

D7.7 Large-scale trial report including best-practices

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Abstract: This deliverable documents the Large Scale Trials involving European municipalities or regions as additional subcontractors for evaluating the OpenBudgets.eu Platform. More specifically, the report details on the experience with the following selected municipalities: Bonn, Paris and Thessaloniki. The deliverable includes feedback from the municipalities and best-practices for operating the OpenBudgets.eu platform.

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Author List

Organisation	Name	Contact Information
Fraunhofer	Fabrizio Orlandi	fabrizio.orlandi@iais.fraunhofer.de
UBONN	Tiansi Dong	tdong@uni-bonn.de
OKGR	Sotirios Karampatakis	karampatakis@gmail.com
Fraunhofer	Piero Hernandez	jeanpierohm@gmail.com
UBONN	Fathoni Musyaffa	musyaffa@cs.uni-bonn.de
Fraunhofer	Hantong Liu	hantong.liu@iais.fraunhofer.de

Executive Summary

This deliverable documents the OpenBudgets.eu Large Scale Trials. These involve European municipalities or regions as additional subcontractors for evaluating and using the OpenBudgets.eu Platform. More specifically, the report details on the experience with the following three municipalities: Bonn, Paris and Thessaloniki. These municipalities have been selected following an open public call for tenders. Following the selection process the municipalities had to agree with the OBEU consortium on the testing plan to follow for the duration of the trials. This report includes details on the proposed plans by each municipality and the testing scenarios followed for evaluating the platform. In particular, seven main different testing scenarios have been designed in order to collect consistent and comparable feedback on the different tools offered by OBEU.

The deliverable includes feedback from the municipalities and best-practices for operating the OpenBudgets.eu platform. The results of the different testing scenarios are described and detailed feedback obtained from the three municipalities is also included. In addition, usability questionnaires have been completed by the testers, one for each testing scenario. This allowed us to have not just textual feedback but also structured comparable outcome for the results of the OBEU platform evaluation.

The results of the large scale trials are overall positive. All the municipalities expressed their clear interest in continuing to work with the OBEU platform and the tools developed by the project. Follow-up projects are being established for continuing after OpenBudgets.eu the work with each municipality, to foster the collaboration with additional municipalities and further develop and disseminate the OBEU stack. Some improvements to the integration of some of the tools and their usability have been proposed by the municipalities, many of them have been collected and directly implemented by the OBEU consortium. The deliverable includes in appendix the original documents sent by the municipalities describing their experience with the platform.

Abbreviations and Acronyms

WP	Work Package
OS	OpenSpending
OBEU	OpenBudgets.eu
LP-ETL	LinkedPipes ETL and LinkedPipes Visualisation
RDF	Resource Description Framework
FDP	Fiscal Data Package
SVG	Scalable Vector Graphics
OKI	Open Knowledge International
OKGR	Open Knowledge Greece
OKDE	Open Knowledge Germany
UEP	University of Economics, Prague
SPARQL	SPARQL Protocol And RDF Query Language
ETL	Extract, Transform, Load

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1 Introduction

This report documents the OpenBudgets.eu Large Scale Trials which involve European municipalities (or regions) as additional subcontractors for evaluating and using the OpenBudgets.eu Platform. More specifically, the deliverable details on the experience with the following three municipalities: Bonn, Paris and Thessaloniki. These municipalities have been selected following an open public call for tenders. Following the selection process the municipalities had to agree with the OBEU consortium on the testing plan to follow for the duration of the trials. This report includes details on the proposed plans by each municipality and the testing scenarios followed for evaluating the platform. In particular, seven main different testing scenarios have been designed in order to collect consistent and comparable feedback on the different tools offered by OBEU. The tested platform is currently hosted at Fraunhofer and publicly available as a service at <http://apps.openbudgets.eu>.

The deliverable includes feedback from the municipalities and best-practices for operating the OpenBudgets.eu platform. The results of the different testing scenarios are described and detailed feedback obtained from the three municipalities is also included. In addition, usability questionnaires have been completed by the testers, one for each testing scenario. The results of the large scale trials are overall positive. All the municipalities expressed their clear interest in continuing to work with the OBEU platform and the tools developed by the project. The deliverable includes in Appendix the original documents sent by the municipalities describing their experience with the platform.

The report is structured as follows. Section 2 provides an overview of the three selected municipalities participating in the trials. About their characteristics, their team and plans for the testing of the OBEU platform. Section 3 details on the seven main testing scenarios agreed for the trials. These testing scenarios have been implemented by all the municipalities to evaluate the platform and provide comparable feedback. Section 4 presents the results of the testing, the feedback from the trials and the results of the usability questionnaires. Section 5 concludes the report.

2 Large Scale Trials, plans and overview

In the following sections, one for each municipality, the original plans for each trial are described. Additional information about each municipality, their team and expertise is also provided. More details on the municipalities and the original proposal documents submitted to the call for tenders are included in Appendix.

2.1 Bonn

Bonn is an international city, former German capital, located in North-Rhine Westphalia near the Rhine river with a population of over 322,000. Embedded in the scientific triangle formed by the cities of Aachen, Bonn and Cologne, called the ABC-region and renowned as the most compact region of scientific research and technology in Europe, Bonn has acquired an international reputation as a scientific location. The nucleus is the university founded in 1818 with nowadays about 32 000 students. Being the birthplace of Ludwig van Beethoven, music ranks very high in Bonn. The annual Beethoven Festival has become an important publicity event for the composer's works.



Expectation from the City of Bonn for OBEU

Using OBEU/OS platform, the City of Bonn hopes for more transparency of the public budget for the citizens as well as more understanding and interest through the visualization of the data. However, the target group should not only include citizens, but also companies and politics. Interesting for the city of Bonn is to contribute to this model, in particular through the feedback discussions and to create a platform that meets municipal requirements.

The current process of Bonn's participation in the budget is to be revised, since the response is not so great and must be established. Through the open-budget project, the city of Bonn hopes for synergies and opportunities to optimize citizens' participation.

The city of Bonn is also planning to use the OBEU platform for internal purposes, such as monitoring of the budgets and trend analysis. For example to easily calculate and visualize different scenarios for different time periods.

The funding amount is to be used to cover the personnel expenses resulting from data provision and explanation and concept, feedback and other support services / communications. The team consists of two technical figures and two administrative figures, of which one is more knowledgeable on financials and administration issues and the other more on dissemination and project management.

More details on the proposed working plans of the municipality of Bonn are attached in Appendix.

2.2 Paris

The executive tender will be the **OpenBudget.fr** association. The process for creating this non profit organisation is started and official creation will be done on 10th January 2017. **Ooffee**, the French company is the "juridic vehicle" for this tender mostly because of the call for participation deadline. Ooffee will delegate the realization of the project to the OpenBudget.fr association, while keeping the responsibility to produce the intended deliverables as engaged by this trial. So, in the rest of the document only the name OpenBudget.fr will be used as it will be the executive organisation of the project.



Paris' 18th arrondissement City Hall

The 18th arrondissement of Paris is a 188,700 habitants city (2005 data). This arrondissement is really engage in open-data and transparency on budget and would like to extend the Paris' participatory budget at his local level. After the organisation and hosting of a civic-tech event in 2016, 18th arrondissement would like to continue the experimentations of opening data and increase citizen participation on budget.

Under the impulse of Anne Hidalgo, mayor of Paris, the 18th arrondissement City Hall is engaging for the development and support of citizen projects for the institutions transparency and citizen participation. In september 2016, a civic-tech Hackathon was held in the 18th City Hall. This event hosted 300 participants during 2 days. The 18th arrondissement willing to start a reflexion on an experimental set-up of the OpenBudget.fr project in the city in order to develop the Paris' participatory budget started in 2014.

The transparency and modernization of budget data and spendings associated with better budget education improve the citizen engagement. Based on that, the 18th arrondissement would like to work on setup of open-source tools for transparency and citizen engagement. OBEU tools seems to offer this simple and comprehensible access to the data.

Overall missions in this project

18th arrondissement city hall will be the experimentation field for the trial. 18th arrondissement will provide data, expertises and facilities to host events for solutions experimentation with public. The number of citizens involved in this experimentation will depend on the solution's maturity and the number of key disseminators involved.

The large scale trial made technologically possible by OpenBudgets.eu is a key democratic change challenge to experiment, observe and learn.

The openness and the new civic detailed participatory opportunity open by this "technology" will have great impact on citizens, but also on politics, public servants and civic oriented research lab.

The Paris Trial team includes the following professional figures:

- Data miner and budget expert
- OBEU tools super-administrateur
- Key Disseminator citizens and public
- Citizens
- Politics and public servants
- Education and sociology experts
- Journalists

During the experiment and deployment of civic-tech innovations it's required to consider event the "tech" part and the "civic" part. As for the tech part, the product have to be easy to use, relevant for his goal and users need, usable by experts for "administrative area" and by anyone for public part.

The plan for the trial can be summarised as follows (More details about the plan in Appendix). Paris will be responsible to manage and orient the feedback gathering from all the type of participants in this experimentation, manage consolidation of all of them for sending to the OBEU management committee. Final users and tooling usages feedback will be gathering throw "classical" light ergonomist and sociologist methodology (interview, questionnaires,...), then consolidated and send in "one shot" to the committee.

Technical remarks, improvements, bugs,... will be send as soon as discovered throw a bug tracking system (if available in OBEU) or email, or any other medium that exist in OBEU for this kind of feedback.

See document “Paris-Application” in Appendix for the complete detailed plan of action.

2.3 Thessaloniki

Thessaloniki is the second biggest city in Greece with 1.100.000 inhabitants, including the whole metropolitan area, while the area of the Municipality has 323.000 inhabitants, of which 54,2% are women, representing the second biggest population of women in Greece. Country’s biggest University is situated here and along with the area’s other two HEI, they incorporate more than 100.000 students.



CITY OF THESSALONIKI

INTELSPACE Innovation Technologies S.A. and URENIO Research of Aristotle University of Thessaloniki form a group of organizations working together on projects dealing with innovation ecosystems, innovation policy and strategy development, and planning for intelligent / smart cities. INTELSPACE was founded in 2007 as spin-off company of URENIO Research with a focus on intelligent / smart cities.



To achieve to deliver the required feedback and reports of the LST call for tender, the tenderer proposed the following actions:

- Perform technical trials on the openbudgets.eu platform using budgetary data of the Municipality of Thessaloniki.
- Perform facilitated group discussions with key personnel of the municipality of Thessaloniki about the different functions of the openbudget.eu platform
- Consult experts in the city of Thessaloniki about the Open Data budgetary data sets of the city of Thessaloniki.
- Produce a report on the outcomes of the trials and the specific challenges that will be addressed during the implementation of this exercise.

INTELSPACE SA had proposed to:

- Allocate a project manager for the implementation of actions foreseen in the tender.
- Involve a scientific expert that will monitor the outcomes and deliverables of the performed actions.
- Establish, for the period of the implementation, a steering committee, that will include one member from the municipality of Thessaloniki, Open Knowledge Foundation Greece and INTELSPACE SA.
- To create four (4) task forces that will tackle the required three main (3) feedbacks plus the community engagement.

3 Structured Testing Scenarios

In this section we describe predefined testing scenarios designed for the Large Scale Trials. Every OBEU partner provided input on the software and concrete functionality that should be tested and the expected outcome, e.g. the knowledge and insights that are expected, from the test runs. This set of testing cases was used to have consistent and comparable tests between the three different trials. In the following Section 4, describing the implementation and feedback obtained by the municipalities, we follow the structure outlined in these testing scenarios.

TS1: Data Ingestion with OpenSpending

Name	Data Modeling and Import with OS Packager
Contact	OKI
Description	The municipality users should be able to test the data loading functionality (wizard) offered by the OpenSpending platform to upload their data to FDP format.
Actor/Role	Municipality Admins or similar (Data Owners)
Rationale	At some point the OBEU platform users will be on their own and able to load their own data on the platform. We need to know the issues they face with that process (if any), or feedback on the process.
Data	The test can be done on an arbitrary development dataset first and then on the municipality datasets. Data will be required from the tester.
Software	https://github.com/openbudgets/openspending
Tutorial/HowTo	https://docs.google.com/document/d/10bpu7_Gy37xNm5rE5ZZs76W96EXYue2d_4DHhvS4LdA/edit http://docs.openspending.org/en/latest/contributors/package/

TS2: Automated Data Transformation to RDF

Name	Automated Data Transformation to RDF
Contact	UEP
Description	The municipality users should be able to test the option of transforming their data (successfully uploaded to the OBEU platform as FDP) to RDF format (using the automatic FDPtoRDF pipeline).

