

Development of the Open Budget Format

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Abstract—Opening budget information is one of the main approaches to build transparent government. By using technologies and open data people can build new services, innovations and make citizen society stronger. A lot of budget data published already around the world. Russian government also are interested in open budgets projects. But there is no appropriate, simple and flexible format for publishing budget data. In this paper we analyzed budget process, current structure of Russian budget, existing formats, frameworks and platforms for publishing to propose Open Budget Format as a first step to open budgets in Russia in good machine-readable manner.

of publishing budgets on different levels (national, regional, municipal) we suggest our format of publishing of open budgets which we called Open Budget Format (OBF) based on our experience in working with Government of Leningrad region who already have own initiative of Open Budget [6].

This work is a continuation of our last project of building St.Petersburg open data site [3] and created in 2014 project of Open Budget of Leningrad region on Open Spending platform [7].

I. INTRODUCTION

Open data is a world tendency in improvement of governmental processes, building e-government and making government more transparent. Another role of opening government data is giving ability to independent developers to create new applications and services by using open data sets. It allows driving innovations and citizen activism and could make significant input in building better citizen society, better government and better life in cities for people.

Open data initiatives have long story and different types of data are interested for developers in countries. So budget data is one of the mostly popular and demanded type of open data. A lot of projects in this area have been developed in US and Europe. Publishing budget data in machine-readable formats has many advantages for different groups of users: analysts and economists can use the data for social and scientific research; citizens can get understanding of the costs of the regional government in a convenient and understandable form, evaluate the effectiveness of budget spending, offer their ideas to public authorities, plan the family budget and calculate its contribution to the budget of the region; business representatives may use the data in the professional sphere for analytical, journalistic or political activity; government agencies may compare budget data of different, and can be more open to the citizens.

Some of tendencies in open data should be mentioned. First of all making data more structured, semantic rich and connected with each other. Linked data [1] is one of the main milestones in Open data format evolution. "Participatory budget" is also new term in governance processes and allows citizens to participate in budget process. It could be main step to "Participatory government" and from "dark age" of "Bureaucratic-authoritarian rule" to "democratization and increasing transparency" and even "institutionalization of budget process reform"[2].

In this paper we will give short explanation of current and mostly well-known active projects in area of open budget data. From explanation of budget process in Russia and specifics

II. MOTIVATION

Theme of Open Budget has high interest among different government organizations in Russia. The need for implementation of a "citizen budget" and "open budget" were announced in the annual Budget Message of the President of the Russian Federation for 2014-2016 years. Guidelines for the presentation of the budget of the Russian Federation and local budgets and performance reports in a form accessible to the citizens have been approved by order of the Ministry of Finance, Ministry of Regional Development and the Ministry of Economic Development on 22.08.2013 N N 86n, 357, 468. So regional governments have strong motivation to do it.

Current budget process and spendings of government is very inefficient both because of Russian traditions of governance, high level of bureaucracy, corruption and low level of openness of the authorities in general. Understanding by citizens of budget process and structure of all levels of budgets is very poor. So when we did our first project in open budget data we tried to understand challenges in this area and improve representation of fiscal information.

Budget processes, structure of budget is very different in countries and there is a lot of budget information in different formats (mostly in Excel tables). So another challenge in the world that there are no standards for publishing budget data. There is very popular platform for publishing budget data – Open Spending but no flexible and simple format for data. As a Russian budget structure especially complicated we had a lot of problems when tried to upload our budget into Open Spending platform. So as we had this problem we think that a lot of people have one.

One of the solutions for this is developing Open Budget Format that first of all will help us to make budget system in Russia more transparent. But maybe could be interested in another countries.

III. RELATED WORK

A. IMF standards

International Monetary Fund (IMF) [8] is an international organization which brings together 188 countries. In addition to its main activity – lending to countries with deficit of balance of payments, the organization also contributes to a more stable world economic development, works for better management of world financial flows and increase fiscal transparency through the collection and publication of government finance statistics (GFS)[9]. In 1994, the IMF has developed a Special Data Dissemination Standard (SDDS)[10], as part of its Data Standards Initiative [11] whose mission has been promoting the transparency of economic and financial data.

