions

Co-creation contribution	So that we can	Category	Scenario
Collect samples of water and shellfish to send to the lab, upload private data, temperature etc.	Create maps and graphs	Data Provision	Drone Pilot David
Helicopter data and activity, vessel data & activity, coastguard tool	Provide search support	Data Provision	Sergeant Steve
A specification for data service standards	Develop an infrastructure to share data from different creators in the app	Expertise	Drone Pilot David
Support on information and data enrichment services	Provide a service in which data are well described for easy integration	Expertise	Drone Pilot David
Expertise in identifying what is in the photographs	Inform authorities of what is taking place in the environment	Interpretation and analysis	Drone Pilot David
Harmful algal bloom (HAB) analysis expertise and HABs tool expertise	Conduct HAB's status evaluation, deliver status data to aqua-culture and public, map reporting	Interpretation and analysis	Drone Pilot David
Model outputs, specifically physical/ biochemistry outputs	Provide video/cartoons of projections of water movements, properties, and characteristics, nowcast/forecast	Modeling and simulation	Drone Pilot David
A numerical simulation of oil spills/ harmful algal blooms	Provide evaluations of where the photographed things will travel to	Modeling and simulation	Drone Pilot David
Information in easy to understand language	Provide a blog post with an overview of an environmental issue using statistics	Networking and Promotion	Drone Pilot David
Activity, networking, promotion, lobbying	Promote business and product, aid decision on potential sites	Networking and Promotion	Engineer Ed
Data analysis, expertise in policy	Inform policy, access success, to inform data collection	Policy input	Captain Cillian

Influence, push for policy objectives, activity, provide evidence	Consider other actors/interest groups, push for certain policy objectives	Policy input	Engineer Ed
A digital framework for awarding badges	Develop a mechanism to provide general users with an incentive to continue using the service	Software Input	Drone Pilot David
A User Interface design	Design an intuitive user interface hiding the underlying service technology from the user	Software Input	Drone Pilot David
Take photos/ describe visual photos	Provide an alert system for risk levels (green, orange, red)	Visual data	Drone Pilot David
Use of my craft to assist with pictures/ videos as required	Provide a data file of images over a defined period	Visual data	Drone Pilot David

3.5.3 Pilot OGI ICT Toolkit Evaluation

3.5.3.1 Data Sets

The list of data sets is presented below:

- Irish Weather Buoy Network
- Irish Wave Buoy Network
- Irish National Tide Gauge Network
- East Atlantic SWAN Wave Model

The data sets are already in RDF (LOSD format). The link to access data seta are at: https://drive.google.com/open?id=0B0_fFuauifo0R2RLR0M1dThLMWs

3.5.3.2 OGI ICT Toolkit Screenshots

The next figure presents the screenshot of OGI ICT toolkit using data sets from the Pilot.
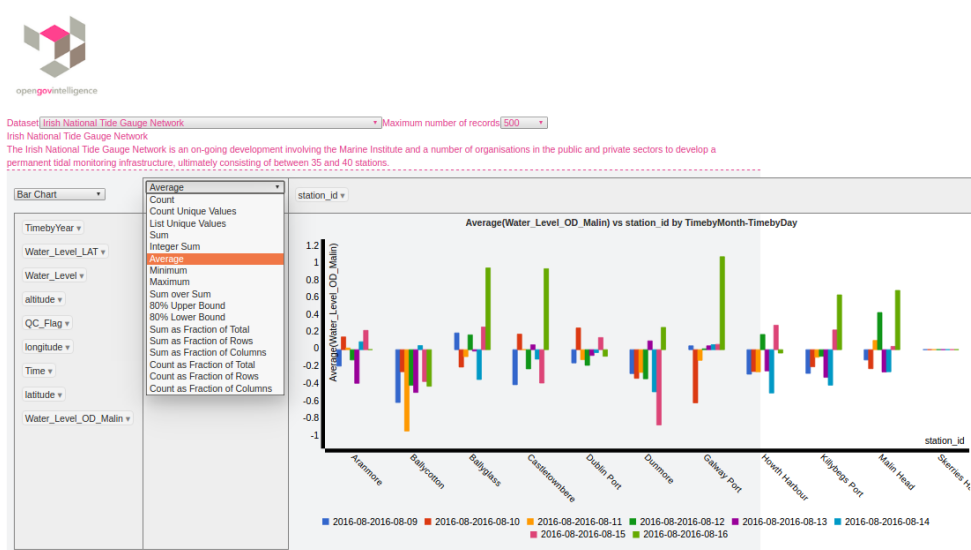
Figure 13 - Average Bar chart of Irish National Tide Gauge Network data set

3.6   Pilot 6 – The Estonian Ministry of Economics (Estonia)

3.6.1 Pilot description and expectation

The Estonian Ministry of Economics will make use of the OGI ICT Toolkit to address issues in the Estonian real estate market such as timely publication of data and information asymmetry. In order to best identify the barriers facing transparency in the Estonian real estate sector interviews have been carried out with all stakeholders from the private sector, the public sector, and the Estonian public at large. In combination with these interviews workshops have been conducted to gain a better understanding of the current needs of those with an interest in the real estate sector.

For a detailed description of Enterprise Lithuania and Lithuanian pilot, please check report D1.1 and D4.1.

3.6.2 Pilot Co-Creation Framework Evaluation

The purpose of the user workshop in Tallin, Estonia, was defined by the following four points:

1. To get end user feedback
2. To improve the initial offering of the public service
3. Involve stakeholders with the design of the service
4. Raise awareness of the Estonian Real Estate Pilot Program

Once the initial goals of the Estonian Real Estate Pilot Programs were discussed, a first of our two sessions was performed. In the first session which was titled "Developing the Estonian Real Estate Pilot Program" we focused on the following questions:

- What problems do you see with this pilot program and its goals?
  - What are the main areas in the real estate sector that you see issues?
- What are the potential solutions for these problems?
  - How could this pilot program better address these issues?
- In what ways would this new public service be beneficial for Estonia?

All participants had time to think silently on these questions and write down their answers. After this silent ideation period group discussion was held about each participants' answers.

The second session was titled "Constructing the Functionality of the Estonian Real Estate Pilot Program". For this session we wanted to focus on gathering participant created personas and user

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- ▪ User Stories
  - As an X I want to do Y.
    - *As a <type of user>, I want <some goal> so that <some reason>.*
- ▪ Personas
  - Demographics - who is this person?
  - Needs - what are their needs, how could this service benefit them?
    - Example: Priit is a 35 year old Estonian who has recently moved to the United Kingdom for work. He speaks English quite well and has a bachelor's degree in computer science. Since he just arrived he is having issues when it comes to finding a career which is related to his degree.
- ▪ Why do these matter?

stories. As we are following an agile development approach for the pilot program creation, we made sure to co-generate user stories and personas with the workshop attendants as these are key parts of agile development. They were shown the following slide information on a slide:

This was then followed by this task:

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1. Prepare at least one persona:
    a. Demographic Information
        1. Who is this person? How old are they? What is their occupation? What do they do?
    b. Needs
        2. (What sort of reasons would this person have for using our public service)
    Using the previously generated persona, please try to write down 10 to 15 user stories for this person.
        a. Reminder: *As a <type of user>, I want <some goal> so that <some reason>.*

For this session we split the participants into pairs and had each pair generate up to three personas. After they had time to prepare their personas and user stories these were discussed as a group.