	<p>This is a follow-up of Data load with OpenSpending. The user task consists only of finding the "run external hooks" button in the OS Packager UI (after loading the data).</p> <p>We will then analyze the logs and search for any problems in the transformation.</p> <p>If this test is not possible (e.g. data cannot be loaded using OS Packager) or not successful (transformed RDF data has problems), then custom LinkedPipes ETL pipelines have to be created manually by the OBEU partners.</p> <p>On a second stage, this process has been redeveloped and automated, so the transformation is happening automatically without the need for users to press any button.</p>
Actor/Role	Municipality Admins or similar (Data Owners)
Rationale	At some point the OBEU platform users will be assisted in testing the transformation to RDF of their own data on the platform. We need to know the issues they face with that process (if any), or feedback on the process in general.
Data	The test can be done on the municipality datasets uploaded as FDP on the OBEU platform using the OpenSpending tool. Data will be required from the tester.
Software	http://etl.linkedpipes.com/ https://github.com/opendatacz/lp-etl-components/tree/master/t-fd-pToRdf http://next.openspending.org/packager http://next.openspending.org/admin/ https://github.com/openbudgets/pipeline-fragments/tree/master/FDPtoRDF
Tutorial/HowTo	https://github.com/openbudgets/pipeline-fragments/tree/master/FDPtoRDF/documentation/user%20documentation
Questionnaire for feedback	<p>No questions - users just trigger the pipeline. Feedback is the RDF produced by the pipeline, or LP-ETL logs if it fails.</p> <p>Documentation on the success of this test needs to be collected by the OBEU partners working with the municipality.</p>

TS3: ETL Pipelines for RDFising fiscal data

Name	ETL Pipelines for RDFising fiscal data
Contact	(OKGR)
Description	Fiscal Data need to have a common semantic representation, according to the OpenBudgets.eu RDF model. We have already demonstrated how the Data Model can be used to describe fiscal data. Datasets of previous years, covering a wide variety of

	<p>organizations (from local municipalities to EU level), have already been modeled using the OpenBudgets.eu model. Current (and future) fiscal data, in raw form, need also to be transformed using the same data model.</p> <p>Users responsible for this task will have to follow the RDFising process as it is described and performed under OpenBudgets.eu. LinkedPipes ETL will be used to execute this task. Users will not need to create their own pipelines, but they are going to re-use pipelines whose structure have already been created and configured. Users will have to make minimal adaptations (e.g. the year or month of the dataset, its operational character and other minor changes) during the transformation process. They will also have to fill in the metadata of the dataset, such as the publisher, the date created and the date updated and some other informational attributes.</p> <p>As data modelers, we want to know the possible pitfalls and misunderstandings, users may have to tackle in order to upload and transform fiscal data according to OpenBudgets.eu Data Model.</p>
Actor/Role	Fiscal department employees and staff + OBEU data modelers
Rationale	<p>This scenario will test the semantic transformation procedure of fiscal data, in terms of correctness, effectiveness and simplicity. Hopefully, users will become familiar to performing a task that may seems too complicated. User experience but also the results of the testing scenario could lead to further improvements, additions, or fixes of some of the steps of the process, in order to be adapted more easily by Public Administrations..</p>
Data (optional)	<p>raw budget revenue and expenditure data monthly-basis budget data where available</p> <p>Users responsible for this task will have initially to pre-process and transform fiscal data into a common format, in particular, in .csv format, if not available.</p> <p>This scenario assumes a common raw budget data representation of fiscal datasets. In case of an updated raw budget data structure, further actions need to take place (data cleaning, or new components in pipelines).</p>
Software	<p>LinkedPipes ETL - https://github.com/linkedpipes/etl</p> <p>OpenBudgets.eu Data Model - https://github.com/openbudgets/data-model</p> <p>OpenBudgets.eu pipelines - https://github.com/openbudgets/datasets</p>

	<p>CSV2RDF Pipeline Template: https://github.com/openbudgets/pipeline-fragments/blob/master/CSV2RDF/pipeline/CSV2OBEURDF-Template.jsonld</p>
Tutorial/HowTo	<p>https://github.com/openbudgets/pipeline-fragments/blob/master/CSV2RDF/documentation/CSV2OBEURDFPipelineDocumentation.pdf</p>

TS4: Visualisations

Name	Visualisations
Contact	OKFGR
Description	<p>Citizens will be able to search and view budget information of the Municipality, in any level of detail. They could specify the fiscal information they want to retrieve and visualize by customizing corresponding variables (year or specific time period, operational character, administrative unit, etc.). Visualization features of the retrieved budget data will contribute to the analysis and presentation of the data. Based on their selection, different visualizations will be displayed and comparison between various time periods or others, could be made.</p> <p>We want to check and hopefully confirm that the visualization features and possibilities of OpenBudgets.eu are understandable and adequate for the users of the platform.</p>
Actor/Role	Municipality domain experts, admins and staff, citizens.
Rationale	<p>The OBEU platform users will be assisted in testing the visualisations of their data. The integration of the visualization and data exploration features that have been developed under OpenBudgets.eu will allow data to be displayed from different aspects, in any level of detail or aggregation. We have to check if this service is friendly to the user and does show in an appropriate and insightful way the information they want while trying to find and represent some interesting views over the budget of the Municipality. Any usability improvements or feedback on the process in general will be valuable as well.</p>
Data	Available budget revenue and expenditure data of the Municipality in OpenBudgets.eu model format.
Software	<p>https://github.com/openbudgets/ OS Viewer: https://github.com/openbudgets/os-viewer</p>

	http://docs.openspending.org/en/latest/developers/viewer/
Tutorial/HowTo	http://docs.openspending.org/en/latest/users/

Name	UX of KPI app (Comparative Analysis Visualizations)
Contact	(OKFGR)
Description	<p>As the KPI app is supposed to be used by website admins (admin-site management) and regular users, the User Experience we deliver must be pleasant. People should be able to navigate and use the service as smoothly as possible.</p> <p>We will gather data with respect to any functionality of the KPI app and iteratively work on/improve the UX based on feedback.</p>
Actor/Role	Municipality Website Admins or similar (KPI app Users)
Rationale	The scenario will test if the app is useful and easy to use for the municipalities and the users. KPI app should be accessible through any device (mobile, desktop, tablet). It is mainly targeted to citizens so it should be as simple as possible. Logs will be monitored to get feedback and improve the app.
Data	The test can be done on an already available data or data uploaded on TS2/TS3.
Software	https://github.com/okgreece/KPIs http://kpi.okfn.gr
Tutorial/HowTo	http://kpi.okfn.gr/#about-page

Name	Defining and Publishing KPIs
Contact	(OKFGR)
Description	KPIs can be constructed via simple forms through the admin panel. Admins will use the admin panel to define aggregators, indicators and finally publish on the dashboard.
Actor/Role	Municipality Website Admins or similar (KPI app Users)
Rationale	Besides the predefined KPIs, admins can define additional KPIs through the admin panel. Moreover, admins can decide on which KPI to publish on the dashboard. UX should be tested to recognise any pitfalls and potential improvements in the whole procedure, whether something didn't work properly, as well as the simplicity of the process.
Data	The test can be done on an already available data or data

	uploaded on TS2/TS3.
Software	https://github.com/okgreece/KPIs http://kpi.okfn.gr
Tutorial/HowTo	http://kpi.okfn.gr/#about-page

TS5: Microsite

Name	Microsite configuration
Contact	(IAIS)
Description	The microsite is designed to be configurable in terms of colors, language, datasets, arrangement of the views, etc. As a microsite developer I want to know whether microsite users are able to configure their own microsite and which problems they face so that <see rationale>.
Actor/Role	Municipality Website Admins or similar (Microsite Users)
Rationale	At some point the microsite users will be on their own configuring the microsite(s) and changing properties according to their website layouts. We need to know the issues they face before that.
Data	The test can be done on an arbitrary development dataset. No data needed from the tester.
Software	https://github.com/openbudgets/microsite
Tutorial/HowTo	https://github.com/openbudgets/microsite Demo: http://microsite-obeu.iais.fraunhofer.de/vizmanager/1/

Name	Discussion Forum
Contact	(IAIS)
Description	As a regular user I want to share my opinion and thoughts about budget and spending, so that I am able to participate in open conversations with other citizens.
Actor/Role	Regular user (citizen)
Rationale	It is important to know that citizens feel comfortable discussing

	and criticizing aspects of the datasets.
Data	The test can be done on an arbitrary development dataset. No data needed from the tester.
Software	https://github.com/openbudgets/microsite
Tutorial/HowTo	https://github.com/openbudgets/microsite Demo: http://microsite-obeu.iais.fraunhofer.de/vizmanager/1/

Name	Authentication, Authorization and Configuration of Services
Contact	(IAIS)
Description	As a Service Admin I want to create user profiles for the website admins of different municipalities and assign them specific permissions, so that services and new customers are quickly setup.
Actor/Role	Service Admin
Rationale	Although we want maximum configurability, we do not want people being able to delete important data or modify configurations that can affect the service for other municipalities.
Data	The test can be done on an arbitrary development dataset. No data needed from the tester.
Software	https://github.com/openbudgets/microsite
Tutorial/HowTo	https://github.com/openbudgets/microsite Demo: http://microsite-obeu.iais.fraunhofer.de/vizmanager/1/

Name	User Experience (UX)
Contact	(IAIS)
Description	As the Microsite is supposed to be used by website admins (admin-site management) and regular users, the User Experience we deliver must be pleasant. People should be able to navigate and use the service as smoothly as possible. We will gather data with respect to any functionality of the microsite and iteratively work on/improve the UX based on feedback.
Actor/Role	Website Admins and Regular Users

Rationale	There is no point in creating something no one will want to use and UX is the main factor in this matter.
Data	The test can be done on an arbitrary development dataset. No data needed from the tester.
Software	https://github.com/openbudgets/microsite
Tutorial/HowTo	https://github.com/openbudgets/microsite Demo: http://microsite-obeu.iais.fraunhofer.de/vizmanager/1/

TS6: Data Mining

TS6.1:

Name	Data Mining - descriptive statistics
Contact	(OKFGR)
Description	<p>The municipality users should be able to access summary information of data in a meaningful way in order to understand simple patterns that could emerge from the municipality's data. They could actually see different descriptive statistical measures- such as the mean, the range, the variation of the amounts that are interested in. There are also more sophisticated summaries of these amounts, such as algorithms that show the distribution of amounts in different classes of money and summaries that show subjects with the most frequent activity, for example a citizen could see which administrative unit has the most spending activity.</p> <p>Citizens can also see the correlation coefficients that measure the influence of one amount for example budget or expenditure phase, to another.</p> <p>This kind of analysis is very important because it allows simpler interpretations of the data as it is hard to understand visualizations showing only the raw data, helping in this way every user to understand better the basis of every Municipality's structure.</p>
Actor/Role	Municipality Admins or similar (Data Owners)
Rationale	<p>The OBEU platform users will be assisted in testing the correct functioning and the effectiveness of the service, in terms of analysis capabilities of financial data. They will be able to understand the Municipality's structure through the described descriptive tasks which will be visualized in the platform.</p> <p>The ability of any citizen or stakeholder to search and scrutinize any level of detail of the Municipality's financial data, in terms of economic activities or transactions, administrative units, or a</p>

	<p>specific time period will enlighten the Municipality's work and plan in the allocation of their fiscal resources, as well as the citizens' valuable contribution and may bring out some interesting key points in the budget formation and budget data of the Municipality or result some kind of simple patterns.</p> <p>We want receive feedback and see if this kind of information is easily accessible, understandable, as well as useful to the municipality and the citizens.</p> <p>These tasks will also augment the trust of citizens in the Municipality about the ways they spent their money and will benefit the transparency issue.</p>
Data	Available budget revenue and expenditure data of the Municipality in OpenBudgets.eu model format.
Software	<p>Data Mining Analysis and Algorithms -</p> <ol style="list-style-type: none"> 1. https://github.com/openbudgets/DAM 2. https://github.com/okgreece/DescriptiveStats.OBeu <p>Indigo - https://eis-openbudgets.iais.fraunhofer.de/indigo/</p>
Tutorial/HowTo	https://github.com/okgreece/DescriptiveStats.OBeu

TS6.2:

Name	Data Mining - time-series analysis and prediction
Contact	(OKFGR)
Description	<p>Apart from "basic" views over data, the municipality users should be able to test and access to more complicated budget information concerning the changes over time of a specific revenue or expenditure category of a specific administrative unit. This provided capability in the OpenBudgets.eu platform involves methods and techniques of time series analysis that take into account the internal structure of the data, such as autocorrelation, trend or seasonal variance, in order to extract meaningful characteristics and fit a model to predict appropriately future behavior of such data. As it is hard to understand complex data mining techniques, in OpenBudgets.eu platform the results are interpreted with simple visualizations including some basic diagnostic summary information to evaluate the outcomes and eventually help users to understand better the performance of Municipality's over time.</p>
Actor/Role	Municipality Admins or similar (Data Owners)
Rationale	<p>The OBEU platform users will be assisted in testing the internal structure of Municipality's data in time domain revealing trends, correlations of data with the time domain, predictions of future behavior and some measures to evaluate the predicted results. This kind of analysis describes from a different perspective the municipality's fiscal performance, by including the time domain in the analysis task, studying the variations of the selected fiscal</p>

	<p>amount over the years and providing solid predictions according to the observed past behavior. For example, users will have the capability to perform temporal analysis of an administrative unit or municipality of a specific budget phase on the municipality's budget data and produce deep insights about budget allocations, between different administrative units and years. Evaluation summary tables will be also provided in order to evaluate better and trust the predicted future behavior of the selected municipality's data. This scenario aims to verify the easy handling and correct understanding of the aforementioned features by the users. Time-series analysis will gradually augment the trust of citizens in the Municipality about the ways they spent their money over the years. It will also help understand better the municipality's behavior in the previous years and also get a view about its future policy.</p>
Data	Available budget revenue and expenditure data of the Municipality in time domain and in OpenBudgets.eu model format.
Software	<p>Data Mining Analysis and Algorithms -</p> <ol style="list-style-type: none"> 1. https://github.com/openbudgets/DAM 2. https://github.com/okgreece/TimeSeries.OBeu <p>Indigo - https://eis-openbudgets.iais.fraunhofer.de/indigo/</p>
Tutorial/HowTo	https://github.com/okgreece/TimeSeries.OBeu

TS6.3:

Name	Data Mining - clustering
Author	(OKFGR)
Description	<p>The municipality users should be able to perform an iterative process of knowledge discovery that involves a set of techniques and algorithms used to test and find groups (clusters) of similar budget or expenditure observations in the municipality's data. They will have the capability to interact and perform various clustering algorithms that differ in their notion of how to form and define a cluster or automatically let our proposed method to select the appropriate clustering algorithm according to a set of internal measures. Cluster analysis is a complex data mining technique which in OpenBudgets.eu platform its results are interpreted with simple visualizations including some basic summary tables to evaluate the results and eventually help users to understand better the structure of Municipality.</p>
Actor/Role	Municipality Admins or similar (Data Owners)

Rationale	<p>The OBEU platform users will be assisted in testing and finding the groups into the structure of Municipality's data according to the observed and selected fiscal data.</p> <p>Given a set of data that characterize a specific level of the municipality, such as the budget phase in administrative units, cluster analysis involves techniques that will show the internal groups with similar characteristics. For example, users can study the groups of administrative units according to the observed expenditure budget phase amounts and see which administrative units have similar expenditure amounts. This kind of analysis in the structure of Municipality will discover internal patterns in different levels of the municipality's fiscal data, produce deep insights about the budget allocations between different levels and provide a view about the policy of the municipality according to the selected fiscal data. This scenario aims to verify the easy handling and correct understanding of the aforementioned features by the users. Finally it will augment the trust of citizens about the ways the municipality handles the budget and spending amounts of money.</p>
Data	Available budget revenue and expenditure data of the Municipality in OpenBudgets.eu model format.
Software	<p>Data Mining Analysis and Algorithms -</p> <ol style="list-style-type: none"> 1. https://github.com/openbudgets/DAM 2. https://github.com/okgreece/Cluster.OBeu <p>Indigo - https://eis-openbudgets.iais.fraunhofer.de/indigo/</p>
Tutorial/HowTo	https://github.com/okgreece/Cluster.OBeu

TS6.4:

Name	Data Mining - rule/pattern mining
Contact	(UEP)
Description	<p>Association rule/pattern mining is a technique for discovering interesting relations between attributes in databases. To select interesting rules from the set of all possible rules the measures of interestingness are used. In OpenBudgets.eu platform there will be supported basic measures, confidence and support and also the measure lift. This measure finds groups of pairs attribute-value having enhanced occurrence measured against a random choice from data.</p> <p>Based on skills of responsible person there are these four options for use of rules mining algorithm:</p> <ul style="list-style-type: none"> ● Direct use of RStudio ● DAM integrates R packages ● DAM integration via REST API ● Web UI (EasyMiner)
Actor/Role	Municipality Admins or similar (Data Owners) for Web UI option,

	data miners or data scientists for other options.
Rationale	The OBEU platform users will be assisted in testing and finding of interesting associations in the Municipality's datasets. Although the use of rule/pattern mining on budget data is not typical, this technique can discover some interesting patterns such as above average spending in a certain budget line for a specific region or the relationship between spending public money and the electoral cycle.
Data	Available budget revenue and expenditure data of the Municipality in OpenBudgets.eu model format.
Software	https://github.com/kizi/easyminer https://github.com/openbudgets/DAM www.easyminer.eu Indigo - https://eis-openbudgets.iaais.fraunhofer.de/indigo/ Documentation http://www.easyminer.eu/tutorial EasyMiner API tutorial: https://github.com/KIZI/EasyMiner-EasyMinerCenter/wiki/API-usa-ge-manual
Tutorial/HowTo	https://github.com/KIZI/EasyMiner-EasyMinerCenter/wiki/API-usa-ge-manual

TS6.5:

Name	Data Mining - outlier/anomaly detection (frequency based)
Contact	(UEP)
Description	<p>The users should be able to execute the method for detection of outliers on their data. This method is based on extraction of frequent patterns that follow the paradigm: if an instance contains more frequent patterns, it means that this data instance is unlikely to be an anomaly. Considering this, the method calculates the anomaly score for each input instance where higher scores represent anomalies. Users should be thus able spotlight instances in data that are more likely to be abnormal. Results can be interpreted with help of basic tabular representations or visualizations providing conceptual explanations of those situations.</p> <p>Based on skills of the responsible person there are the following possible options for trials:</p> <ul style="list-style-type: none"> ● Direct use from RStudio ● DAM integrates R packages ● DAM integration via REST API (end of February) ● Web UI (EasyMiner) (end of March)

Actor/Role	Municipality Admins or similar (Data Owners) / Data Mining expert
Rationale	The OBEU platform users will be assisted in testing and finding outliers - observations in data that appear to deviate significantly from others. Although this method is not primarily designed for budget data, it can help to reveal instances that are composed from combinations of low-frequency values. This approach might help to spotlight instances that are worth further investigation.
Data	The test can be done on an arbitrary development dataset or available budget revenue and expenditure data of the Municipality in OpenBudgets.eu model format.
Software	Data Mining Analysis and Algorithms: 1. https://github.com/openbudgets/DAM 2. https://github.com/jaroslav-kuchar/fpmoutliers Indigo - https://eis-openbudgets.iais.fraunhofer.de/indigo/
Tutorial/HowTo	Link to a tutorial or a guide for users Demonstration of the algorithm: <ul style="list-style-type: none"> https://gist.github.com/jaroslav-kuchar/0968328abaf7be7a2d34199e1d9cb571

TS6.6:

Name	Data Mining - outlier/anomaly detection (LOF based)
Contact	(UBONN)
Description	This method is based on the local density of data-items in the whole dataset. Outlier items are those whose local densities are quite different from their neighborhoods.
Actor/Role	Municipality Admins or similar (Data Owners) / Data Mining experts
Rationale	The OBEU platform users will be assisted in testing. Domain experts shall evaluate the validity of the outlier items detected by the algorithm.
Data	The test can be done using several datasets in the RDF formats
Software	https://github.com/openbudgets/outlier_dm https://github.com/openbudgets/DAM https://github.com/openbudgets/preprocessing_dm Indigo - https://eis-openbudgets.iais.fraunhofer.de/indigo/
Tutorial/HowTo	https://github.com/openbudgets/outlier_dm/blob/master/Tutorial.md

TS7: Participatory Budgeting

Name	Participatory Budgeting Platform
Contact	(Civio)
Description	<p>Citizens will be able to influence the budget allocation inside a given city by using the tool developed.</p> <p>As soon as a voting process is opened by a city or municipality, citizens can vote on the proposals they'd like to see implemented. Every participant is assigned a certain amount, representing their share of the public budget which they can allocate to different proposals. Multiple proposals can be selected, as long as the assigned amount is not yet fully allocated. Proposals can be filtered according to specific districts such as Downtown or the Riverside (virtual districts right now) or according to keywords relevant such as Environmental Protection, Bicycles or Parks and Recreation. It is also possible to choose the amount of proposals shown. Finally a tree diagram visualisation allows an overview of each proposals share of the allocated budget.</p> <p>Educational resources for citizens gathered in D.7.4, will provide online materials to understand i.e. how to use the tool, the budget cycle, terms used or how to influence and monitor the budget.</p> <p>This will ensure transparency during the participation process, so every stakeholder can access information about the feedback sent and its effective impact in the decisions made.</p>
Actor/Role	Municipality Admins or similar (Data Owners)
Rationale	<p>The testing scenario will verify the correct functioning and the user friendliness of the service, as well as whether it is appropriate and sufficient enough for the needs of citizens and administrators in participatory budgeting and budget voting and learning tasks.</p> <p>Based on the voting feedback received, a Municipality could achieve better budget management and city governance, counting with citizens' approval when planning their budget policy, investments and allocation.</p>
Data	<p>Data Protection Law accomplishment will play a key role at the time of identifying and verifying voters.</p> <p>Data tests can be done on the municipality datasets uploaded as FDP/RDF on the OBEU platform using the OpenSpending tool.</p>

Software	https://github.com/openbudgets/participatory-budgeting
Tutorial/HowTo	https://github.com/openbudgets/participatory-budgeting

4 Large Scale Trials, implementation details and feedback

In this section, for each municipality, we present the feedback and the results for all the test scenarios. Details on the implementation and the outcome of the evaluation are included. The results of the usability questionnaires (originally done using Google Forms) are also described .

4.1 Bonn

Testing Scenarios

TS1: Data Ingestion with OpenSpending

Bonn datasets were acquired from a private channel, and mirrored publicly¹. Overall, budgets from the year of 2017-2024 have been obtained, including the explanatory documents that explains available dimensions and the content of each value in the classifications.

Bonn datasets have a complicated and unusual structure for several reasons. First, unlike other datasets, Bonn datasets have a positive and negative measure values, which represents the budget direction. Positive values refers to expenditure budget, while negative values represent revenue budget. Second, the dimensions within Bonn datasets also contains hierarchical structure and optional dimensions. Rows/observations/records with similar core dimensions may duplicated with other rows with different optional dimensions. For this reasons, rows with similar core and optional dimensions have to be aggregated. Third, the datasets of Bonn contains the maintenance costs which represented as zero-values rows, and hence cannot be visualized properly upon ingestion using OBEU/OS (OpenBudgets.eu/OpenSpending) Viewer. However, a simplified version of Bonn’s datasets have been prepared by the municipality and it could be easily uploaded to the OBEU platform using the OBEU/OS Packager.

Feedback on the Packager focused on possible improvements of usability of the tool and on simplifying the import procedure for non-tech-savvy users.

¹ https://drive.google.com/drive/folders/0B_pRuFrTj344ck5RZWViUnBNZTQ?usp=sharing

TS2: Automated Data Transformation to RDF

OpenSpending packager supports a specific format and structure to package the fiscal datasets. The packager adds the datasets in CSV format with additional metadata that should be filled out by the user who upload the datasets. This metadata is then saved in an additional file in JSON format. Fiscal Data Package specification² explains the detail of FDP format.

The structure of the datasets that are supported by OpenSpending Packager are datasets which include the dimension notation / code and dimension labels / description within a single CSV file. Since the datasets from the municipality of Bonn are not structured this way, the OBEU/OS Packager does not support augmenting Bonn CSV datasets with metadata.

The automatic transformation pipeline of raw datasets depends on the OpenSpending packager. Since the Bonn datasets complexity hinders the transformation of datasets into FDP, the automatic transformation into OpenBudgets semantic data model could not be done without changing the data structure of the original raw datasets. For this reason, we ask the municipality of Bonn to provide some simplified datasets to test the automatic transformation of Bonn datasets. This simplified dataset, however, is limited to one year only and hence cannot be used to transform all the datasets for all the available years.

The FDP to RDF pipeline runs automatically once the datasets have been uploaded using the Packager. Hence, no feedback on the usability of this tool is required. The resulting RDF data was manually checked for correctness.

TS3: ETL Pipelines for RDFising fiscal data

To bypass limitation of the OBEU/OS Packager, we develop our own transformation pipelines that handles the complexity in Bonn datasets. The pipeline is developed in the LinkedPipes platform, which is developed within the OpenBudgets project. Developing such manual pipelines needs expertise and extra time, but able to handle complicated datasets. The pipelines are available in OpenBudgets' datasets Github page for Bonn³, and transformed Bonn datasets are available in the OpenBudgets.eu's triple store⁴.

Overall we developed the transformation pipeline for all the available classifications as well as the datasets. Upon datasets transformation, a Data Structure Definition is provided to describe all available dimensions and measures. In the dimensions transformation, it is also possible to translate the German dimension label into other language using a machine translation API.

Overall, three different pipelines were implemented for each of the optional classifications typical of the Bonn municipality data model. These pipelines were replicated for each budget year from 2017 to 2024. Because of the complexity of the task, the municipality needed the help of the OBEU consortium in order to create the pipelines and transform the datasets.

Bonn datasets have positive and negative measure values, which represent the budget direction. Positive values refer to expenditure budget, while negative values represent revenue budget, which are not suitable for the visualization tools. After communicating with OBEU technical partners, Bonn municipality splitted their datasets into two data-tables, one only containing positive amount values, the other only containing negative values.

