

Implementing Ontologies and Knowledge Bases As A Means for A More Efficient Creation and Adopting of Budget Local Self – Government Units in Bosnia And Herzegovina

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Abstract: In this paper we examine ontologies and new tools that can help municipalities and cities in The Republic of Srpska create and adopt their budgets faster and more efficiently. We show that using knowledge bases, ontologies and the latest tools for updating knowledge can improve the process of creating and adopting budgets. The model that we propose is simpler than the existing procedures in the local self-government units (cities and municipalities). The new model will provide a more accurate projection of revenues and expenditures based on the knowledge bases while they will also provide trend monitoring and better understanding of the budget structure.

Keywords: budget; ontology; public administration; municipality

I. INTRODUCTION

Bosnia and Herzegovina is a complex community which consists of two entities: The Republic of Srpska and The Federation of Bosnia and Herzegovina with The District of Brčko. In The Republic of Srpska there are only two levels of government: the municipal/city and entity. In the Federation of Bosnia and Herzegovina there are three levels of governance: the municipal/city, canton and the Federation of Bosnia and Herzegovina. In The Republic of Srpska there are 62 municipalities/cities while in the Federation of Bosnia and Herzegovina there are 10 cantons and 69 municipalities/cities. Each municipality/city, canton and entity adopts its own budget as does the country of Bosnia and Herzegovina itself.

Because there are specific budget adoption procedures in each entity and in Brčko District, in this paper we will just look at the budget process in The Republic of Srpska. This process is common in all municipalities. According to the "Law on Local Self-Government"¹ municipalities and cities are "units of local self- government." The municipality is the basic territorial unit of local self - government formed from

part of one, one or more settlements². The municipality has the right to deal with all matters of local interest not excluded from its jurisdiction, nor assigned to any other level of government. A city is established in urban areas that make up a coherent geographical, social, economic, historical and territorial whole with the appropriate level of development. We can find concepts such as local autonomy, local governments, local communities, municipality, national self-government³ and the like in the literature. These terms are used in everyday life, but also in some scientific and technical discussions as a kind of synonym for local self - government units municipalities and cities (municipalities/cities).

Local self - government is a regulated system of exercising the right of local self-government, by which the citizens of the territory defined by local units directly or through freely chosen representatives manage the affairs of immediate interest to the local population, while owning property, its own sources of public revenue and acting on the principle of constitutionality and legality⁴.

In order to effectively examine the use of new technologies in the creation and adoption of the budgets, we will begin by introducing the basic concepts of the budgets, ontologies and tools that can be useful.

II. THE CONCEPT OF LOCAL SELF - GOVERNMENT BUDGET

The budget we examine in this paper is a one-year law of the local self - government units which projects, approves and distributes all revenues and expenditures in a budget year. The budget is the instrument by which revenues are recorded and expenditures allocated by the decision on stipulated

obligations [5]. It is a legal document that is adopted by a strictly defined procedure, and is a kind of mathematical (statistical) document showing the plan of revenues on one side and the expenditure structure on the other side.

The different definitions of the budget that are outside the scope of this paper share some common elements: budget is a public planning document which simultaneously projects revenues and expenditures, the budget is set for a period of one year, the budget structure contains all the features of the socio-economic and political relations of the municipality/city in which the budget is passed.

Budget revenues are public revenues and the largest share of it are taxes, while the majority of the expenditure makes up wages, social benefits for employees and material costs.

The essential knowledge of the budget required for its planners and adopters are: they must know it is an administrative document valid for a period of one fiscal year, accurately determining the structure of revenue and expenditure, prepared and adopted prior to the start of a budget year, it contains general provisions essential to the process of execution while it must be in accordance with economic policy. It is a systematic overview of revenue and expenditure with specified types and amounts grouped by the type and purpose of use. This, along with the rest of essential knowledge should be properly updated and used.