What we had hoped to do with this user workshop was get individuals from many different agencies in the same room talking about Linked Open Statistical Data in Estonia, and in this end we succeeded. We had many participants from 7 public sector organizations and 2 private sector companies.

Going into the workshop we had hoped to receive information about:

- Potential issues with the pilot

- Potential solutions

- User Stories

- User Personas

- Other organically generated information.

In the first session we received the following information about potential problems and solutions our pilot would face. They have been ordered by number of occurrences/mentions going from the most commonly mentioned problem/solution to the least commonly mentioned.

Table 18 - Summary of Ideas and Solutions from participants

Problems	Solutions
Data Quality	Open API Solutions, Automatic dataset updates

Confidentiality issues	Anonymise the data
Competition from existing real estate portal	Involve users in design process, talk with current users of existing portals
Data Integrity	Update national registries, involve governmental agencies
Data is not open	Open API solutions, common license template
Data sets are not linked	Use OGI ICT Toolkit to link data sets
Needed data not collected	Get users to provide data.

The biggest issues which participants perceived matched what previously identified by pilots' partners on an initial research. In Estonia, the data quality is quite poor for many data sets. If the data exist, it may not even be useable due to the "confidential" nature of such data.

When looking at the solutions, mostly they are out of our hands and require government intervention or policy changes. The problems and solutions which we can best address are: competition from other real estate portals, needed data not being collected, and, to some extent, confidentiality issues.

When discussing the benefits that the Estonian Real Estate portal could have for Estonia, the main five benefits were:

1. Increased transparency in real estate sector;
2. Fairer pricing;
3. Happier citizens;
4. One stop shop for real estate data; and,
5. Increased availability and usage of real estate information.

In the second session we had asked participants to generate user personas for potential users of the Estonian Real Estate Portal. A list of the basic generated personas in order of discussion is below.

- As a foreign IT specialist coming to Tallinn, I need a safe, environmentally friendly place to live; information on recycling and public transportation, so that I could live in a clean environment, recycle, move easily in the city.
- As a family with 5 and 8-year old kids, I want to buy a house outside of Tallinn, we need low living costs, information on schools and kindergartens, transportation information, info on shops, sports and entertainment facilities, green areas and parks so that I wouldn't have to walk more than 20 minutes to school and kindergarten
- As a student moving to Tallinn, I need information on location of universities, public transportation, if it's a tolerant & safe neighbourhood, cheap living costs, proximity of entertainment facilities; central heating not important :)

- Elderly Finnish couple, 65+, sold apartment in Helsinki, moved to Tallinn to spend their golden years, looking for a 2-3-room apartment in very good condition with everything necessary in walking distance or close by public transportation. Need information on expenses related to the apartment (communication costs, mortgage, loans taken by the house union), is there an elevator in house, type of house, location (safe, important PoI-s nearby)

- Male, 35-years old, coming from South Estonia to find a job in Tallinn. Wants to move his wife and 2 children to Tallinn. Looking to rent a 2-room apartment and has a price limit, needs public transportation nearby and a municipal school in his area.

- Mikk, a young graduate with a wife and baby on the way, looking for family place to move to, wants the portal to suggest areas that meet his requirements, and once he finds the area, he wants to have more information about prices, quality of the building, etc.

- A guy got married, wants to sell his apartment and move to a new one. He wants to sell his apartment and get the highest possible price, wants to promote his area and to check out what advantages he can mention in his selling advertisement.

- A real estate company wants to develop their own service of selling accommodation. They would like to make personal offers based on user preferences, so the portal could offer them property in the areas that interest them.

- As an exchange student coming to Estonia for 3-4 months, I want to rent an apartment or a room in a shared apartment, need the apartment to be furnished, close to the city centre and/or university, an English-speaking landlord, sports facilities nearby, affordable meals close-by, information about pollution, traffic, etc.

- She's 45 handicapped and in a wheelchair, heavy smoker, working as an office clerk, wants to buy an apartment, needs public transport, handicap accessible, close to work and hospital, and if there are any public smoking places, and clubs for people with similar situations.

- 25-year old heterosexual couple want to buy their own apartment. No children yet but maybe soon so they need a two room apartment. Interested about police complaints, noise in the area, energy efficiency level of the building. Need elevator, good view from their window (no high buildings close to their windows), have electric cars which they need to charge and if there are any vegetarian restaurants nearby.

When looking at these personas and what needs they had, the following datasets stood out as the most important:

1. Transport
2. Safety
3. Price of real estate
4. Environment
5. Points of Interest

6. Information on the property

The last point of discussion will be how this information benefits our pilot program and how we can use it for the design of the pilot. What we now know is the main problems/solutions, who may use our service, the benefits people expect, and what datasets we should use for our initial pilot program. In terms of future research, we need to address the issues of data confidentiality as well as finding out how/why people use other real estate portals.

In terms of initial pilot construction, we have outlined the following for our 1st iteration.

Initial target groups:
1. Foreign students
2. Estonians new to Tallinn

Initial data sets:
1. Transport information
2. Safety statistics
3. Price statistics
4. Points of interest data (schools, doctors' offices, etc)
5. Information on the property (age, utilities, amenities etc)

Initial functionalities
6. As a user I want to be able to search by address so that I can see the location on a map
7. As a user I want to be able to see how safe my home is so that I can feel safe when moving to a new location
8. As a user I want to be able to measure the distance between my house and different points of interest so that I can travel more efficiently
9. As a user I want to be able to find addresses where I could live based on my own criteria (like price and safety) so that I don't waste time searching for real estate that I don't wish to see
10. As a user I want to be able to find out how often public transport comes by my address so that I can understand how much time I will have to spend commuting via public transport

In the workshop participants came up with ideas individually, and then these were discussed as a group. The ideas put forth by every applicant were collected and all feedback was recorded. We believe that having individuals from many different agencies gives strength to the proposed initial direction of the pilot program. Expected barriers are known now, giving to the pilot a better understanding of the solutions to overcome these barriers. Also, a better understanding of who may be the users of new Estonian Real Estate portal and how they will want to use it.