² <https://specs.frictionlessdata.io/fiscal-data-package/>

³ <https://github.com/openbudgets/datasets/tree/master/Bonn>

⁴ <http://data.openbudgets.eu/sparql>

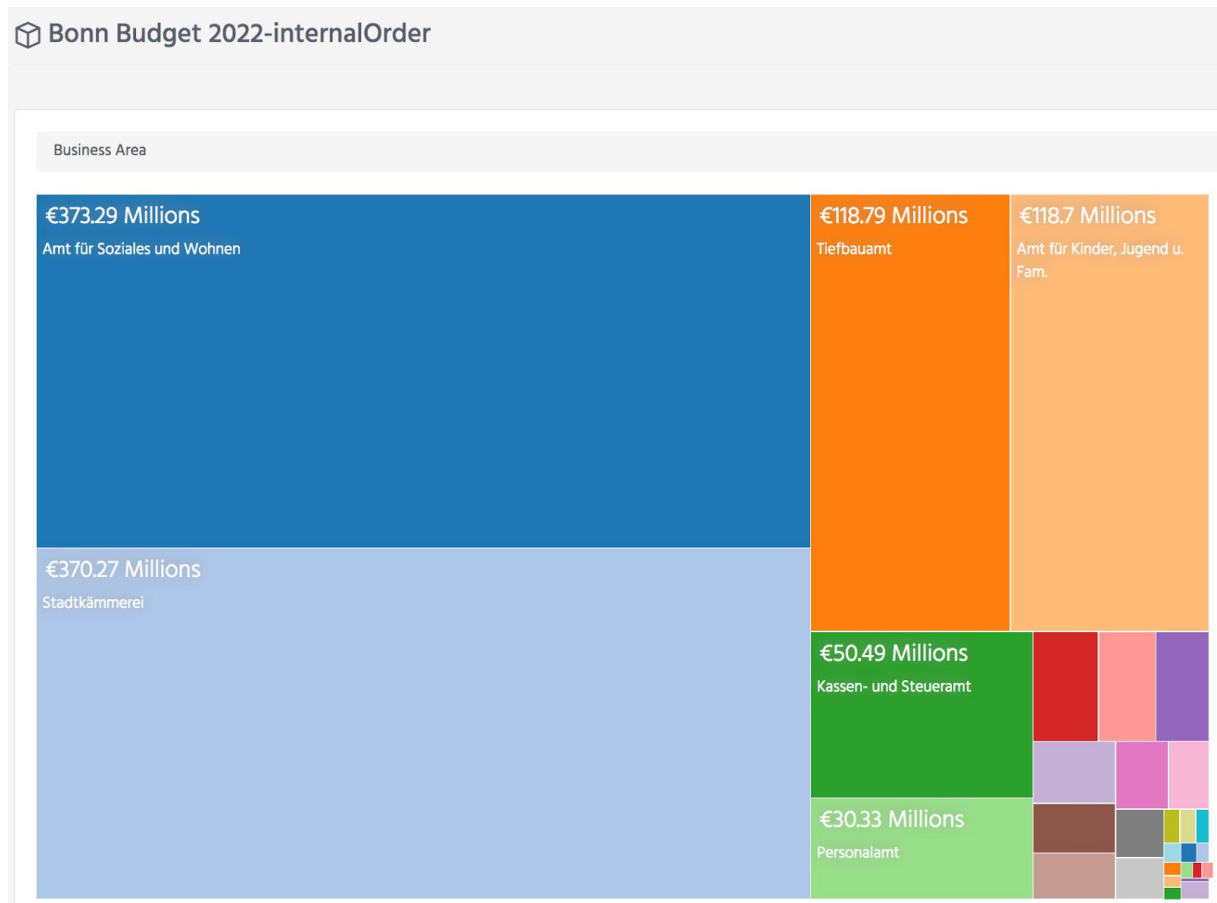


Fig 1. A tree-based visualization of Bonn Budget dataset in 2020

TS4: Visualisations

To evaluate visualisation tools, colleagues in municipality Bonn acted as professional experts in budgeting, and selected visualisation tools to evaluate their familiar datasets.

The municipality favors the style, colors, and the simplicity of the visualisation tools, such as tree-based (Figure 1), pie-based, bar-based visualisation method, especially the bar-based tool developed by the University of Bonn (Figure 2). This particular visualization has been revised according to constructive suggestions by the municipality of Bonn. One of the discussion topic was to improve this visualization so that the visualization can be embedded to the official site of the municipality of Bonn. A demo of this visualisation is publicly accessible at <https://budget-bonn.herokuapp.com/>. The screenshot of the visualization is provided in Figure 2.

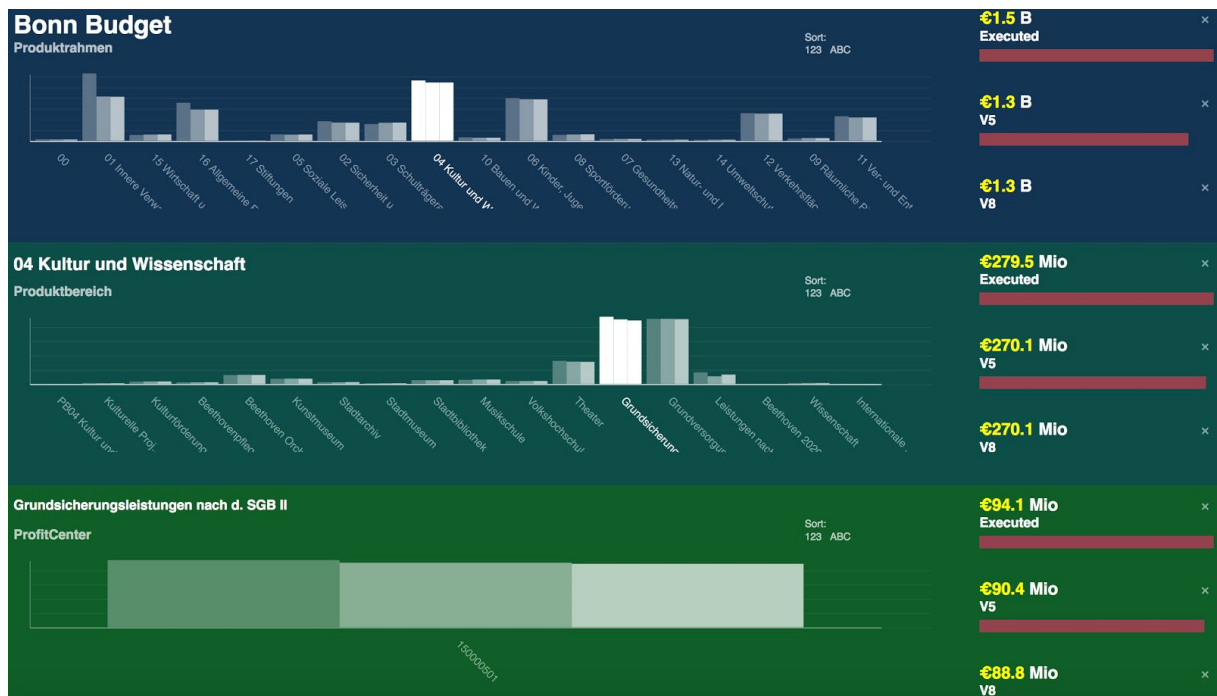


Fig. 2. A sample visualisation of Bonn Budget Data

Part of the visualization packages are also the KPIs tool, as tested in TS4. The municipality of Bonn tested the tool setup example for the Greek (Thessaloniki and Athens) case. An instance of the KPIs tool has also been developed at a later stage by the OBEU tech partners, but in this case the setup of the tool was too complex for the municipality to be completed properly. However, the KPIs tool functionalities were very interesting for the municipality who wanted to continue working on creating an instance for the Bonn city case. This kind of tool was envisioned as very useful for domain experts rather than regular citizens.

TS5: Microsite

During this test scenario, the OBEU team set up a Microsite instance for the municipality of Bonn, configured with their most relevant datasets and showcasing the main features of it.

First, participants got to interact with the main module, where they were able to inspect their data through the embedded OS-Viewer, and switch to the chat area to post comments and read past reviews.

Then, we jumped into the administration module, where participants got the opportunity to customize the look & feel of their datasets by theming, and the layout of all elements shown to citizens in the main module. Microsite users were left on their own configuring the microsite(s) and changing properties according to their website layouts.

The administration panel has been perceived as very easy to use and configure. Additional feedback concerned requests for multi-language support and for being able to select exactly a particular view or configuration of a chart as a default visualization on the microsite.

The Bonn municipality expressed interest in adopting the microsite for allowing citizens to explore Bonn budget data. However, a translation of the tool options into German language is deemed to be necessary for the publication of the tool to Bonn citizens.

TS6: Data Mining

Large scale testing on data-mining is carried out by the municipality Bonn in two ways as follow: (1) colleagues in municipality Bonn accessed our OBEU homepage to test data-mining functions; (2) colleagues in municipality Bonn set data-mining tasks to us, and we run related data-mining functions. The result is evaluated by the colleagues in municipality Bonn for the validity.

In the first testing paradigm, colleagues in municipality Bonn acted as both professional experts in budgeting and normal citizens. As professional experts, they selected their familiar datasets (in this case, they only selected Bonn datasets), uploaded to the OBEU database using the wizards, and selected data-mining tools to evaluate the data analysis quality. A screenshot is shown in Figure 3.

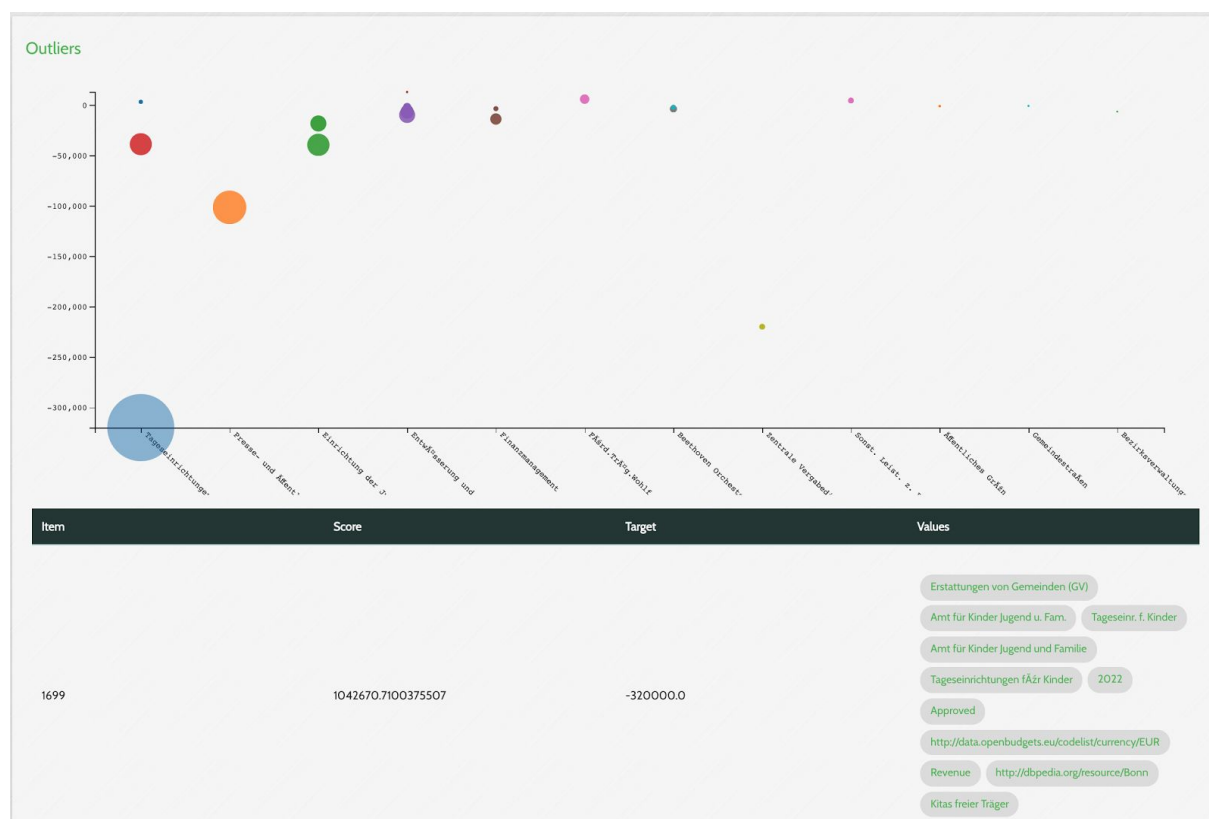


Fig .3 Outlier detection result of Bonn Budget 2022 (Internal-Order)

The feedback is that dataset containing positive and negative numbers are not suitable for statistical analysis, as the sum of all the amount may lead to zero. After discussing with OBEU team, they simplified some of the Bonn datasets, and fed to the data-mining tool.

The second testing paradigm is the validity test of data-mining algorithm. Concretely, colleagues in municipality Bonn set a data-mining task: in 2020, city Bonn will organize a big celebration for the 250th birthday of Ludwig von Beethoven and will be a big budget than normal allocated. The testing target is to check whether OBEU data-mining tools can identify this unusual case.

We applied two outlier-detection functions separately for the Bonn datasets. One (frequency-based method) developed by UEP, the other (LOF-based method) developed by IAIS/UBonn. Both methods successfully identified the unusual budgeting in 2020 without knowing the exact reason behind. What surprises colleagues in municipality Bonn is that our

outlier-detection functions identified some other outliers which are well-known by the colleagues in municipality Bonn.

The general feedback from colleagues in municipality Bonn is that only small amount of citizens shall be interested in data-mining and that experts in budgeting can easily recognize unusual budgeting cases (therefore, less interested than normal citizens), because they are experts in Bonn budgeting cases.

TS7: Participatory Budgeting

The participatory budgeting platform has been tested by the Bonn municipality. However, they stated that they were not interested in publishing such a tool to the citizens yet. Apparently, citizens are not yet ready for such a tool where they could vote for budget items and projects of their city. Another problem envisioned by the Bonn municipality would be the huge amount of bureaucracy necessary for the implementation of such a tool open to their citizens. The implementation of the tool would require much longer time than a short trial of a few months.

Nevertheless, Bonn found the tool very easy to use and configure and easy to understand. It is clear and nice to use and it is suitable for regular citizens. Configuration of the tool on the portal is also easy and understandable. The demo tool tested by the municipality was set-up by the OBEU consortium and Civio in particular. The interface is appealing and everything worked as expected.

Creation of an OBEU instance for Bonn

Uni Bonn has implemented a replica of the OBEU platform hosted on their own servers. The steps followed for this process are straightforward, briefly: (i) install Docker software first on the server, (ii) clone the OBEU Git repository, (iii) change the configuration file and run a script to set up. In the configuration file, the domain name is changed according to the server being used. The implementation details can be found in OBEU Git repository (available at <https://github.com/openbudgets/integration/blob/master/README.md>).