A. *Ontology*

Ontology is a very broad term and it is a more conceptual idea rather than a strictly defined formalism for expressing knowledge. Literature recognises a number of different formalisms which represent knowledge in a manner that is included in the concept of ontology. It describes a specific area with a given terminology, basic concepts, classification of these concepts and the connection between the concepts while defining the rules between them. It provides a detailed description of the structure of an area of knowledge with formal definitions of mutual relationships and connections among the various elements of the area [6]. Ontologies are used for knowledge representation, knowledge management and organization, as well as for the search and retrieving of desired knowledge. It is beneficial because it can be updated, new concepts and connections can be added and it is subject to revision and correction. Creating an ontology is an iterative and continuous upgradeable process.

"An ontology is a formal specification of shared conceptualization [7].

In literature there are many definitions, but most of it boils down to the fact that ontology is set of terms and relations between them. It describes a specific domain or area of knowledge.

In computer and information sciences, ontology is a data model that represents the concepts within a domain and the relationships between those concepts [8]. It describes the concepts and relationships that can exist for an agent or a community of agents.

It must be borne in mind that it is difficult to define clear

rules by which we should organize concepts in budget planning. In order to accurately determine the area covered by ontology, we should provide answers to the following questions: Which domain of the budget (revenues and expenditures) is described by ontology? To what purpose will the ontologies be developed? What questions should the ontology be able to answer? Who will be the beneficiaries of ontology? Who will be responsible for maintaining the ontology?

To determine the area that ontology should cover, we must bear in mind the questions to which knowledge bases and inference mechanisms can be effectively employed. Here we mainly deal with the possibilities of sharing knowledge for the creation and distribution of the budget in local self - government units and its later reuse. The knowledge contains useful information for effective budgeting but in addition we it as a set of definitions of formal vocabulary and as building blocks of the Semantic Web.

Ontology can support communication and allow recognition: areas (domains) of budget adoption and surrounding areas.

B. *Protégé-OWL editor*

There are a large number of languages and tools for describing ontologies. Among the most common ontological languages are Web Ontology Language (OWL) and ontology editing tool "Protégé-OWL." OWL is development environment presented by World Wide Web Consortium (W3C).

Protégé is an open source platform that allows users to: read and save OWL and RDF ontologies, update and visualize classes, define logic class characteristics, performance reasons, and updates. Its purpose is to allow users to display the meanings of terms and the relationships between those terms. It provides a rich set of structures and modeling activities that support the creation, visualization and manipulation of ontologies represented in different formats. It is developed at Stanford Center for Biomedical Informatics Research at Stanford University School of Medicine in California [9].

There are a number of modules in the free use (various programs that update Protégé-OWL tool).

III. PROCEDURES FOR PROPOSING AND BUDGET PLANNING

The budgetary procedure is a legally defined activity of competent authorities and covers the process of preparation, determination, decision-making and execution. Here we highlight several stages (Figure 1), for which we need access to the appropriate knowledge in order to implement them: budget initiatives, planning budget expenditure and revenue, drafting the budget proposal, budget adoption, budget execution and control of budget execution.

Procedures for budget preparation, its deployment and its use are almost the same for all local self - government units (municipalities / cities) in The Republic of Srpska.