It is important to highlight the importance of co-creation process, including end users in the process of OGI ICT Toolkit development and dividing responsibility about definition of pilots' goals. As noted, objectives changed from the initial common target users to foreign students and new Estonians moving to Tallinn, as example. It means a need to have further user workshops where include more of the end users and trial our initial prototype service on them to get even further input.

Below, the List of organisations that participated on the user workshop in Tallin (Estonia). All names are translated in English:

1. European Commission
2. Mooncascade
3. Ministry of Economic Affairs and Communications
4. Tallinn University of Technology
5. Finance Ministry
6. Teleport
7. Land Board
8. Estonian Statistics Board
9. Tallinn City Government
10. National Registers and Information Systems center
11. Land board

The link to presentation given to participants is below:

https://docs.google.com/presentation/d/1r55VkEJxT5ECyYnJleCsHqEwjm55bg5OT8-bPHPlVH0/edit?usp=sharing

3.6.3 Pilot OGI ICT Toolkit Evaluation

3.6.3.1   Data Sets

The list of data sets is presented below:

- Buildings registry
- Car crashes

The data sets are already in RDF (LOSD format). The link to access data seta are at:

https://drive.google.com/open?id=0B89NqGUhD5HxRGQ0ZXNwMU9vNkE

3.6.3.2   OGI ICT Toolkit Screenshots

The next figures present the screenshots of OGI ICT toolkit using data sets from the Pilot.
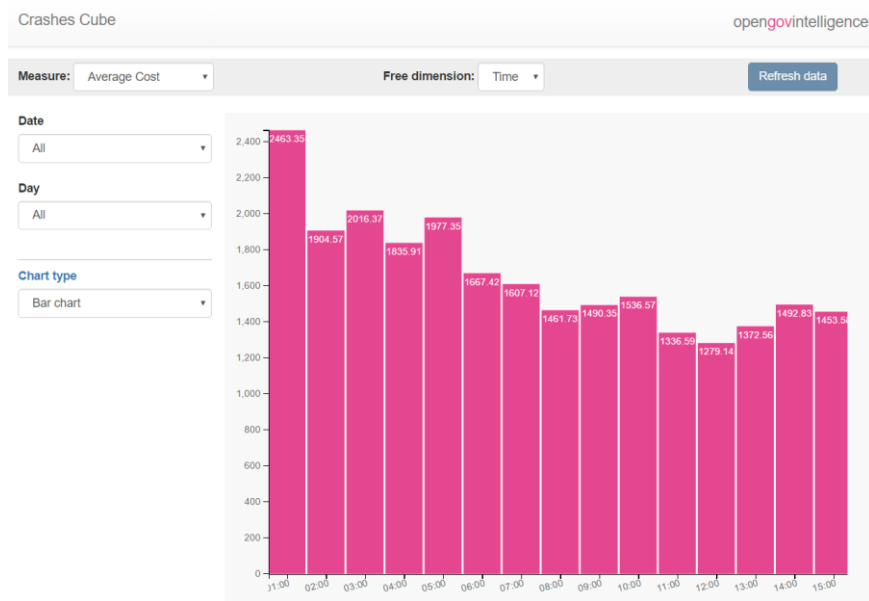
Figure 14 - Bar chart of Average Cost
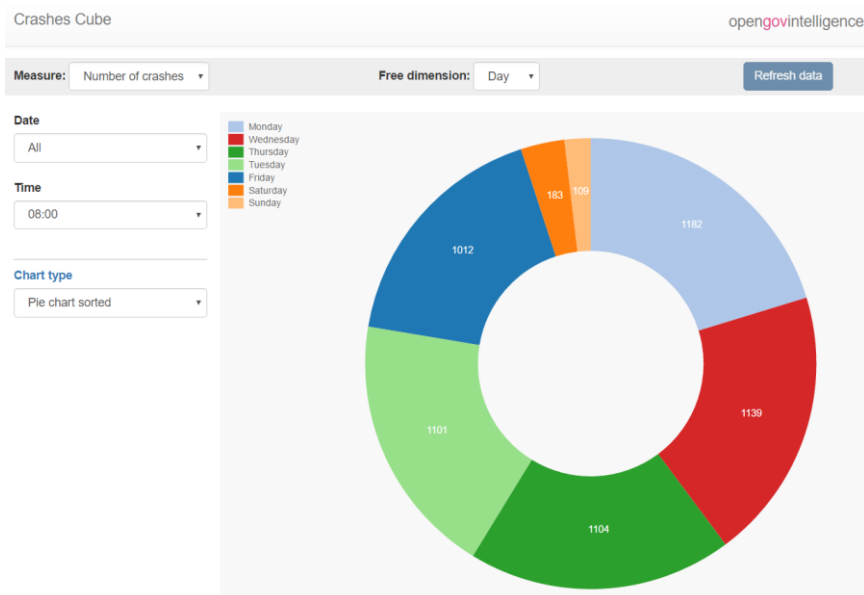
Figure 15 - Pie chart Distribution of crashes

4 OGI ICT Toolkit Evaluation

Evaluation of OGI ICT toolkits is divided in two categories. The first of building blocks and the second for evaluation of cubes design. The summary of data collection and methodology of evaluation is presented at Table 19.

Table 19 - Cube Design and Building blocks data collection and methodology methods of Evaluation

Category	Target groups	Data Collection Approach	Methodology of Evaluation
Product Quality	ICT Partners and IT Department of PAs	Questionnaire and Structured observation of application/website	ISO/IEC 25010
Quality in Use			
System's Data Quality			ISO/IEC 25012

Since the beginning, criteria for evaluation the OGI toolkit needs to be defined. Scientific literature review couldn't provide us an extensive list of standards and requirements organised and structured. On the other hands, ISO/IEC 25010:2011, the standard for Systems and Software Quality Requirements and Evaluation (20510:2010 2010), presents a structured list of requirements for building blocks and systems, which we considered for cubes design.

ISO 25010 is adopted as the evaluation method for OGI ICT toolkit. ISO 25010 is organised in 8 parameters which are divided into 30 measurement variables. For this first evaluation process, qualitative approach was used and 22 measures, from 30, were used because OGI ICT Toolkit has no maturity for this questions and close related to the third area of evaluation, Acceptance (check Figure 2).

Based on the questions at Table 27 on section 7.3, we summarized the answers from technical partners and leaders in charge of pilots.

Table 20 - OGI ICT Toolkit Questions and answers

#	*Parameter*	*Requirement*	*Questions and Answers*
1	**Functionality**	**Functional Completeness**	**Q: The set of functions on the OGI tool kit covers all the needs of pilots and users to perform their specific tasks?** **A: Yes,** the OGI ICT toolkit covers all the needs. The first is opening-up and linking the data sets with tools like Grafter and Tarql. Second the platform created to store and manipulate the data sets has functionalities already started to be used, as the screenshots on each pilot reveals, or using at LOSD produced by OGI ICT Toolkit in other platforms.