4.2 Paris

Testing Scenarios

TS1: Data Ingestion with OpenSpending

The municipality of Paris tested the import to OBEU through OpenSpending (OS Next platform - <https://next.openspending.org>) which at the same time converts the source file (CSV) to the Fiscal Data Package (FDP) format. The experience depended on the quality of the source data, obviously. In their case, the data was already clean (official published open data), yet can already indicate that small abnormalities (like # in cells) should not prevent the upload. They noticed a compatibility problem with Firefox regarding a display issue only while using the internet explorer. Most end-users won't be able to manually "debug" their CSV to make the import work. The user path to access 'My datasets' should be simplified: once logged in, "My datasets" should appear on the top bar or in the User drop down menu -

instead of 'Profile' or "Admin". Also, the user path to access OS Viewer from "My datasets" should be simplified. For most users, they assumed this is the feature they would like to use (visualize their data and publish their dataviz), so this should be evident and straightforward. (more details on this in the TS4 feedback below).

TS2: Automated Data Transformation to RDF

Paris initially noticed some bugs related to the Automated Data Transformation from FDP (fiscal data package) to RDF (resource description framework). These issues have been fixed later on, yet the beginning of the trial showed clearly that there were still some issues with OS-Explorer/Rudolf. The matching of CSV (comma-separated values) field to FDP classifications during import is mostly straightforward but could be simplified. After following the tutorial instruction, it mentions "Now the transformation to RDF will be performed in the background (it can take a few minutes) and after that, the dataset will be available in the "OpenBudgets platform", but it didn't explain what is the "OpenBudgets platform" and where the output of the ETL is. After some exchange between OBEU consortium members and Paris, it was pointed out that In fact the 'Run External Hooks' button on OS (SaaS version) - <https://next.openspending.org/admin/> - was hard-coded to point to the main RDF ETL Pipeline hosted at the Fraunhofer Institute. During the trial, the bug was fixed. A new smoother process has been implemented for the automatic transformation of data to RDF and to OBEU platform. In this case the dataset was uploaded here: http://eis-openbudgets.iais.fraunhofer.de/viewer/budget_mairie18__994e0 .

TS3: ETL Pipelines for RDFising fiscal data

This tool was not deeply tested as the data could be imported using the automatic import and transformation functions. The creation of the pipelines and the use of LinkedPipes required the help of OBEU experts. This is because the necessary knowledge about Linked Data and open data transformations was not present in the Paris team.

TS4: Visualisations

According to the feedback on testing the visualisations in the Paris case, the KPI revealed a very interesting tool. It has been tested with the data from Greece - available on <http://kpi.okfn.gr>. Paris' feedback has been mostly related to the UX of KPI app since the target of this tool is to undifferentiated citizen. A lot of different ways to visualize fiscal datas are possible, yet the navigation appeared not very user-friendly, and some explanations should be suggested while the users are looking to display those data sets. Graphics were found clear, yet the user experience should be improved with some more text explaining on the displayed data. Simplicity is appreciated, but may exclude a large part of novice users. Paris suggested to improve the UI to make it more intuitive for regular users.

Feedback on the OBEU/OS Viewer visualisations has been provided as part of the Microsite test scenario, as in the following TS5 section.

TS5: Microsite

An instance of Microsite had been installed together with the OBEU team to use and test. Microsite is basically an embedded version of OS Viewer (<https://next.openspending.org/viewer/>) which explains why our following comments concern both tools and scenarios.

Basically this tool allows a stakeholder to publish dataviz of their budget on their own websites, available for their citizens to use. This first test was based on the dedicated instance, yet Paris will install our own instance of Microsite, using the real extended data.

Since its audience is the general public, this makes Microsite the most prominent and visible part of the whole OBEU toolchain. This is one of the key tools of OBEU which requires a specific attention to the aspects of UI and UX. According to Paris, the maintenance by the town hall should not be a problem. Since Microsite is just an embed of OS Viewer, there's no replication of data. Every change on the OpenSpending platform, including OS Viewer will appear as it is on the Microsite, which is very convenient and simple to be used by civil servant.

Paris suggested that the “social dimension” of Microsite should be expanded. Indeed, at the moment, only the default viz is published on the Microsite webpage. Users can tweak the parameters on the left panels to create their own personalized dataviz, but they cannot make it public or available to other users. They can only share a link to their dataviz, or embed it on their own website. Paris also suggested to improve the personalisation option, to reinforce as much as possible the implementation and regulate the use of Microsite, especially to support a communication department use of the outcome of Microsite.

A suggestion for a different presentation would be to let the UI have 3 different tabs: (1) main for the default dataviz (new one in development), (2) one for "expert dataviz" (old OS Viewer), a (3) last one for "showcases" published by the admin.

TS6: Data Mining

The Paris team lacked expertise on data mining in general and for fiscal data in particular. This made almost impossible for them to test the data mining functions offered by OBEU. The algorithms and the methodology behind the data mining tools were not properly understood and as a result this testing scenario was not fully completed. Feedback on these tools was that they could have been made more user friendly and better explained to regular users, however the complexity of the data and the analysis algorithms makes it almost impossible.

TS7: Participatory Budgeting

The participatory budgeting platform has been tested by the Paris municipality. However, they stated that they were not interested in publishing such a tool to the citizens yet. The municipality already works with another company for a similar tool offering participatory budgeting, therefore they would prefer to continue with their well known tool.

Nevertheless, Paris found the tool very easy to use and configure and easy to understand. It is clear and nice to use and it is suitable for regular citizens. The interface is appealing and everything worked as expected.

4.3 Thessaloniki

Testing Scenarios

TS1: Data Ingestion with OpenSpending

During this test scenario, the participant had to use the OS Packager utility to upload a dataset on the platform. By the time of testing this procedure was applicable only through original OpenSpending platform, thus adding some confusion over the workflow required. This led to the decision to integrate OS packager on the OpenBudgets.eu stack. Datasets for the Municipality of Thessaloniki are already published as Open Data and can be exported in different formats, as CSV or Excel, through the municipality's website⁵. OS Packager requires the source file to be in CSV format so the procedure was easy to implement. OS Packager has a very user friendly interface, to help users to model and describe their fiscal data, as also commented by the tester. A minor problem occurred, as the original dataset was not containing a "Date" column where OS Packager expects a column containing data about the date, in various date formats, where the specific budget line or transaction refers to. This was solved by manually editing the file using a spreadsheet editor and repeating the drill from start. Later updates of the OS Packager improved this behavior by adding a "virtual" column, as a standard data for all rows. In general the outcome of the test was that the OS Packager offers a very user friendly environment to upload fiscal data on the platform. As stated on the final report (see Appendix) "The testing procedure did not identify any major problems in the process. The anticipated functionality was tested thoroughly and found operational. No issues that require attention have been identified."

TS2: Automated Data Transformation to RDF

At this testing scenario the participant had to test the Automated Data Transformation to RDF, using the pipeline FDP2RDF through the OS Admin utility. The procedure is very simple as the user has to connect on the OS Admin with his user credentials (Google OAuth), find the dataset on his portfolio and click a button. The button runs a hook that triggers a pipeline to transform the dataset in RDF using the OpenBudgets.eu Data Model and then stores the outcome in N-Triple serialization on the server, available for public download and stores the dataset and complementary datasets (codelists, DSDs, etc) on the platform's Triplestore. The procedure is non interactive, minimizing effort and failures. On completion of the pipeline the dataset in RDF format is available to download and stored on the triplestore, for further usage by the other OpenBudgets.eu platform services. During the test for Municipality of Thessaloniki there was not found any major errors. Only a minor UX issue, where the rendering of the hook button using a specific web browser(Firefox) was not possible, although it was functional. The problem was tackled by using a different web browser(Chrome).

TS3: ETL Pipelines for RDFising fiscal data

This testing scenario, examines the procedure of creating custom pipelines using an ETL tool, in our case LinkedPipes ETL, to transform fiscal datasets in RDF format, using the OpenBudgets.eu Data Model and upload on the platform. This procedure offers much more flexibility in data import/export operations and data modeling. For instance, in Municipality of Thessaloniki, it was a requirement to design and implement a procedure that would automate the ETL process. Budget data of Municipality of Thessaloniki updates every month, so a manual data modeling through the OS Packager would require additional effort every month from the Department of E-Government. Thus, a LinkedPipes ETL pipeline was designed to automate this procedure. The pipeline was implemented as a template, so other municipalities could easily reconfigure and reuse the pipeline to cover their needs. The procedure is described more detailed on (see Appendix). After the pipeline was set on the server, it allowed to automatically retrieve the dataset from municipality's website on a monthly interval, transform in RDF and upload the dataset on the platform's triplestore. During the test two minor problems were identified. The first was an issue where a user could not delete a link between two components on the LinkedPipes ETL GUI. The latter was an

⁵ https://gaiacrmkea.c-gaia.gr/city_thessaloniki/index.php

issue with setting up the pipeline on the server. In general there was not major issues during this testing scenario. The overall impression was that the procedure would require specific skills by municipalities employees or assistance by experts to set up correctly, however it offers a deploy-and-forget utility which minimizes effort needed in the long term.

TS4: Visualisations

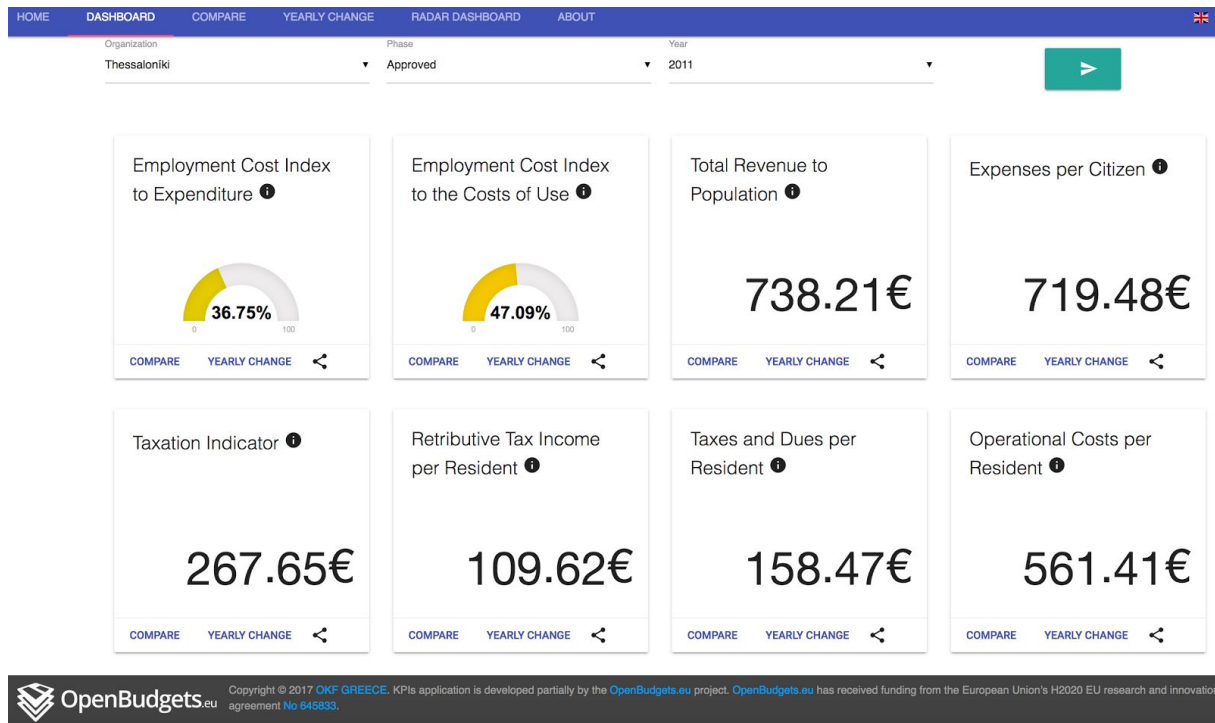
Fiscal data, either it is a few rows of fiscal numbers and items, or huge and with complex structure datasets, are difficult to be understood by either common people or more advanced users. To this end visualizations offer a method to provide easy to consume views over information. The OpenBudgets.eu platform offers different type of views over the data, either it is a well defined graph over the raw data, or more complex views produced by common or advanced analysis over the raw data. On this scenario for the case of Thessaloniki LST, OS Viewer and the KPI application had to be tested. The test was separated on three parts TS4a , TS4b and TS4c, where TS4a was the test of OS Viewer and the latter the testing of the KPI application. On TS4a, Data already uploaded on the platform on previous tests, had to be used in order to provide some useful views over the data. Additionally, the basic functionality that OS Viewer offers, such as filtering, sharing and embedding was to be tested. The testing procedure did not identify any major problems in the operation of the Visualisations application. The anticipated functionality was tested thoroughly and found operational. Issues that required attention for improvements and corrections were documented and reported. What was liked most was the well composed UI, and the ability to produce different types of graphs within a few clicks.

The KPI application offers a method to monitor the performance of public bodies, based on their fiscal data. Greek Municipalities are already obligated (by Greek Government Law 74712/29-12-2010)⁶ and other related laws or decisions, to publish their fiscal data based on standards. On the same Law, there is the definition of a set of Key Performance Indicators, based on these data and census data, originated by the Hellenic Statistical Authority⁷. On this end, the KPI application can be used to calculate and publish the values of these indicators, offering a monitoring tool to both public servants and citizens. The administrative part of the application was used to configure the calculation of the indicators. This was the TS4c concept. Administrators from the Finances Department of the Municipality had to define the budget items that would be used for each indicator. The application offers a simple enough interface for this, which was found helpful. Some minor issues were found, reported and corrected during the tests. Public servants reported that they could use the administrative panel of the application with some support by the OBEU developers. However this is a one-off procedure, so once set up correctly, there is no need to reconfigure the app. For the case of Greek Municipalities, the same configuration can be used for all other municipalities, because they use common standards, offering also comparison capabilities.

The TS4b was to test the capabilities of the visualizations offered by the KPI application. The environment was found very simple to use. The app presents the values of the indicators in simple coloured gauges. The sharing options was tested and found very useful. The API that the application offers was much appreciated, as it could provide integration with other services. No major issues were found during the tests.