Annually or other intervals 65 countries who are members of the IMF publish different financial statistics, which includes such categories of data as sectoral balance sheets, general government operations, external debts, international financial statistics, balance of payments, public sector debts and etc. from real, financial, fiscal and external sectors.

Data requirements has been developed by the IMF and published on the website as manuals and detailed guides for preparing tables with. There are no special requirements to the format in this initiative (mainly data are published in the format of Excel documents), only a list of data and description is published. Thus, the data published by the IMF have only 2 stars out of a possible 5 stars of corresponding well-known «5 star rating of Open Data» introduced by Tim Berners Lee [5].

Also datasets are published on the different web resources (such as Public Global Indicators[12], e-library of the IMF [13], World bank data[14]), part of them are published on local web sites of Ministries of Finances (here for example you can see SDDS data published in Russia[15] - see example of page on fig. 1) and Central banks of country-members of the IMF. Big fragmentation as ways of presenting of data and data sources is a fact. Also part of data visualized in Google Public Data tool [16].

REAL SECTOR			
National Accounts			
GDP in current prices, by expenditure approach	Billion rubles	Q1/14	15 650,8
Final consumption	Billion rubles	Q1/14	12 151,7
Household consumption expenditure	Billion rubles	Q1/14	8 573,7
Government consumption expenditure	Billion rubles	Q1/14	3 502,6
Non-profit institutions serving household	Billion rubles	Q1/14	75,4
Gross accumulation	Billion rubles	Q1/14	2 124,2

Fig. 1. Example of presenting IMF data by Ministry of Finance of Russia

Authors see the high interest of the international community in an information about the financial performance, spendings and revenues of governments around the world. In

general we can say that processing of these semi-structured data and introducing single format with the formation of a knowledge base in the field of finance is an interesting scientific challenge. If this huge amount of data published by the IMF were semantic structured, it would allow to create new expert systems and analytical tools in the financial sector. And the first step for this is development of common machine-readable format in the field of finance.

B. Open contracting Data Standard

Open Contracting is a set of norms and practices for better disclosure and participation in public contracting including tendering, performance and completion processes. It includes the variety of contract types, from more basic contracts for the procurement of goods, to complex contracts, joint venture agreements, licenses and production sharing agreements. Open contracting can include any public contracting such as contracts funded by combinations of public, private and donor sources. Open contracting system should help to fight with corruption in developing countries and increase transparency of governments’ spendings around the world.

The Open Contracting Data Standard (OCDS) [17] is developed for the Open Contracting Partnership by the World Wide Web Foundation, through a support of The Omidyar Network and the World Bank. The current Beta OCDS [18] provides a description of the overall OCDS Model, and a JSON Schema for open contracting releases and records that include a set of recommended fields. Organization developed Open Contracting Global Principles and other countries can sign up and should share information related to all stages of contracting and subcontracting in the provided format:

- *Planning* - the planning process of the procurement and information from the planning phase of the contracting process, should include reference to budget, information about public hearing, lists with associated documents
- *Formation* - data regarding *Tender* process - publicly inviting prospective contractors to submit bids for evaluation and selecting a winner or winners. Information also should include list of goods and services to be purchased, tendering method, justification of procurement method, selection criteria, period when the tender is open for submissions, number of unique bidders who participated in the tender and information about bidders and all documents and attachments related to the tender. Any conflicts of interest uncovered or debarments should be issued. Second stage of formation is *Award*. There may be more than one award per contracting process and all of them should be included with date and value of a contract award per each supplier (winner). All information about signed *Contract* between the buyer and supplier(s) should be published including contract ID, list of goods and services, periods, milestones and deliverables.
- *Performance* - Information during the performance, or implementation stage of the contract. General schedules, including major milestones in execution, and any changes thereto; statuses of implementation against milestones; dates and amounts of stage payments

made or received (against total amount) and the source of those payments; service delivery and pricing; arrangements for ending contracts; final settlements and responsibilities; risk assessments, including environmental and social impact assessments.

- *Completion* - the confirmation that all obligations (deliverables and payments) of the contract have been completed, or that a contract has been terminated for other reasons.