2		Functional appropriateness	**Q: The set of functions on the OGI tool kit covers all the needs since the beginning to the end to accomplish theirs initial objectives?** **A: Yes.** OGI is able to cover all the pilots' needs, mainly for intermediaries and expert users. Beginners will have chance to learn with D4.7 – Recommendations and tutorials for opening-up and exploiting statistical data, as a Capacity Building. Further, the design of the linked data dashboard will employ actors as co-creators to feedback on the data visualisations and how well they support their requirements related to energy, search and rescue and tourism as the scenario requires. Previous non-Linked Data dashboard design and functionality will also feed into the appropriateness here as in presently dashboards exist and a Linked Data Dashboard has existing prototypes upon which to build an effective design and appropriateness.
3	Performance	Resource utilization	**Q: The OGI tool kit is able to deal with amounts (quantity) and types of resources (data)?** **A: Yes,** OGI ICT toolkit is able to deal with the amount and quantity. The data sets being used are not bigger on the size of Gigabytes (GB) but on the scale of Megabytes (MBs), it is working properly. Quantitative analysis will be conducted on the next round of evaluation.
4		Capacity	**Q: There is a known limit capacity of any dimension (storage, processing, etc.) that OGI tool kit will face during any pilot phase?** **A: This limit was not yet reached.** Deep tests will be conducted on the next round of evaluation. Even considering this, capacity is not an issue because data sets are on the scale of Megabytes.
5	Compatibility	Coexistence	**Q: The OGI tool kit is able to perform required functions efficiently while shares a common environment with other products?** **A: No.** So far OGI tool kit (Fuseki, cube builder and cube visualisation) has no limitations of Coexistence with other products/tools functioning in the same environment.
6		Interoperability	**Q: The OGI Tool kit is able to create an interoperable environment for exchange and use of information?** **A: Yes.** OGI ICT Toolkit was created interoperable by default. Considering data source on an interoperable format such as tabular CSV, and output data (Data Cubes format, RDF and TTL).
7	Usability	Learnability	**Q: The OGI tool kit has appropriate documentation for beginners use it?** **A: Not yet.** Proper documentation will be created on the next two years of project. Part of solutions will be addressed with D4.7 – Recommendations and tutorials for opening-up and exploiting statistical data, as a Capacity Building, in special for beginners.
8		Operability	**Q: The OGI toolkit has attributes that makes easy to operate and control?** **A: Yes**, it already has attributes to easy control but quantitative and

			qualitative tests will be conducted later. OGI toolkit components have web interfaces which is easy to operate and control. The next round of evaluation will include the third part of evaluation, which is acceptance of OG ICT Toolkit. Tests with users for operability will be conducted.
9		User error protection	**Q: The OGI tool kit protects users to make errors? What are the functions or attributes that helps users and/or avoid errors?**
			A: Yes, OGI ICT Toolkit was designed to avoid errors. Currently the OGI applications have initial versions that verifies user actions and disable options that would lead the user to commit errors. As example, some users cannot insert another csv file after first upload.
10		Accessibility	**Q: OGI tool kit is prepared for the widest range of characteristic and capabilities of users?**
			A: Not 100% of planned accessible functions are properly implemented. In the next round of implementation the accessible functions will be adjusted according to user profile, e.g. Linked data conversion will be allowed for service creators not consumers.
11		Maturity	**Q: OGI tool kit has reliability under normal operation?**
			A: Yes, the initial version of OGI ICT Toolkit is offering demo services on a testing server. For normal conversion, loading and visualisation operation this table could aggregate the performance measures as follows:

% Uptime	Max. Downtime/Week	Max Downtime/Month	Max Downtime/Year
98%	3.4 hours	14.55 hours	7.27 days

12	Reliability	Availability	**Q: OGI tool kit will be available to all users at same time without losing any other requirement performance?**
			A: Yes. The probability of the "Linked Data" service to be available shall be *at least* 99% of the time. In essence, the system *shall* be available "24 X 7" except for scheduled downtime related to configuration or system upgrades.
13		Fault Tolerance	**Q: OGI tool kit has fault tolerance?**
			A: Yes. OGI toolkit components have built in fault tolerance plus the fault tolerance characteristics that have added above that.
14		Recoverability	**Q: OGI tool kit has data recovery function?**
			A: Data recovery functions not supplied yet, but will be available in next releases of ICT development. This is just the first year and only few months of development were conducted.
15	Security	Confidentiality	**Q: OGI tool kit has any confidentiality issues concernment?**
			A: No. Majority of data sets are already in statistical version, what means they are not personal or sensitive. Further, OGI uses Open Data as default, which means they are free to use, access and share with appropriate "share-alike" Creative Commons license. No data

			protection or privacy concerns with scientific data for pilots.
16		**Integrity**	**Q: OGI tool kit has any function that prevents unauthorized access, modification of system and data?**
			A: Yes, there is a function defining the level of user and what actions they can perform on the platform. Open access to system only provided to users of the pilot data dashboards. Access to the data conversion system to appropriate users only.
17		**Modularity**	**Q: OGI has the modular characteristic?**
			A: OGI toolkit is a loosely coupled application.
18		**Reusability**	**Q: OGI has reusable characteristic?**
			A: Yes, by default. OGI toolkit components can be reconfigured to work with other data sources/applications.
19	**Maintainability**	**Analysability**	**Q: OGI has documentation for failures and errors?**
			A: Not yet developed. Currently OGI toolkit components have built in errors documentation, but a detailed error analysis is planned for later releases of ICT development. Remembering this is the first year of project, yet on initial stage of maturity.
20		**Modifiability**	**Q: OGI has characteristics of improvements without degrading existing efficient and effective characteristics?**
			A: Yes. OGI toolkit still under development and it is open for any improvements without interfering with efficiency or effectiveness of the application.
21	**Portability**	**Adaptability**	**Q: OGI is prepared to have a adaptable language or building blocks?**
			A: Yes. OGI ICT Toolkit components were written in different languages, but all components are communicating via APIs. There is no worries on language incompatibility. Later, tests will be conducted to identify any issue on this parameter.
22		**Installability**	**Q: OGI can be easy installed and uninstalled?**
			A: Yes, OGI ICT Toolkit components are web services and can be easily installed/uninstalled and run at any environment. However, there is no need for pilots, because technical partners are providing to business pilots' leaders the platform already installed on the web.
23		**Replaceability**	**Q: OGI has flexibility on changing to other software parts?**
			A: Yes, OGI toolkit components can be reconfigured to work with other data sources/applications. As example, visualization service can be run using any Fuseki instance containing data cubes.