⁶ http://www.ypes.gr/UserFiles/f0ff9297-f516-40ff-a70e-eca84e2ec9b9/fek2043_30122010.pdf (in Greek)

⁷ <http://www.statistics.gr/en/home/>



TS5: Microsite

The Microsite service was found very interesting as it offers the capabilities of the whole OBEU platform as an embeddable website, meaning that there is no requirements on resources for infrastructure on the Municipality side. An account for the Municipality of Thessaloniki was created using the Microsite application on the OBEU platform. An employee of the from the E-Gov Department of the Municipality had to configure a microsite instance for the Municipality of Thessaloniki. All configuration options was tested and found well composed and functional. No major issues were found. However during the first cycle of the test, there was missing some advanced configuration on the OS Viewer, as the only selectable type of visualization was the Treemap. This was reported and fixed on the latest updates. Additionally by the time of the first cycle of tests, the KPI application dashboard was not yet integrated on the Microsite application. This was fixed on the latest updates.

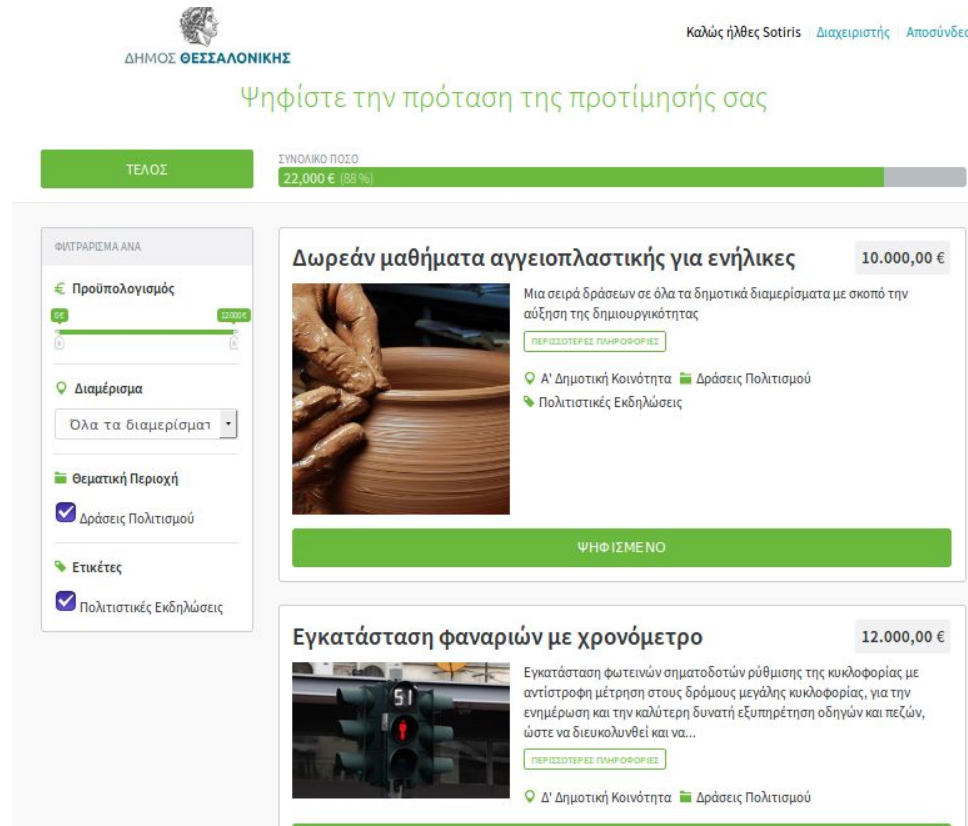
TS6: Data Mining

During this test, the capabilities of the Data Mining algorithms offered by the Indigo application were tested. Data ingested on the platform during previous tests was used. All of the algorithms were tested and found functional. But some of them would require a domain expertise in order to gain useful reports over the produced results. At the moment, there is not such capacity on the Municipality, as shown also on the other trials as well. However, the ability to have useful predictions and insights over the data was considered very useful, under the proper guidance of experts (Statisticians). No major errors was found during the tests.

TS7: Participatory Budgeting

Participatory Budgeting is constantly gaining positions on the agenda of public administrations. The recent achievements and establishments have been proved successful (Porto Alegre). Thus the Municipality of Thessaloniki had already plans for such procedures. The Participatory Budgeting application developed on the context of OpenBudgets.eu, offers an online application to vote proposals and monitor their progress. The Municipality of

Thessaloniki intend to use such platform as an additional channel for voters, over traditional methods (as is local communities councils, or local paper-based votings), to express their preferences over the proposed projects. The application was tested by employees of the E-Gov Department of the Municipality of Thessaloniki. A multilingual interface was requested, as until the first cycle of the test the application was available only in English and delivered in short time by OBEU partners.



There was no major issues found and the documentation provided was complete. Some minor issues found was reported and fixed on latest updates. The Municipality considers to publish in public the application on the following months for further testing.

Lessons Learned Summary

As a general result, we may state that the expected functionality was found operational and complete. According to the feedback collected from the staff members of the Municipality of Thessaloniki and the external experts, we may state the following conclusions:

- The components which deliver results and outcomes to the end users (e.g. KPIs, Microsite, etc) are beautifully designed with clean aesthetics and enhanced user experience.
- Especially useful and convenient for local authorities IT departments, is the Microsite application that allows them to easily embed OpenBudgets.eu customized dashboard on their existing websites.
- The Visualizations and the Key Performance Indicators applications are well designed. KPI application allows a kind of benchmarking and comparisons, given that appropriate data are indeed available. Allowing administrators to define their own metrics and indicators is a big advantage as they are i) the data exporting in CSV for further processing and ii) the social media integration. These features definitely promote transparency further.

- Indigo, is compatible with the OpenSpending and its overall usability is very good but we cannot comment on the algorithms under the hood. It would be nice though if the algorithms which are implemented during the project, to be able to be also used by OpenSpending platform itself, even outside the context of the project.
- Finally, the Participatory Budgeting platform seems to act more as a standalone application rather than fully integrated with the system, but its purpose and implementation are definitely fit to the OpenBudgets.eu stakeholders needs. Still, in order for this component to operate correctly, a mechanism to authenticate real persons could be achieved only by integrating a national level registry (e.g. GSIS for Greece's case) that ensures real identity.

The OpenBudgets software platform impresses with all the different functionalities that provides. It promotes transparency and the output of open data processing is significantly useful to the different stakeholders. Having everything as open source is a big bonus to the community and ensures future updates. An important concern, is its complexity, which, of course, could be surpassed by letting an expert to setup the system, but most importantly is the difficulty of the process of importing the various heterogeneous data into the system. Available open data need to be transformed in many ways and to be distilled in multiple levels to become meaningful and comparative but fortunately the OBEU team has prepared the necessary tools for that. It just remains to teach the local authorities and the other stakeholders how to use them properly. A complete listing of issues detected during the test can be found starting at page 94 of the “*Large-scale Trials for the Evaluation of OpenBudgets.eu Platform*” document attached in Appendix (file “Thessaloniki-LST-Report”) and provided for feedback by IntelSpace.

4.4 Usability Questionnaires Results

In this section we provide the results of the questionnaires ordered by testing scenario (as introduced in Section 3). All the questionnaires have been completed by the municipalities and are anonymous. Scores are expressing agreement with the statement and always on a scale from 1 to 5, where **1 means “strong disagreement” and 5 “strong agreement”**.

As we had eight (8) different questionnaires each with an average of ten (10) questions, here we can only display a few charts depicting the most interesting responses results to some of the questions. However, all the complete questionnaires results are available at the following publicly accessible folder:

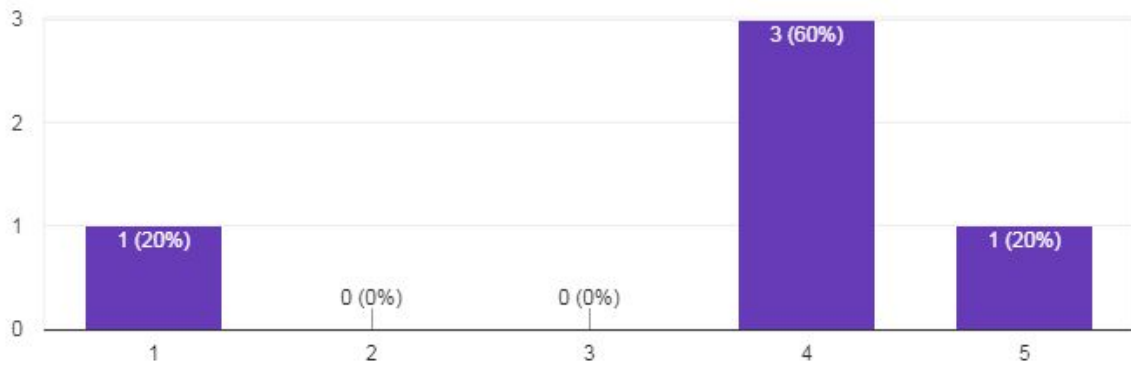
<https://drive.google.com/drive/folders/OB5ecBIVKmMmeUkJrZk5NXzRDNFk?usp=sharing>

TS1: Data Ingestion with OpenSpending

Regarding the OBEU/OS Packager for uploading data to the platform it is clear that most of the users found it easy to use (with 1 exception out of 5 responses) and well integrated with the platform. Also, it has been perceived as a tool not difficult to learn. Some of these results are summarised below.

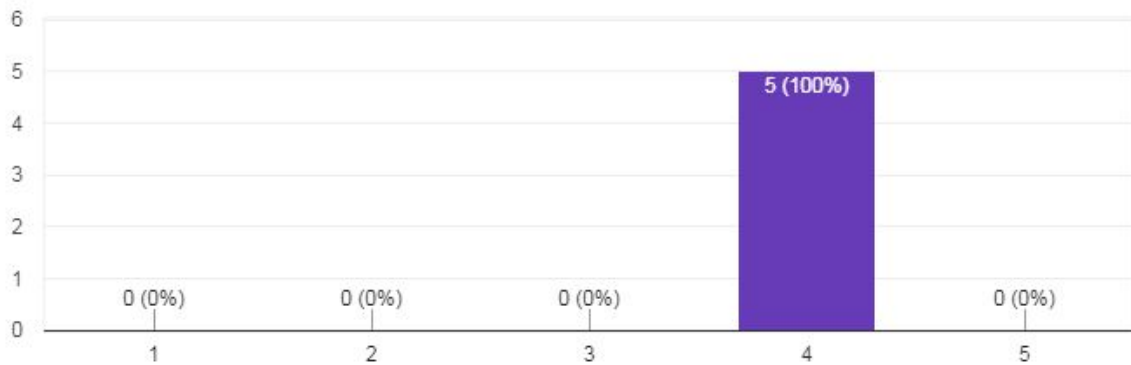
I thought the system was easy to use

5 responses



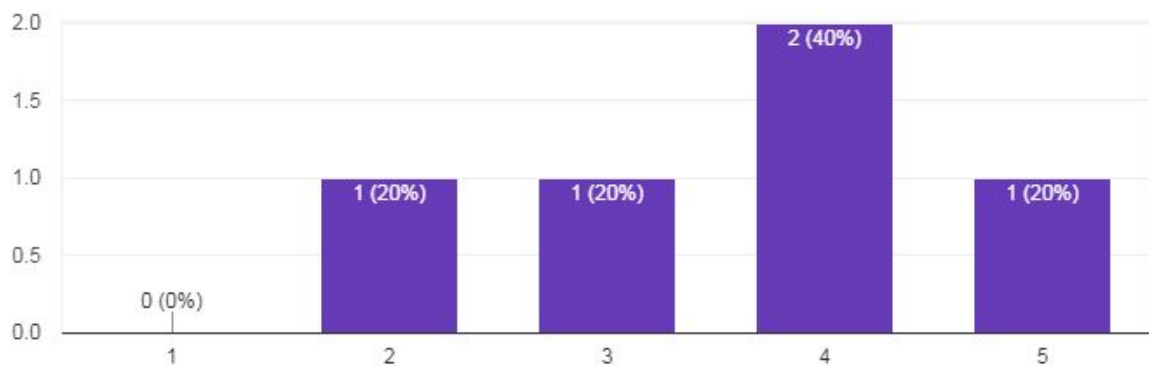
I found the various functions in this system were well integrated

5 responses



I would imagine that most people would learn to use this system very quickly

5 responses



TS2: Automated data transformation to RDF

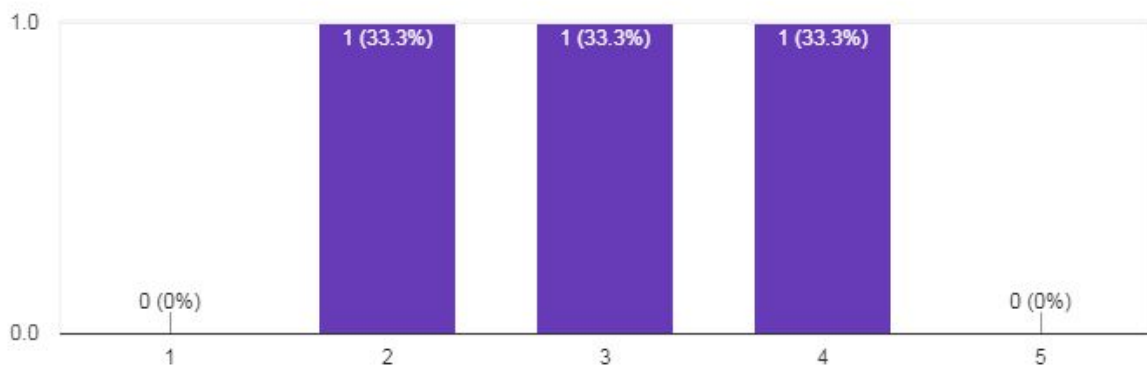
In this case we did not have a usability questionnaire available, as this test did not include any user interaction or interface.