OCDS (description of standard and source code) is available on GitHub [19]. Releases of Contracting data in OCDS could be provided through an open REST API [22]. For example, the standard may develop a common API pattern such that URIs such as:

```

/open-contracting/{open-contracting-id}/tender
/open-contracting/{open-contracting-id}/award
    
```

Data in OCDS and scheme of data are described as JSON format. For example here is a part of JSON scheme file:

```

{
  "awards": { "title": "Awards",
  "description": "Information from the award phase of the contracting process. ",
  "type": "array",
  "mergeStrategy": "arrayMergeById",
  "mergeOptions": { "idRef": "awardID" },
  "items": { "$ref": "#/definitions/award" },
  "uniqueItems": true },
}
    
```

Data file in OCDS web site is not yet published on the date of publication of this paper.

C. Open Spending

Open Spending Platform (OSP) [20] is one of the most popular platform for publishing finance data (including budgets and contracts). 70 countries already uploaded 881 datasets including some datasets from Russia. Data could be uploaded (CSV) on web site via special web interface but should be prepared before. There are some requirements for publishing data: for example columns "amount" and "time" are required. Also dataset should be ready to use "dimensions" which are main characteristics of data sets on OSP. After some preparation steps data could be visualized. On fig. 2 our visualization of budget of Leningrad Region [7].

There is possibility to upload information about Government contracts - data format for the publication of transactional expenditure data. Data is published in a set of CSV files. Specification of set of files is inspired by the General Transit Feed Specification which is widely used for the dissemination of public transit information.

Also OSP introduced general budget data package [21] which could be used for publishing budget data in CSV.



Fig. 2. Visualization of budget of Leningrad Region, Russia

IV. BUDGET LIFE CYCLE

A. Budget life cycle in Russia

The budget process in Russia consists of four phases, which correspond to the stages of the budget cycle, used in European countries [4].

The first stage is the drawing up the draft budget. At this stage, the forecast of socio-economic development of the country or region is made, the characteristics of the budget and the direction of budget deficit are determined, the budget is apporportioned and draft budgets prepared.

The second stage of the budget process is to review and approve the budget. The draft budget at this stage is submitted to the legislative and considered in several readings. If there are any discrepancies, the approval procedures take place. Then the draft budget is approved and the budget law was adopted.

The third stage is the implementation of the budget. Objective of this phase is to ensure timely receipt of the full income stipulated in the law on the budget, as well as timely and uninterrupted financing of planned spending. At this stage admission revenues and expenditures are made.

The fourth stage is the preparation, review and approval the budget execution report. This step is the preparation of reports, which is sent for verification to the financial control bodies. Then, the budget execution report is sent for review and approval to the representative and legislative bodies.

At each stage of the budget process different documents, such as the draft budget, the budget law, the budget execution report shall be prepared. These documents can be prepared in several versions because of the need for approval and coordination between the various government agencies. Therefore, documents should be prepared and presented to citizens in the format in which they can be explored and compared.

B. Levels of Budget

There are three levels of budgets in Russia. The federal budget and the budgets of state extra-budgetary funds of the Russian Federation related to the federal level. They are regulated by federal laws. All costs associated with the implementation of centralized management of the state functions, funded from the federal budget.

The next level is the regional level. Budgets of the regions of Russia and the budgets of the territorial state extra-budgetary funds of the Russian Federation are to this level. They are governed by laws of Regions of Russia. Costs associated with the financing of the development of the production sector, public utilities, transport and communications, are funded from the regional budget. This level of budget is also intended for the allocation of public funds for the maintenance and development of the social infrastructure of the society.

The third level is the municipal level. It includes the budgets of municipal districts, urban districts budgets, budgets of urban and rural settlements, budgets intracity municipalities of federal cities of Moscow and St. Petersburg. Budgets at the municipal level are regulated by municipal legal acts of the representative bodies of municipalities. Municipal budgets allocate budgetary funds for social policy, for example, to improve the quality of public services, the problems in the housing and communal services, the development of the municipal economy.

Each level of the budget is intended to fund various types of expenses. Public bodies that are engaged in the distribution of budget funds, and regions of Russia also differ in their structure. Therefore, projects and laws of budgets on different levels have different structures. This is another reason why the documents are published in various formats that can not be compared in an automated way.