5 Conclusions

The purpose of this document is to present the pilots development status and evaluation. The evaluation is divided in four areas: Co-Creation-Framework, OGI ICT Toolkit, Acceptance and Outcomes (Check Figure 2). The first two areas were evaluated on this first year report. The other areas will be evaluated on the other next two evaluation rounds.

The Co-Creation framework evaluation showed that pilots are prepared to collect information from stakeholders, in special civil society (people) and civil servants (government), but also from private sector (enterprises). The participation of these stakeholders helped to re-shape the initial objectives and pilots' plans with important insights of main problems and solutions. Below the table with development status of co-creation area.

Table 21 - Pilots' Co-Creation Status

Pilot Name	Status
MAREG (Greece)	Co-initiation and co-design have already been performed. In the next round the focus will be on co-implementation and co-evaluation of OGI ICT Toolkit.
Enterprise Lithuania (Lithuania)	Co-initiation and do-design have already been performed. In the next round whey will conduct co-implementation and co-evaluation of OGI ICT Toolkit.
Trafford (England)	Co-initiation and do-design have already been performed. In the next round co-implementation and co-evaluation of OGI ICT Toolkit will be performed.
The Flemish Government (Belgium)	Co-initiation, do-design and part of co-implementation have already been performed. In the next round the focus will be on the co-implementation and co-evaluation of OGI ICT Toolkit.
Marine Institute (Ireland)	Co-initiation, do-design and part of co-implementation have already been performed. In the next round the co-implementation and co-evaluation of OGI ICT Toolkit will be the main focus.
Tallin (Estonia)	Co-initiation and do-design have already been performed. In the next round co-implementation and co-evaluation of OGI ICT Toolkit will be conducted.

The OGI ICT Toolkit was evaluated using a qualitative approach based on the ISO/IEC 25010:2011 standard. Technical partners and pilots' leaders were interviewed and in this way information about fundamental requirements and parameters for the ICT Toolkit development has been collected. Some of the requirements already are successfully designed and realized, whereas others will be implemented later. Considering the initial stage of development was not possible to perform a quantitative approach to evaluate the requirements. The OGI ICT Toolkit will be double-checked on the next round of evaluation based on a combination of qualitative and quantitative approaches, together with acceptance and outcomes areas, not performed due the same reasons of project maturity.

Table 22 - Pilots' OGI ICT Toolkit Usage

Tools	Pilots					
	MAREG (Greece)	Lithuania Enterprise	Trafford (UK)	The Flemish Government Belgium	Marine Institute (Ireland)	Ministry of Economics (Estonia)
Cube Browser	X					X
Cube Explorer		X			X	
Cube Visualizer	X					X
Grafter	X		X			X
Tarql – Cube Builder		X		X	X	
Aggregator	X					
JSON-QB API	X	X	x		X	X

Delft conducted a pre-test of acceptance of OGI ICT Toolkit in which 11 groups developed a fictive application using the toolkit. The results are summarized at Medium blogspot (https://medium.com/opengovintelligence/tudelft-msc-course-using-ogi-toolkit-for-data-driven-smart-services-delivery-89927fd90f2f). The results suggests that the to improve acceptance of OGI ICT Toolkit, the documentation should be improved, the toolkit should be easy to install and more intuitive to use. A JSON API and there is no local execution for R experts process the data, focusing on the use of visualisations functionalities.

As aforementioned, the outcomes could not be evaluated as the pilots are in the early stage of development. Next rounds of evaluations will be conducted to provide better understand of how OGI project can realize the intended outcomes for government, civil society and enterprises. In particular, the money savings, time reduction, efficiency, customer orientation and transparency will be evaluated.

6   References

Delbecq, Andre L., Andrew H. Van de Ven, and David H. Gustafson. *Group techniques for program planning: A guide to nominal group and Delphi processes*. Scott Foresman, 1975.

20510:2010, I. I. (2010). Systems and Software Engineering—Systems and Software Product Quality Requirements and Evaluation (SQuaRE)—System and Software Quality Models. Geneva, International Organization for Standardization.

7 Appendices

7.1 Co-Creation User Workshops Evaluations

7.1.1 Pilot 2 – Lithuanian Enterprise (Lithuania)

Eight participants answered the evaluation questionnaire. The feedback is presented below:

1- How satisfied were you with the interview of co-creation user workshop?
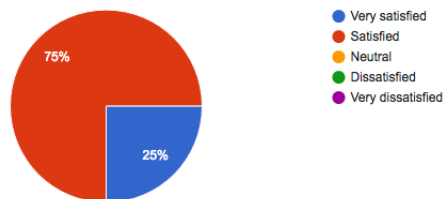
2- How relevant was the content of this interview to your current position?
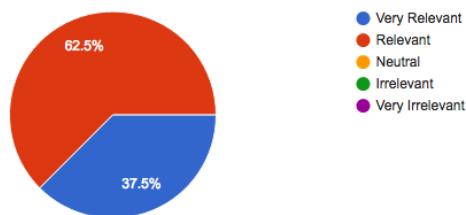
3-How was the moderation of the interview?
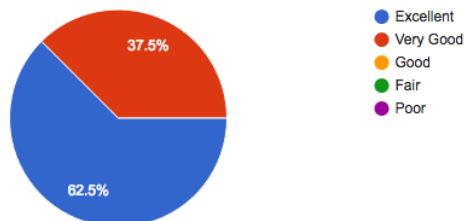
4- Do you believe that the interview had an ideal range of time?
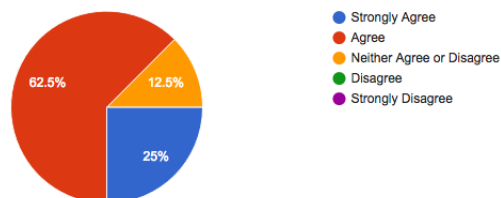
5- How satisfied were you with the interview session content? (Both presented and pre-read material)
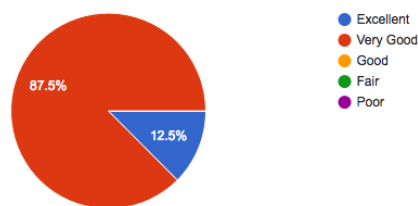
7.1.2 Pilot 6 – The Estonian Ministry of Economy

Below, the results of survey conducted to participants:

How satisfied were you with the user workshop?
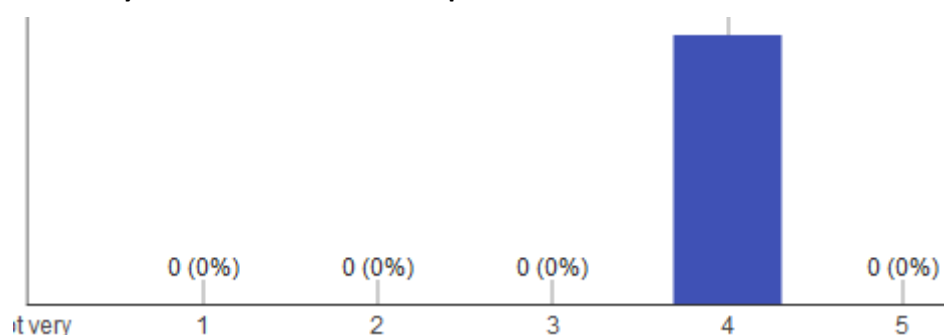
What were your key take aways from this user workshop?