TS3: ETL pipelines for RDFising fiscal data

This test scenario consists of custom ETL transformation pipelines for complex data transformations to RDF. As this scenario is targeted at experts in Linked Data and RDF technologies, the results of the survey are obviously indicating that the complexity of this tool for the municipalities is quite high and there is need of technical support by experts. The most indicative results are summarised below.

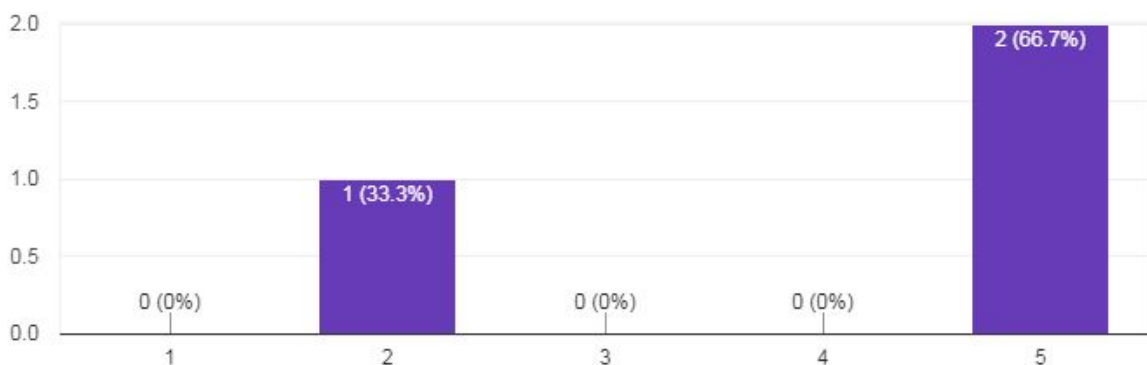
I thought the system was easy to use

3 responses



I think that I would need the support of a technical person to be able to use this system

3 responses



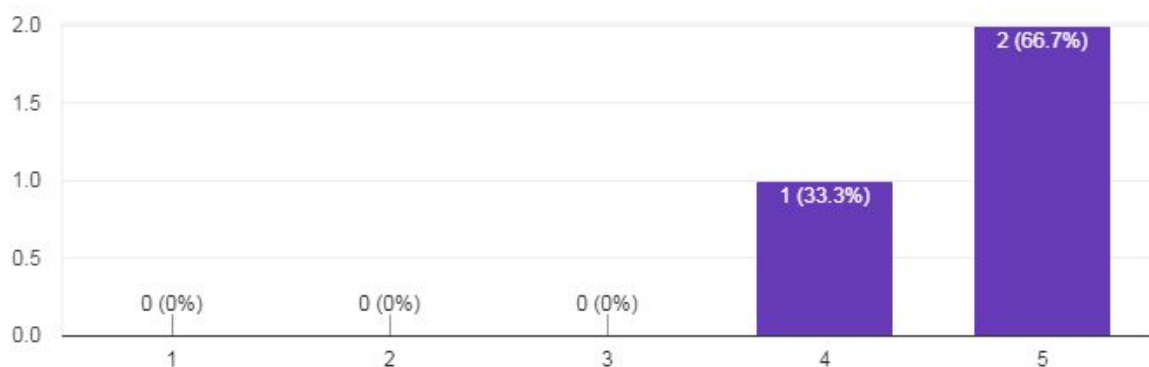
TS4: Visualisations

This test scenario includes the testing of the data visualisations with OS Viewer and the indicators offered by the KPIs tool. In this case three different questionnaires have been designed: one for the OS Viewer Visualisations and two for the KPIs tool (the user interface and the admin configuration panel).

The **visualisations** overall were positively evaluated, as we can see from the following responses.

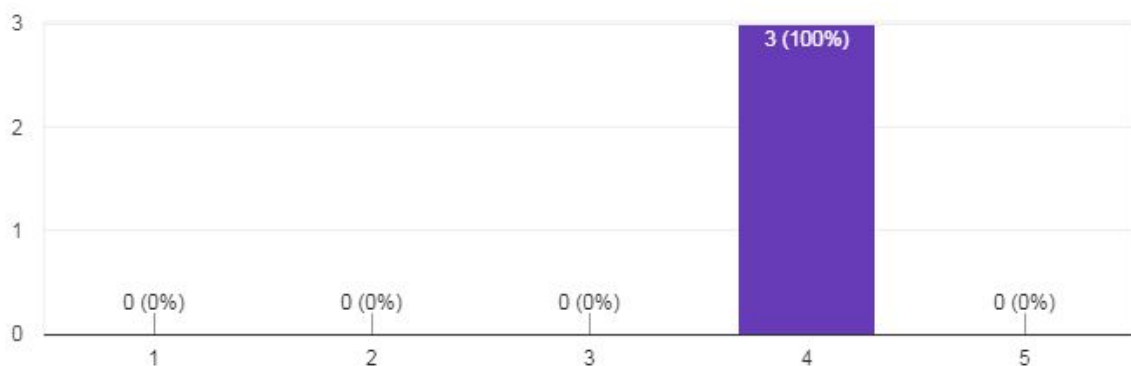
I think that I would like to use the visualizations frequently

3 responses



I felt very confident using the system

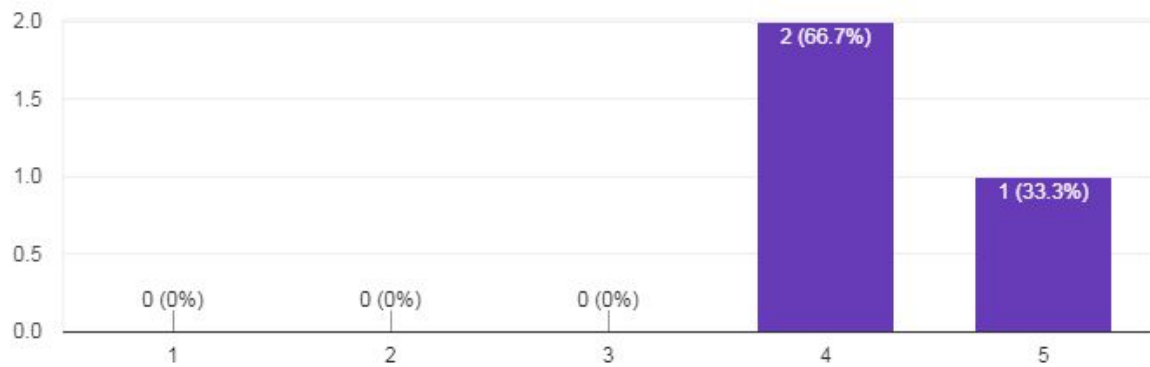
3 responses



Regarding the **KPIs tool**, users found it useful and easy to use. As summarised in the following charts.

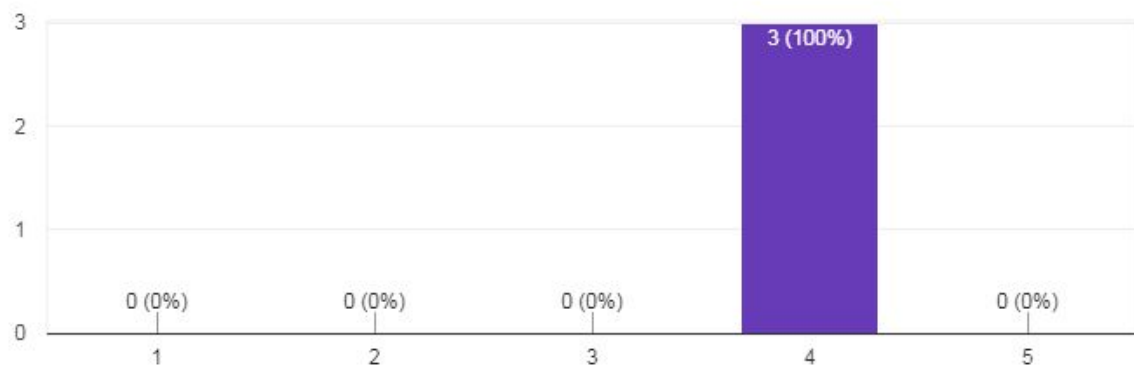
I think that I would like to use this system frequently

3 responses



I thought the system was easy to use

3 responses



Moreover, about the **KPIs** tool they also provided the following feedback.

What I liked most on this application was...

3 responses

the analytical diagrams
Easy, interesting overview of many indicators
the nice graphics

What I disliked most on this application was...

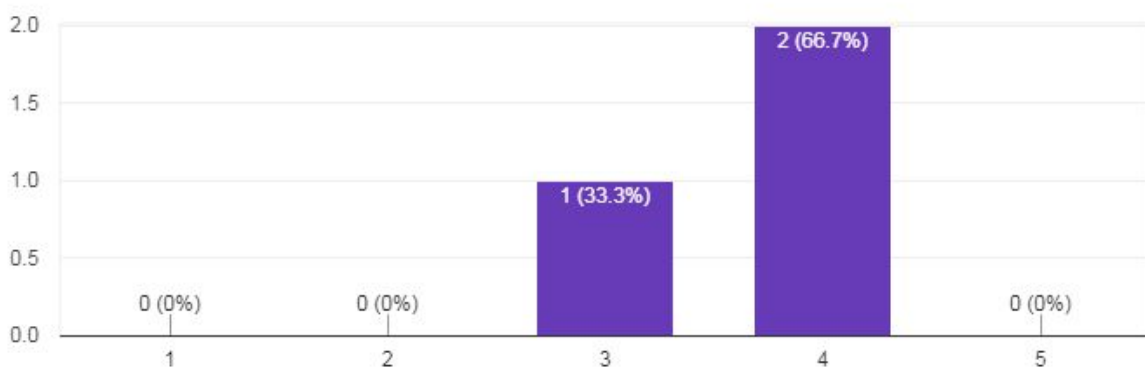
3 responses

nothing
some indicators are a bit complex for a normal citizen
a bit slow

Finally, regarding the **admin panel for configuring the KPIs tool**, the users found it a bit more difficult to use than the tool itself but still very useful. This tool however is targeted more at technical users and administrators and not for regular citizens.

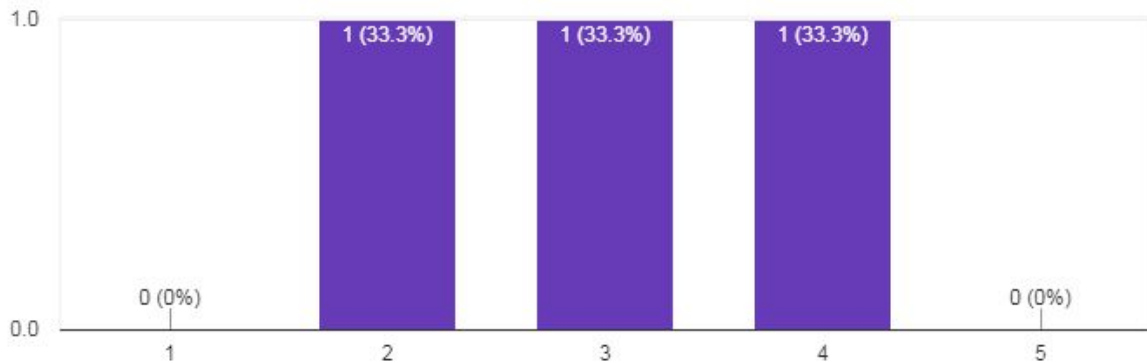
I think that I would like to use this system frequently

3 responses



I needed to learn a lot of things before I could get going with this system

3 responses



What I liked most on this application was...

3 responses

- that it is easy to use
- Complete and easy overview of many indicators
- very good idea and flexible configuration

What I disliked most on this application was...

3 responses

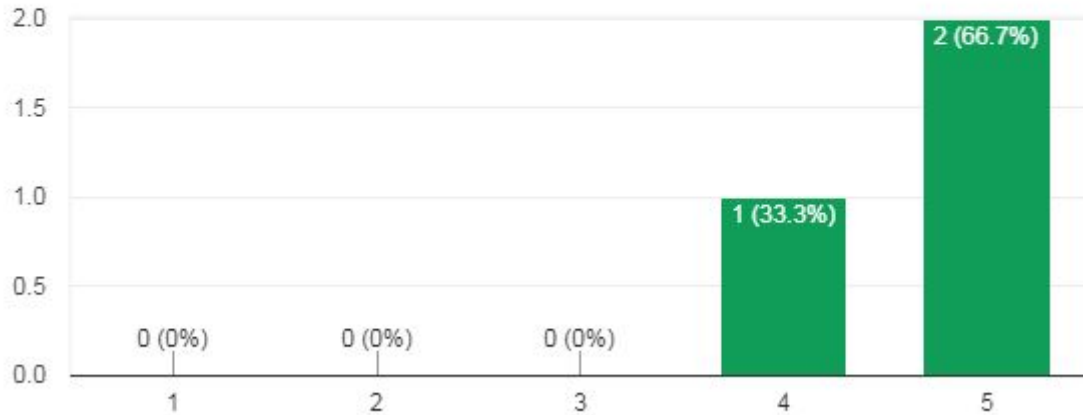
- nothing
- Some indicators are very complex and more for administrators
- the configuration can be a bit difficult for non tech people

TS5: Microsite

As regards the OBEU Microsite, users were clearly happy about it and expressed strong interest in continuing to use it. From the responses received, we can say that overall it has been perceived as a tool which is easy to use and well integrated (as summarised in the following charts).