C. Structure of Law of Budget

The structure of a budget law is considered by the example of the Leningrad region. Budget Law consists of the text of the law and its applications. The text of the law contains numbers and references to relevant applications, describing the following parameters of the budget:

- The main characteristics of the budget (revenues, expenses, projected deficit, sources of domestic financing of the budget deficit, the amount of the reserve fund).
- Budget revenues and norms of their distribution.
- Chief administrators of budget revenues.
- Features of usage of budget funds under the various areas.
- Intergovernmental transfers.
- Budgetary loans.
- Regional internal debt.
- Contributions to the charter capital.
- Budgetary investment in capital construction projects.

The text of the law on the budget of the Leningrad region is complemented by 163 applications, half of them are attributable to the following financial year and the other half to two years after the following financial year. Each application has its own budget to the format and structure. Some of them are presented in tabular form, the other represented in text form. The following main applications can be of most interest to the citizens:

- Chief administrators of income.
- Budget allocations by targeted items.
- Budget allocation by category.
- Departmental structure of expenditures.

D. Structure of Expenditures

Expenditures in the budget are recorded in several applications and distributed to the programs, departments and codes of government operations. Budget classification code consisting of 20 digits, is used to classify expenditures (fig. 3).

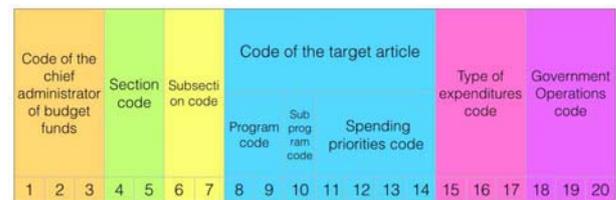


Fig. 3. Budget Classification Code

Managers of budgetary funds (1-3 digit in the code) are public authorities or local authorities, which have the right to obtain and use resources, for example, committees or district administrations.

Sections (4-5 digit in the code) and subsections (6-7 digit in the code) allocate budget funds for the basic functions of the state. Sections define the direction of sectoral costs, such as health, education, housing and utilities. Subsections detail the direction of spending within sections. For example, section "Education" consists of subsections "General Education", "Preschool education", "Higher Education."

Target costs (8-14 digits in the code) provide a binding budget funds to specific programs, lines of activity and subjects of the budget process in the range of sections and subsections.

Type of expenditure (15-17 digit in the code) indicate the type of budget. These include, for example, payments to personnel, procurement, investment, grants, subsidies.

Classification of general government operations (18-20 digits in the code) is a grouping of operations depending on their economic substance, such as wages, payment of communications services, rents.

E. Current budget format in Russia

The budget consists of law and several annexes. Applications, the most interesting to study, are departmental and program cost structure. The structure of the budget format discussed using the example of the budget of the Leningrad region[28]. Example of data from the program budget of the Leningrad region is presented at the Table I.

Column 1 shows the name for the classifiers. In columns 2, 3, 4 indicated classification expenditure required to identify each budget item. Column 5 shows the amount of spending which is planned for the budget line or a group of costs. Amounts are usually specified in thousands of rubles.

TABLE I. EXAMPLE OF DATA FROM THE PROGRAM BUDGET STRUCTURE OF THE LENINGRAD REGION

	Name	Target costs	Type of costs	Section, sub-section	Amount
	1	2	3	4	5
1	Total				76591596,0
2	State Program "Development of Public Health"	51 0 0000			13388576,1
3	Subprogram "Development of primary health care"	51 1 0000			601 242,0
4	Costs for the operation of state-owned public institutions	51 1 0016			169 453,3
5	Wage fund of state-owned institutions and contributions for compulsory social insurance	51 1 0016	111		135 922,3
6	Ambulatory care	51 1 0016	111	0902	135 922,3

Line 1 represents the total amount that will be spent on the Leningrad region.

Line 2 is set to only the column with the target costs (2), which is equal to "51 0 0000". Value of the column "Name" (1) in this case refers to the column 2 and identifies the program (the data format for the program: XX 0 0000). Figure in the column "Amount" in this case refers to the amount of funds to be spent on the costs of the program.