- Common problems across Estonian organisations which means that joint solutions make sense.

- Building awareness and spreading theknowledgeof open data is vital for the topic.

- That much more information could be made public and useful that is actually not available at the moment because of the privacy issue.

Would you be willing to participate in future workshops?
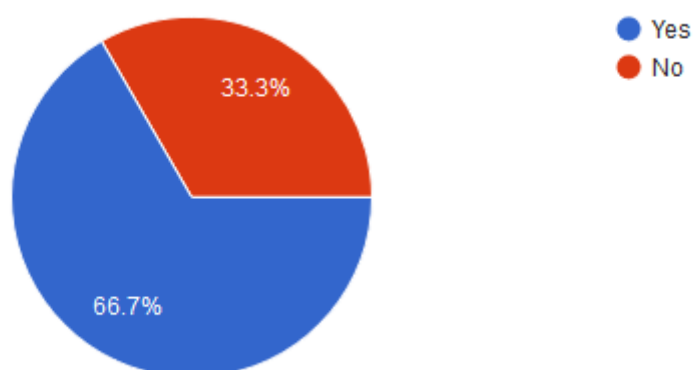
7.2 Data sets conversion examples

7.2.1 Pilot 1 – MAREG (Greece)

The MAREG data conversion sample (IWBNetwork) has the follow source schema in RDF:

- Vehicle_type;
- Fuel_type;
- Registration_year;
- Vehicle_brand;
- Area; and,
- Number_of_vehicles.

Table 23 - Greek Data Set Dimensions Conversion in RDF

Dimensions Conversion	
vehicle_type	Mareg:vehicle_type rdf:type qb:DimensionProperty ; qb:codeList <http://id.mareg.gr/statistics/conceptscheme/vehicle_type>; rdfs:label "Vehicle Type"@en ; rdfs:label "Τύπος Οχήματος"@gr ; rdfs:range skos:Concept
fuel_type	Mareg:fuel_type rdf:type qb:DimensionProperty ; qb:codeList <http://id.mareg.gr/statistics/conceptscheme/fuel_type> ; rdfs:label "Fuel Type"@en ; rdfs:label "Τύπος Καυσίμου"@gr ; rdfs:range skos:Concept
registration_year	Mareg:registration_year rdf:type qb:DimensionProperty ; rdfs:label "Registration Date"@en ; rdfs:label "Ημερομηνία Πρώτης Κυκλοφορίας"@gr ; rdfs:range skos:Concept ; rdfs:subPropertyOf sdmx-dimension:timePeriod
vehicle_brand	Mareg:vehicle_brand rdf:type qb:DimensionProperty ; qb:codeList <http://id.mareg.gr/statistics/conceptscheme/brand> ; rdfs:label "Vehicle Brand"@en ; rdfs:label "Μάρκα Οχήματος"@gr ; rdfs:range skos:Concept

Area	Mareg:area rdf:type qb:DimensionProperty ; rdfs:label "Area"@en ; rdfs:label "Δήμος"@gr ; rdfs:range skos:Concept ; rdfs:subPropertyOf sdmx-dimension:refArea
Measures conversion	
number_of_vehicles	Mareg:number_of_vehicles rdf:type qb:MeasureProperty ; rdfs:label "Count of vehicles"@en ; rdfs:label "Αριθμός Οχημάτων"@gr ; rdfs:range xsd:integer

The conversion process in Unified Modelling Language (UML)
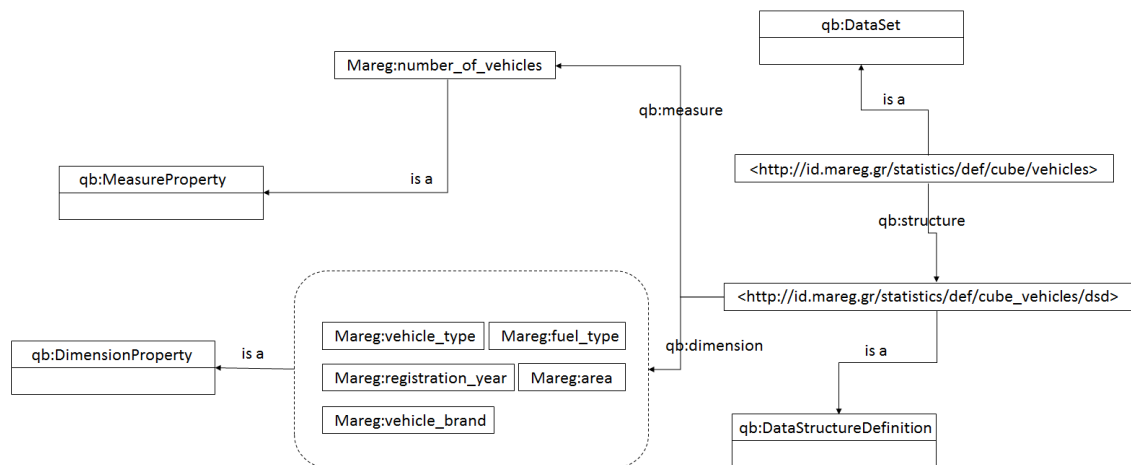
Figure 16 - Greek Data Set conversion process in UML

7.2.2 Pilot 2 – Lithuanian Enterprise (Lithuania)

The Lithuanian Enterprise data conversion sample has the follow source schema in RDF:

- Employee_number;
- Municipality;
- Time_period;
- Economic_entities_in_operation_at_the_beginning_of_the_year_units;
- Country; and,
- County.