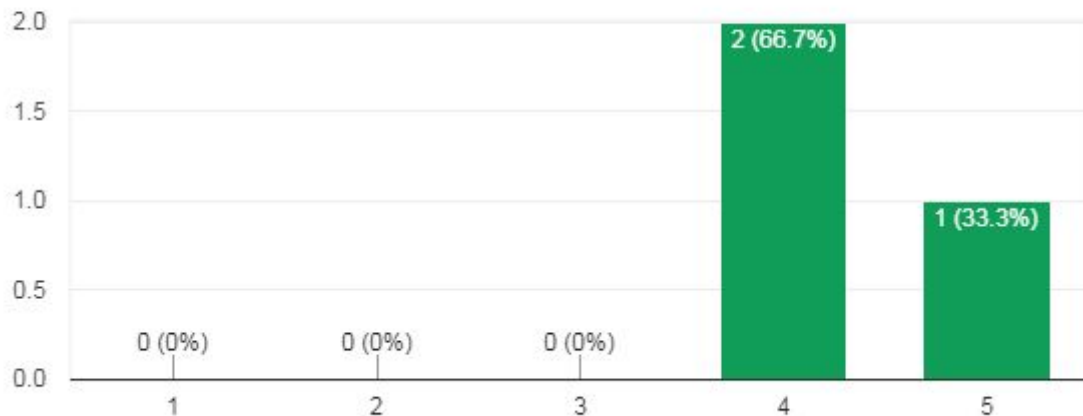
I think that I would like to use the OBEU Microsite in the future

3 responses



I thought the Microsite system and its configuration was easy to use

3 responses



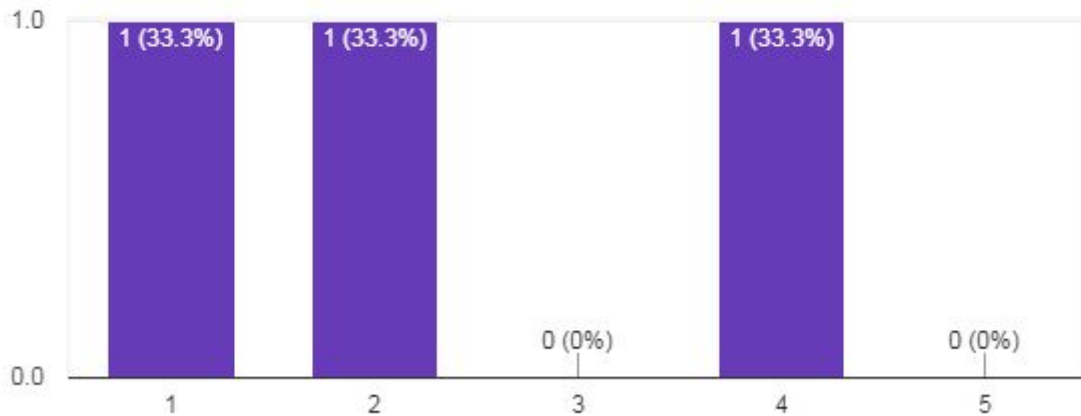
TS6: Data Mining

This testing scenario included a total of six sub-scenarios, one for each data mining algorithm. However, we deemed Outlier Detection to be the algorithm which is easier to understand for non-technical users. For this reason we had only one questionnaire designed for evaluating data mining performed using the Outlier Detection (LOF) application. The

application displays a chart, as output of the analysis performed, that can be explored by the users. The survey result shows that this is still a quite complicated topic for regular users and these data mining algorithms require the support of some experts in order to be fully operated and understood.

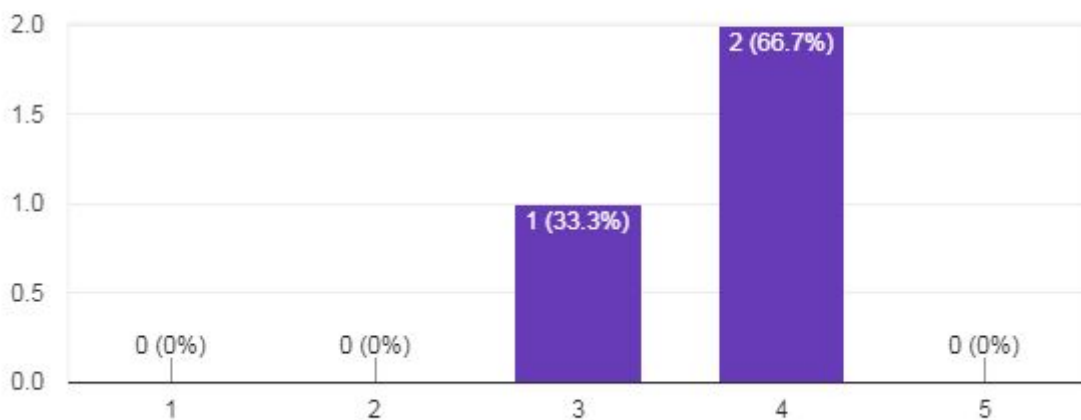
How well do you understand this data mining method?

3 responses



How often does such outliers appear in the datasets which you process?

3 responses

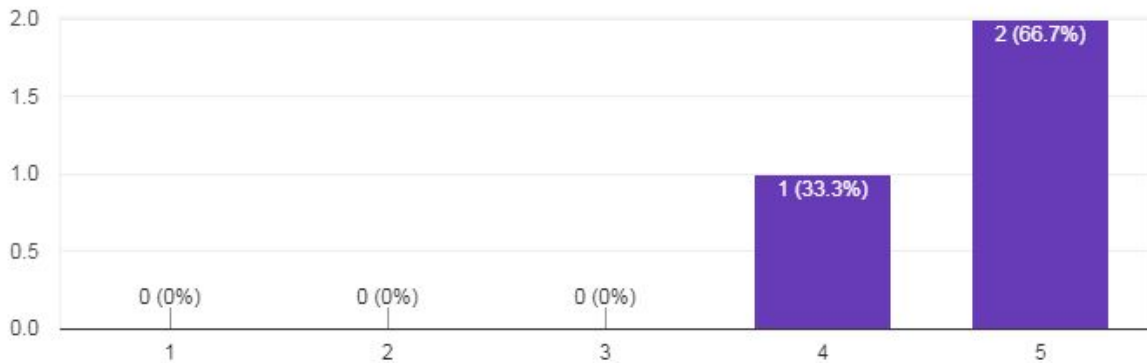


TS7: Participatory Budgeting

This testing scenario evaluates the participatory budgeting tool. In particular the Administrator's page ("Admin") and its usage for creating, managing and monitoring budget proposals. The survey evaluates also how the proposals are displayed and monitored. The results are quite positive and the interface has been perceived as clear and easy to understand.

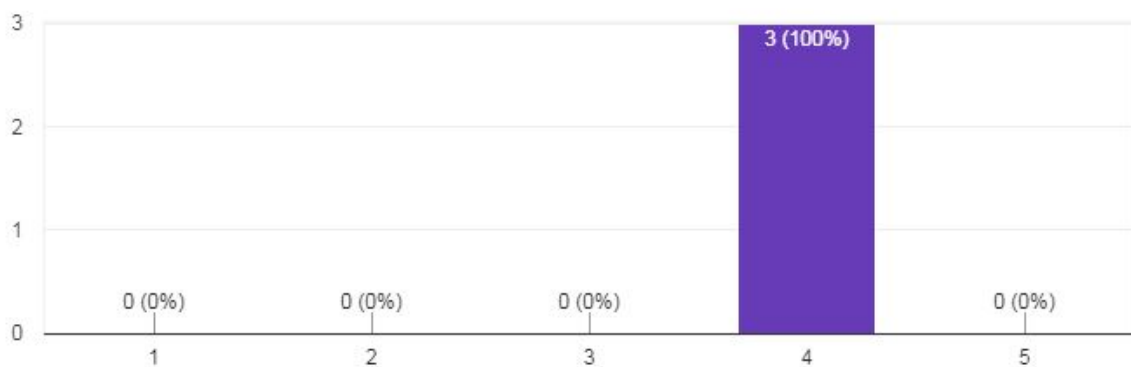
All proposals are displayed in a friendly way, easy to understand and can have their own identifiers (i.e. tags, areas, etc)

3 responses



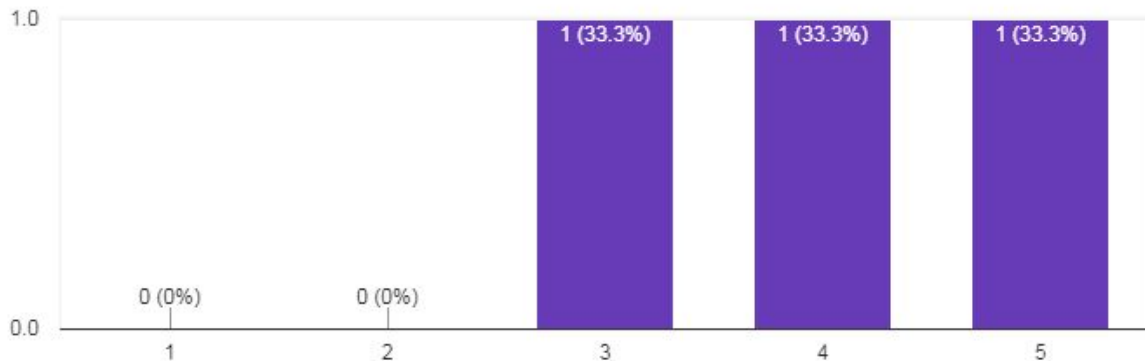
I found very useful the whole platform for creating proposals, voting them and follow them up through the monitor...receiving feedback from the citizens.

3 responses



I would recommend other administrators to use this platform for implementing participatory budgeting processes in their municipalities

3 responses



5 Conclusions

In this deliverable we have described the work done together with three selected municipalities - Bonn, Paris and Thessaloniki - in order to test the functionalities of the OBEU platform. The platform was tested in all its aspects by potential users belonging to the budget administration departments and policy makers of a municipality, but also by citizens. A detailed plan for evaluating all the main tools of the platform has been described. Feedback from the users has been collected and surveys on the usability of the tools have been deployed. Overall, the project received very positive feedback on the set of tools developed. All the municipalities clearly stated that they would like to continue using the OBEU platform and sets of tools. Follow-up projects are being established between the consortium partners and the municipalities in order to continue the collaboration started.

As for the lessons learned, in general, we may state that the tools' functionality was found operational and complete. According to the feedback collected we can summarise the trials' outcome with the following points:

- Key components offering visualisations and interaction over the data to the end users (in particular the Visualizations, the KPI tool, and the Microsite) are appealing, well integrated, with clear functions and enhanced user experience.
- A tool which is particularly useful and convenient for local authorities IT departments, is the Microsite application that allows them to easily embed OpenBudgets.eu customized dashboard on their existing websites.
- The KPI application revealed to be useful for benchmarking and comparisons. It allows administrators to define their own metrics and indicators and promote transparency.

- The search and exploration of datasets, offered by Indigo, is compatible with the OpenSpending platform, which allows for potential alignment of the data in the two platforms and future sustainability of the project.
- The data mining algorithms are interesting but need the explanation of the experts in order to be fully understood and operated. They are targeted at tech savvys and experts and/or budget administrators/journalists who would like to investigate anomalies in the data.
- Finally, the Participatory Budgeting platform acts as a standalone application rather than fully integrated with the system, but it covers a different phase of the budgeting process. Its purpose and implementation are fitting with the OpenBudgets.eu stakeholders needs.
- Budget data can sometimes be very complex in its structure/modelling and therefore needs specific custom data transformation pipelines. These are unfortunately quite difficult to operate by regular users of the municipalities and would need assistance and support by experts.

The OBEU platform promotes transparency and offers data processing capabilities significantly useful to the different stakeholders. Having everything as open source is a big bonus to the community and ensures future updates. An important concern is the complexity of both the developed software and the data. However, this issue could be mitigated with the help of experts setting up the system and importing the various heterogeneous data. This confirms the sustainability and exploitation plans of the consortium that sees this as a new business opportunity.

Appendix

All the original documents submitted by the municipalities participating in the trials are available online at the following address:

<https://drive.google.com/open?id=0B5ecBIVKmMmeVjVlcjB4ME1vaWc>

Because of the size of the documents (just one of them can be more than 100 pages) we have included here the list of documents and provided links to them online. The list of document includes the original proposals for the trials and the final reports.

Bonn Application

Available at <https://drive.google.com/open?id=0B5ecBIVKmMmeV1E0a3pxOVpDb28>

Bonn Profile

Available at <https://drive.google.com/open?id=0B5ecBIVKmMmeUFBHVV92ZkdQUnc>

Bonn LST Report

Available at <https://drive.google.com/open?id=0B5ecBIVKmMmeVjVlCjB4ME1vaWc>

Paris Application

Available at <https://drive.google.com/open?id=0B5ecBIVKmMmeWVFkT3hFZjBPYIE>

Paris LST Report

Available at <https://drive.google.com/open?id=0B5ecBIVKmMmeTIiKYmx5dUpGZDQ>

Thessaloniki Application

Available at <https://drive.google.com/open?id=0B5ecBIVKmMmeQUIRZ2RLWUdXTEU>

Thessaloniki LST Report

Available at <https://drive.google.com/open?id=0B5ecBIVKmMmeVHBMZU9YQ0FhZ1U>