The next line in the program structure (line 3) has a similar structure, but has a value of "51 1 0000" and describes a subprogram (the data format for the subprogram: XX X 0000), so the figure in the column "Amount" means all costs within subprogram.

Line 4 describes the expenditures under target costs (the data format for the target costs: XX X XXXX) and the amounts that will be spent in this article costs for all types of costs (column 3), and all sections and subsections (column 4).

Example of names for type of costs (column 3) is presented in line 5. Value of the column "Amount" in this line indicates the amount to be spent on all sections and subsections of this type of costs.

In line 6, the name of the section and subsection is indicated. Value of the column "Amount" specifies the amount of funds that will be spent on the specified type of costs, section and subsection.

Thus, the new information in this table provides only the last line, in which all the cells are filled, that is determined the amount of funds spent on the specific section, the subsection, the type of costs, the target costs, the program and the subprogram. The remaining lines contain the names of the classifier and the summed amount of expenses. For example, the sum of all rows with the target item of expenditure "51 1 0016" and the type of expenditure "111" is equal to the value specified in the column "Amount" in line 5, the sum of all rows in which the first digit of the column "Target costs" is "51" turns the amount indicated in line 2.

After studying the data presentation formats, we can conclude that this format is not optimal for the study of professionals and can not be processed in an automated way. This table contains a lot of extraneous lines that impede understanding.

V. PROPOSAL OF OPEN BUDGET FORMAT (OBF) 1.0

A. Context and overview

Current version of Open Budget Format have been tested on a budget of Leningrad region but features to support National and Municipal levels also included. Open Budget Format is an open technical specification for government budget. By creating this format the authors pursued several goals on the basis of which main principles of OBF have been developed. Key characteristics of proposed format are presented in table II.

TABLE II. KEY CHARACTERISTICS OF OPEN BUDGET FORMAT

Versality	The format should be simple, general and universal. Must be able to represent the budgets on different levels. Currently in Russia files of budgets on different levels are different, although there is a uniform budget classification system and codes.
Good for automation	Convenient for automatic processing and clear, if necessary for editing (converting) it by user. This problem have been encountered when authors tried to transform a regular russian budget file into format of the Open Spending platform by using Open Refine tool.
Scalable	Ability to use to represent any budgets in other countries too.
Versions support	The need to make changes (amendments) in the budget docs during the budget execution, it is necessary to be able to specify different versions of the budget.
Integrated. Compatible with other budget formats	As Open Spending platform is popular enough, need to have format suitable for this platform without additional global changes, as well as to be able to integrate with other existing formats such as Open Contracting Data Standard and Budget Data Package.
Friendly and intuitive	In connection with an emerging trend of publishing "budgets for citizens" and "open budget" by governments it is necessary to have such version of OBF, which could be readable both for machines and people. Using of XML-version and simplification of format is solution for this.

Main principles of forming of budget file in OBF:

- 1) The basic structural unit of OBF is a "budget item" ("budget line" or "row"). For example in CSV one line is one budget item. The same in JSON and XML.
- 2) There is a block of meta information (meta data), which includes level of budget, references to the law of budget, amendments, version, etc.
- 3) Separately available files of budget classification codes in a special structured format.
- 4) The file should not contain total amount of all budget items or by groups.

B. Common structure

In tables III, IV, V most of available now data elements for OBF are described. All elements are divided in 3 groups: meta-data (table III), required (table IV) and specific (table V). Meta-data contains common information about budget file generally or each budget item if it needs. Required elements are common elements for budgets in most countries. Specific elements list could be extended and depends on budget structure of specific country.

ItemId is unique id of each budget item in current document. It could contain or duplicate *budgetItemCode*.