Table 24 - Lithuanian Data Set Dimensions Conversion in RDF

Dimensions Conversion	
employee_number	OGI:employee_number a rdf:Property, qb:DimensionProperty; rdfs:label "Age"@en; rdfs:range xsd:string;
Municipality	dbpedia-property:municipality a rdf:Property, qb:DimensionProperty; rdfs:label "Municipality"@en; rdfs:comment "."@en; rdfs:range xsd:string;
Time_period	sdmx-dimension:refPeriod a rdf:Property, qb:DimensionProperty, time:inXSDDateTime; rdfs:label "Time period"@en; rdfs:comment "Year where observation is measured."@en; rdfs:range xsd:dateTime; rdfs:subPropertyOf sdmx-dimension:timePeriod; timezone-owl:hasTimeZone timezone-owl:UTC; qb:concept sdmx-concept:timePeriod;
Country	vcard:counrty-name a rdf:Property, qb:DimensionProperty; rdfs:label "Counrty"@en; rdfs:comment "."@en; rdfs:range xsd:string;
County	infobox:county a rdf:Property, qb:DimensionProperty; rdfs:label "County"@en; rdfs:comment "."@en;

	rdfs:range xsd:string;
Measures Conversion	
Economic_entities_in_operation_at_the_beginning_of_the_year_units	OGI:economic_entities_in_operation_at_the_beginning_of_the_year_units a rdf:Property, qb:MeasureProperty; rdfs:label "Economic entities in operation at the beginning of the year units"@en; rdfs:comment "."@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ;

The Figure 17 presents the Lithuanian conversion process in UML.

Figure 17 - Lithuanian Data Set conversion process in UML

7.2.3 Pilot 5 – The Marine Institute (Ireland)

The Marine Institute data conversion sample has the follow source schema in RDF:

- station_id;
- Longitude;
- Latitude;
- Time;
- AtmosphericPressure;
- WindDirection;
- WindSpeed;
- Gust;
- WaveHeight;
- WavePeriod;
- MeanWaveDirection;
- Hmax;
- AirTemperature;
- DewPoint;
- SeaTemperature;
- Salinity;
- RelativeHumidity; and,
- QC_Flag.

Table 25 - Marine Institute Data Set Dimensions Conversion

Dimensions Conversion	
Time	OGI:time a rdf:Property, qb:DimensionProperty, time:inXSDDateTime; rdfs:label "Time"@en; rdfs:comment "Time point where observation is measured."@en; rdfs:range xsd:dateTime; rdfs:subPropertyOf sdmx-dimension:timePeriod; timezone-owl:hasTimeZone timezone-owl:UTC; qb:concept sdmx-concept:timePeriod;
Latitude	OGI:latitude a rdf:Property, qb:DimensionProperty, geo:lat; rdfs:label "Latitude"@en; rdfs:comment "."@en; rdfs:range xsd:decimal; rdfs:subPropertyOf sdmx-dimension:refArea; WeatherOntology:hasUnit OGI:degrees_east;

	qb:concept sdmx-concept:refArea; qb:concept CF-Standard-Names:CFSN0600;
Longitude	OGI:longitude a rdf:Property, qb:DimensionProperty, geo:long; rdfs:label "Latitude"@en; rdfs:comment "."@en; rdfs:range xsd:decimal; rdfs:subPropertyOf sdmx-dimension:refArea; WeatherOntology:hasUnit OGI:degrees_north; qb:concept sdmx-concept:refArea; qb:concept CF-Standard-Names:CFSN0554;
station_id	OGI:station_id a rdf:Property, qb:DimensionProperty, ssn:Dervice; rdfs:label "Station ID"@en; rdfs:comment "."@en; rdfs:range xsd:string;
Measures conversion	
atmosphericPressure	OGI:atmosphericPressure a rdf:Property, qb:MeasureProperty, WeatherOntology:haspressurevalue; rdfs:label "Atmospheric Pressure"@en; rdfs:comment "."@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:mb; qb:concept CF-Standard-Names:CFSN0015;
windDirection	OGI:windDirection a rdf:Property, qb:MeasureProperty, WeatherOntology:haswinddirection; rdfs:label "Wind Direction"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:degrees_true; qb:concept CF-Standard-Names:CFSN0036;
windSpeed	OGI:windSpeed a rdf:Property, qb:MeasureProperty, WeatherOntology:haswindspeed; rdfs:label "Wind Speed"@en;

	rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:kn; qb:concept CF-Standard-Names:CFSN0038;
gust	OGI:gust a rdf:Property, qb:MeasureProperty; rdfs:label "Gust"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:kn; qb:concept CF-Standard-Names:CFSN0039;
waveHeight	OGI:waveHeight a rdf:Property, qb:MeasureProperty, ispra:waveHeightReported; rdfs:label "Wave Height"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:m; qb:concept CF-Standard-Names:CFSN0385;
wavePeriod	OGI:wavePeriod a rdf:Property, qb:MeasureProperty, ispra:wavePeriodReported; rdfs:label "Wave Period"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:s; qb:concept CF-Standard-Names:CFV8N75;
meanWaveDirection	OGI:meanWaveDirection a rdf:Property, qb:MeasureProperty; rdfs:label "Mean Wave Direction"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:degrees_true; qb:concept CF-Standard-Names:CFSN0384;
hmax	OGI:hmax a rdf:Property, qb:MeasureProperty, ispra:waveHeightReported; rdfs:label "Hmax"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ;

	WeatherOntology:hasUnit OGI:m; qb:concept CF-Standard-Names:JNQS0CMX;
airTemperature	OGI:airTemperature a rdf:Property, qb:MeasureProperty, WeatherOntology:hastemperaturevalue; rdfs:label "Air Temperature"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:degree_C; qb:concept CF-Standard-Names:CFSN0023;
dewPoint	OGI:dewPoint a rdf:Property, qb:MeasureProperty, WeatherOntology:hasDewPointValue; rdfs:label "Dew Point"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:degree_C; qb:concept CF-Standard-Names:CFSN0723;
seaTemperature	OGI:seaTemperature a rdf:Property, qb:MeasureProperty, WeatherOntology:hastemperaturevalue; rdfs:label "Sea Temprature"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:degree_C; qb:concept CF-Standard-Names:CFSN0381;
salinity	OGI:salinity a rdf:Property, qb:MeasureProperty; rdfs:label "Salinty"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; WeatherOntology:hasUnit OGI:PSU; qb:concept CF-Standard-Names:CFSN0376;
relativeHumidity	OGI:relativeHumidity a rdf:Property, qb:MeasureProperty, datex:relativeHumidity; rdfs:label "Relative Humidity"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ;