Each budget item should be marked with *level* of budget:

- National (N)

TABLE III. META DATA FIELDS IN OBF

Name	Available types	Mandatory	Description
itemId	string	required	Unique ID of item in current data set. May include numbers, letters, special symbols.
version	string	required	Version of budget doc, see details below. Could be "final" or Number
docVersion	number	required	Last version of document
level	enum	required	"national" (N), "regional" (R), "municipal" (M)
country	string	required	Code of Country (RU, US, etc)
subject	string	required	Name of City, Region or Country, depends on level
dateCreation	date-time	required	Date when current budgetItem has been created
dateChanged	date-time	required	Date when current budgetItem has been changed
tag	enum	required	"expenditures", "income"
stage	enum	required	"Proposal", "approval", "adjustment", "execution", "amendment". Any additional comments could be included in comments section.
lang	string	required	Current language of document
comment	string	optional	For example reference to law

- Regional (R)
- Municipal (M)

Also this information could be included in separate block of meta data (depends on file format: CSV or XML/JSON) for entire budget.

dateCreation is a date of creating document.

dateChanged is a date of updating document.

lang is an ISO 3166 2-Digit Country code for the default language used in the document. [23]

currency should be in 3-letter ISO 4217 format.[24]

In tables with total lists of data elements (fields), types of each element and description. Available the following types of data: string, number, date-time, enum – predefined values. Optional elements will be explored below.

TABLE IV. REQUIRED DATA FIELDS IN OBF

Name	Available types	Mandatory	Description
budgetItemCode	string	required	National budget classification or code system (in Russia Code of Budget Classification)
budgetItemName	string	required	Name of budget item
adminName	string	required	Name of organization that carries out operations with current budget item
adminCode	string	optional	Code of organization
amount	number	required	Amount of budget item
currency	string	required	Currency of country or operation

C. Country or data-specific fields

In section of country-specific or data-specific fields (table V) data elements can be extended by data owners. But some of data elements are predefined. So in Russia each budget item contains additional information (about sections and subsections

of economics for example). So these data could be included in format description. Budget of region consists of programs and subprograms. Names of programs and subprograms included in current version for convenience for data users. It will increase data volume but give additional flexibility in using of data (for example for uploading in Open Spending Platform). Also codes of programs and subprograms must be included as separated fields. The same with “article”, “section”, “subsection”, “government operation”. All of these data are required for Russian budgets.

TABLE V. SPECIFIC DATA FIELDS IN OBF

Name	Available types	Mandatory	Description
programName	string	for Russia	Name of program
programCode	string	for Russia	Code of program
subprogramName	string	for Russia	Name of subprogram
subprogramCode	string	for Russia	Code of subprogram
sectionEcName	string	for Russia	Section of economics
sectionEcCode	string	for Russia	Code of section of economics
subsectionEcName	string	for Russia	Name of subsection of economics
subsectionEcCode	string	for Russia	Code of subsection of economics
articleCode	string	for Russia	Code of target article
typeOfExpiditure	string	for Russia	Type of expenditure
typeOfExpidureCode	string	for Russia	Code of type of expenditure
govOperName	string	for Russia	Government operation name
govOperCode	string	for Russia	Government operation code
uri	string	optional	If available for current budget item
cofogCode	string	optional	Code of Classification of the Functions of Government (COFOG)
cofogName	string	optional	Name of COFOG
imfName	string	optional	Name of International Monetary bank (IMF) classification code
imfCode	string	optional	IMF Code

Some countries may have special URIs for each budget row or Open Spending platform for example have separate web page of each budget item. Special field “URI” for this purpose and could be used optionally.

Developers from other countries may include any budget information in this area. It could be also the United Nations’ classification of the Functions of Government (COFOG) [25] or IMF’s Government Finance Statistics classification for revenues[9]. Although these fields are not required for Russia.

D. Versioning and verifications

Versioning is ability to track changes of budget items during different stages (preparation or execution). We suggest the following system of versioning:

- Mechanism of updating current file (abbr. is “U” means “update”)
- Each version has own file (“F” means “files”)
- Include in versioning system changes during different stages of budget (preparation, approval, amendment) – (“S” means “stages”).

So next combination of versioning is available:

- U-version (information about stages is not included),
- US-version (information about stages is included),

- F-version (information about stages is not included),
- FS-version (information about stages is included).

If developer chooses U or US-version he/she should organize mechanism of updating file on server-side. End user should have final version of file and also there are no need to publish previous versions of file. Also information about this should be mentioned in the place of publication file.

So in U(US) mechanism developer should write new version of each budget item in file as new line (all previous values of the same budget items should be saved in file too and can't be changed). Last version of each budget item should be marked as "final". When new version comes previous version should be set as number (e.g. "1" if current changes are first, or should be decremented from maximum in other cases). New version must have version "final". So as version of document is changed in fact from 1.0 to 2.0 developer should not update each budget item but only should change the changed budget item and change element docVersion for the maximum of version number. New version of budget item must have new itemId. As it described on fig. 4.

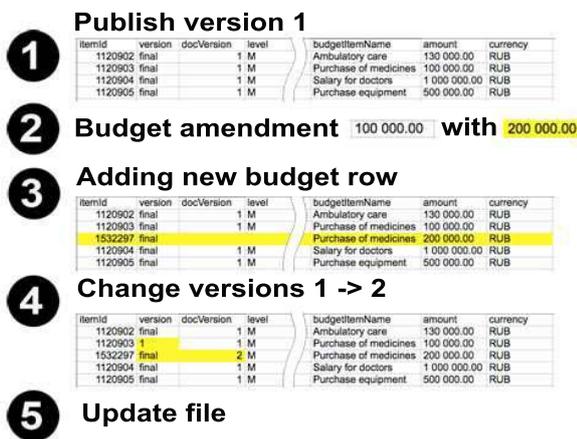


Fig. 4. Process of versioning in OBF

E. Data publication formats

In current version of OBF 1.0 there are 3 ways of publication of open budget data:

- CSV (OBF 1.0-csv)
- XML (OBF 1.0-xml)
- JSON (OBF 1.0-json)

OBF 1.0-csv

If developer plans to use this type of publication he (she) should provide 2 files: csv file which contains data and datapackage.json which is metadata descriptor. It's called "data package" and should be matched to specification[26]. "datapackage" file is standard and ready to get for users. So developer just should prepare CSV file correctly by following next rules:

- All data is presented as rows: one row – one budget item.

- All areas of OBF (Metadata, Required and Specific) should be presented for each row.
- First row should contain names of fields.
- Some data elements from Metadata section will be duplicated and it's okay.
- itemId, versions and some several data fields could be own for each budget item.
- U, US, F, FS-versions could be implemented.

OBF 1.0-csv is the Tabular Data Package specification [26] and should be formatted according to RFC 4180 [27]. Using of Data package format could make OBF compatible with Open Spendings' budget data package.

OBF 1.0-json

In case of using JSON as data representation JSON Schema [29] developed for OBF should be used.

Example of scheme:

```
{ "type": "budgetItem",
  "properties": {
    "itemId": { "type": "string" },
    "version": { "type": "string" },
    "docVersion": { "type": "number" }
    "level": {
      "type": "string",
      "enum": ["N", "R", "M"]
    }
  },
  "required": [ "itemId", "version", "docVersion", "level",
    "subject", "dateCreation", "dateChanged", "tag", "stage",
    "lang" ]
}
```

And here is a piece of data:

```
{
  "budgetItem" : {
    "itemId" : "121299",
    "version" : "final",
    "docVersion" : "1",
    "level" : "R",
    "country" : "RU",
    "subject" : "Leningrad Region",
    "dateCreation" : "16-09-2014 13:14:13",
    "dateChanged" : null,
    "tag" : "income",
    "stage" : "execution",
  }
}
```

```
“lang” : “ru” }
}
```