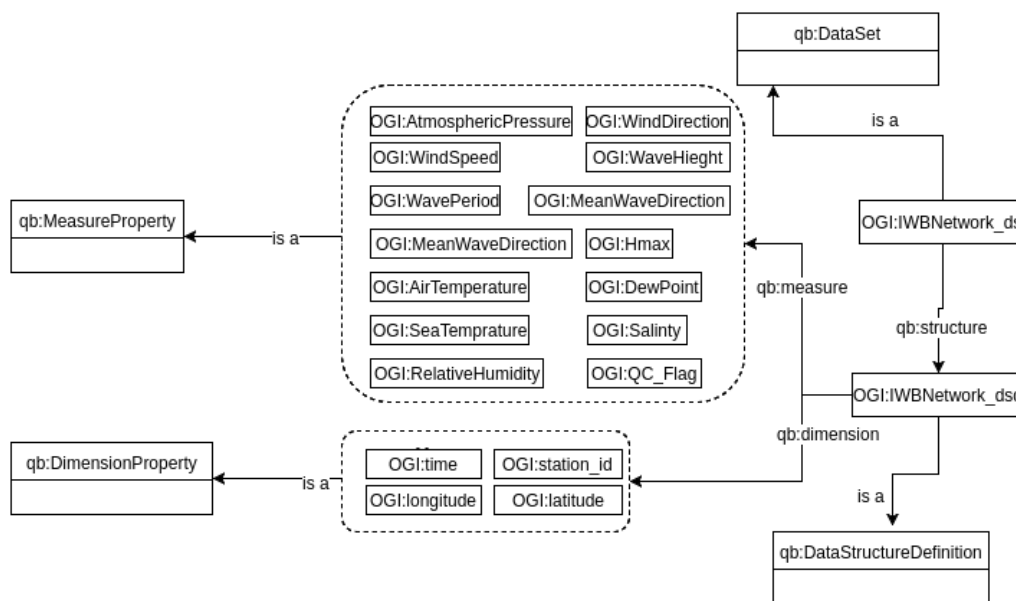|	
	WeatherOntology:hasUnit OGI:percent; qb:concept CF-Standard-Names:CFSN0413;
qC_Flag	OGI:qC_Flag a rdf:Property, qb:MeasureProperty, cmo:hasQuality; rdfs:label "QC_Flag"@en; rdfs:subPropertyOf sdmx-measure:obsValue; rdfs:range xsd:decimal ; qb:concept CF-Standard-Names:CFSN0413;

The Figure 18 presents the conversion process in UML.

Figure 18 - Marine Institute Data-Set conversion process in UM

7.2.4 Pilot 6 – The Estonian Ministry of Economics (Estonia)

The MKM data conversion sample sample has the follow source schema:

- Day;
- Date;
- Time;
- Total_Cost;
- Average_Number;
- Number_of_crashes

Table 26 - Estonian Data Set Dimensions Conversion

Dimensions Conversion	
day	Mkm:day rdf:type qb:DimensionProperty ; rdfs:label "Day"@en ; rdfs:range skos:Concept.
date	Mkm:date rdf:type qb:DimensionProperty ; rdfs:label "Date"@en ; rdfs:range skos:Concept .
time	Mkm:time rdf:type qb:DimensionProperty ; rdfs:label "Time"@en ; rdfs:range skos:Concept .
Measures conversion	
total_cost	Mkm:total_cost rdf:type qb:MeasureProperty ; rdfs:label "Total Cost"@en ; rdfs:range xsd:integer.
average_cost	Mkm:average_cost rdf:type qb:MeasureProperty ; rdfs:label "Average Cost"@en ; rdfs:range xsd:integer.
number_of_crashes	Mkm:number_of_crashes rdf:type qb:MeasureProperty ; rdfs:label "Number of crashes"@en ; rdfs:range xsd:integer.

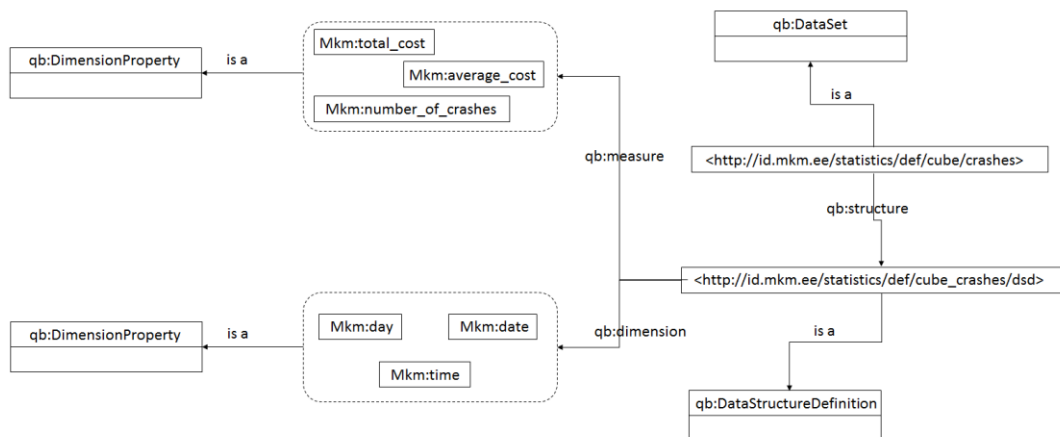The Figure 19 presents the Estonian data set conversion process in UML.

Figure 19 - Estonian Data-Set conversion process in UML

7.3 OGI ICT Toolkit Questionnaire

Table 27 - OGI ICT Toolkit Questionnaire

#	Parameter	Requirement	Questions
1	Functionality	Functional Completeness	The set of functions on the OGI tool kit covers all the needs of pilots and users to perform their specific tasks?
2		Functional appropriateness	The set of functions on the OGI tool kit covers all the needs since the beginning to the end to accomplish theirs initial objectives?
3	Performance	Resource utilization	The OGI tool kit is able to deal with amounts (quantity) and types of resources (data)?
4		Capacity	There is a known limit capacity of any dimension (storage, processing, etc.) that OGI tool kit will face during any pilot phase?
5	Compatibility	Coexistence	The OGI tool kit is able to perform required functions efficiently while shares a common environment with other products?
6		Interoperability	The OGI Tool kit is able to create an interoperable environment for exchange and use of information?
7	Usability	Learnability	The OGI tool kit has appropriate documentation for beginners use it?
8		Operability	The OGI toolkit has attributes that makes easy to operate and control?
9		User error protection	The OGI tool kit protects users to make errors? What are the functions or attributes that helps users and/or avoid errors?
10		Accessibility	OGI tool kit is prepared for the widest range of characteristic and capabilities of users?
11	Reliability	Maturity	OGI tool kit has reliability under normal operation.
12		Availability	OGI tool kit will be available to all users at same time without losing any other requirement performance?
13		Fault Tolerance	OGI tool kit has fault tolerance?
14		Recoverability	OGI tool kit has data recovery function?
15	Security	Confidentiality	OGI tool kit has any confidentiality issues concernment?
16		Integrity	OGI tool kit has any function that prevents unauthorized access, modification of system and data?
17	Maintainability	Modularity	OGI has the modular characteristic?
18		Reusability	OGI has reusable characteristic?
19		Analysability	OGI has documentation for failures and errors?
20		Modifiability	OGI has characteristics of improvements without degrading existing efficient and effective characteristics?
21	Portability	Adaptability	OGI is prepared to have a adaptable language or building blocks?
22		Installability	OGI can be easy installed and uninstalled?
23		Replaceability	OGI has flexibility on changing to other software parts?