OBF 1.0-xml

For XML format also used XML Scheme and below example of data. If JSON format prefer to be used in exchange data between applications XML is appropriate for using when data should be stored or could be used by people or software processing. Also XML is still popular format for publishing Open Data. Data could be written as attributes or separate tags. Data is divided into two blocks: <metadata> and <items>. Block <items> includes required and specific fields.

```
<metadata>
<level>R</level>
<country>RU</country>
<subject>Leningrad Region</subject>
<lang>ru</lang>
</metadata>
<items>
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VI. CONCLUSION AND FUTURE WORK

After research projects and international standards to publish budget data, and studies of the structure and format of the publication of Russian budget data, the first version of the OBF was developed. The first version of the OBF can be used for the publication of government spending at any stage of the budget process for any level of budget. Specificity of structure format also allows to use it for data from other countries. The format also provides the ability to take into account change versions of budgets and ensures interoperability of data from different regions.

We should also mention a few aspects that will be included in future versions of the format. In this paper, several international projects and standards have been listed. One of the next steps in our work is to develop a format to ensure compatibility with the standards that are used in other countries.

Costs and revenues of the state contained not only in the budget. Financial data for the state and the regions are also contained in the reports and government contracts. One of the most interesting applications of the budget is its comparison

with actual costs (government contracts). For this it is necessary to develop a format for the data of public contracts (possibly based and/or compatible with the Open Contracting Data standard) and to adapt the first version of the format for data storage budget execution reports.

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REFERENCES

- [1] C. Bizer, T. Heath, T. Berners-Lee “Linked data-the story so far”, *International journal on semantic web and information systems*, 2009
- [2] You J., Lee W. Budget Transparency and Participation–Korean Case Study. – 2011.
- [3] D. Mouromtsev, V. Vlasov, O. Parkhimovich, M. Galkin, V. Knyazev, “Development of St. Petersburg’s linked open data site using Information Workbench”, *Proceedings of the 14th Conference of Open Innovations Association FRUCT*, Publisher: State University of Aerospace Instrumentation (SUAI), ISSN 2305-7254, 238 p., Finland, Helsinki, 2013
- [4] Shapiro, “A Guide to Budget Work for NGOs”, Vivek Ramkumar “Our money, our responsibility. A Citizens’ Guide to Monitoring Government Expenditures”
- [5] K. Janowicz, P. Hitzler, B. Adams, D. Kolas, and C. Vardeman II, “Five Stars of Linked Data Vocabulary Use”, *Semantic Web Journal*, 2014, Web: <http://www.semantic-web-journal.net/system/files/swj653.pdf>.
- [6] Open budget of Leningrad Region. Official Open data hub and portal. Web:<http://budget.lenobl.ru/>
- [7] Open budget of Leningrad Region 2014. Web:<http://lenobl2014.ru/>
- [8] Web site of International Monetary Bank, Web: <http://www.imf.org/>.
- [9] Government Finance Statistics Manuals and Guides, Web: <http://www.imf.org/external/pubs/ft/gfs/manual/gfs.htm>.
- [10] Special Data Dissemination Standard, Web: <http://dsbb.imf.org/Pages/SDDS/home.aspx>.
- [11] Data and Statistics, Web: <http://www.imf.org/external/data.htm>.
- [12] Principal Global Indicators, Web: <http://www.principalglobalindicators.org/Pages/Default.aspx>.
- [13] e-library of the International Monetary Fund, Web: <http://elibrary-data.imf.org/>.
- [14] World Bank Quarterly External Debt Statistics, Web: <http://j.mp/worldbankdata1>.
- [15] Special Data Dissemination Standard, Web: <http://www.minfin.ru/en/macroeconomics/dissemination/>.
- [16] International Monetary Fund, World Economic Outlook, Web: http://www.google.com/publicdata/explore?ds=k3s92bru78li6_
- [17] Open Contracting, Web: <http://www.open-contracting.org/>.
- [18] Open Contracting Data Standard, Web: http://ocds.open-contracting.org/standard/r/0_3_2/.html.
- [19] Open Contracting Data standard, Github, Web: <https://github.com/open-contracting/standard>
- [20] Open Spending Platform <https://openspending.org/>
- [21] <https://github.com/openspending/budget-data-package>
- [22] Representational state transfer, Web: https://en.wikipedia.org/wiki/Representational_state_transfer
- [23] Country Codes - ISO 3166 Web:http://www.iso.org/iso/country_codes.htm
- [24] Currency codes - ISO 4217. Web:http://www.iso.org/iso/home/standards/currency_codes.htm
- [25] Classification of the Functions of Government. Web:<http://data.okfn.org/data/cofn>
- [26] Data packages format. Web:<http://dataprotocols.org/data-packages/>
- [27] Common Format and MIME Type for Comma-Separated Values (CSV) Files. Web:<http://tools.ietf.org/html/rfc4180>
- [28] The law on the regional budget of the Leningrad Region, Web: <http://budget.lenobl.ru/new/documents/>
- [29] JSON Scheme description. Web: <http://json-schema.org>