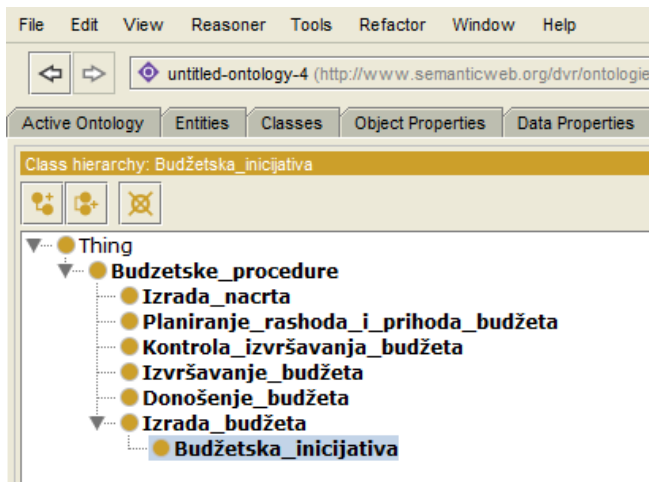


Figure 1: Budgetary Procedures

The budget preparation process usually begins when the Ministry of Finance of The Republic of Srpska submits 'Budget Framework Paper' to local self-government units (municipalities and cities), which must be done by 1st July of the current year. This document must contain the macroeconomic projections and forecasts of revenues and expenditures for the next and the next two fiscal years.

The Finance Departments of local self-government units perform analyses on: the "Budget Framework Paper", the report on the achievement of the budget, the rules governing the collection and distribution of revenues, the analysis of planned revenues and expenditures deviations, employee expenses analysis, assets and liabilities, the analysis of the general economic situation, the budget users report analysis and a number of other analyses which result in notes that guide future planning activities. From this we can see some of the essential knowledge (see figure 2) for the employees in order to draft the budget.

The instructions for the preparation of the budget draft (Figure 3) must include: basic economic assumptions and guidelines for the preparation of the budget draft for next year, a description of the planned policy, assessment of the budget and expenditures for the coming year, proposed expenditure amount and process and the dynamics of the municipality/city budgeting.

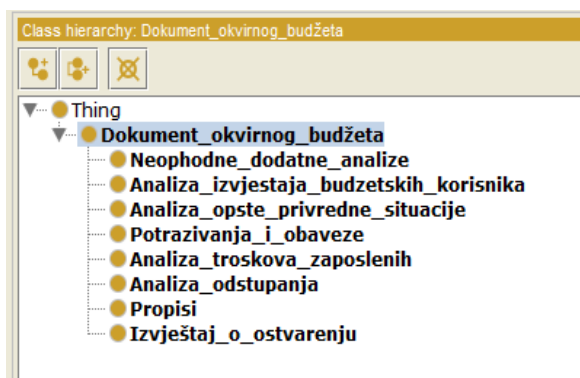


Figure 2: Budget Essential Knowledge

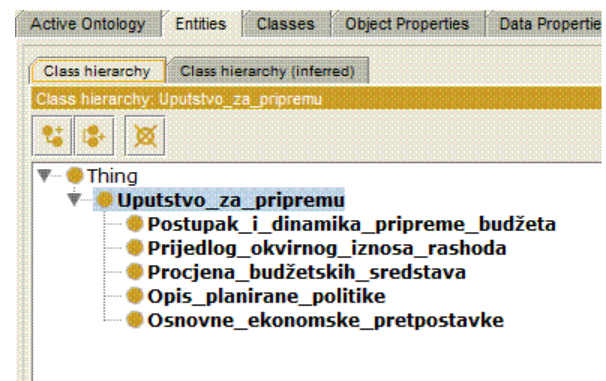


Figure 3: Instructions for the preparation

The Finance Department of the local self-government units should do an assessment of revenue (total) and the structure of expenditure (current expenditures and grants, funds for the operation of the budget users, capital expenditures, grants and reserve funds).

If there is a number of budget users in a local self-government unit, then The Finance Department provides these users with a manual for the preparation of the draft budget for the next year until 20th July. When making instructions, The Finance Department of a municipality/city must be governed by the laws regulating the financing of the budget users, the reports on the budget users spending and assessing the realization of revenues.

Budget User Requests consist of financial claims and the written explanation (Figure 4). A written explanation should include information on the organizational structure of the budget users, activities and services, description and reasons for activities that require additional funding for each request, the reasons, the description and the plan of implementation costs.

Municipal administration, as a budget user, is obliged to submit the request for budgetary operating and capital costs which are under the jurisdiction of the Division.

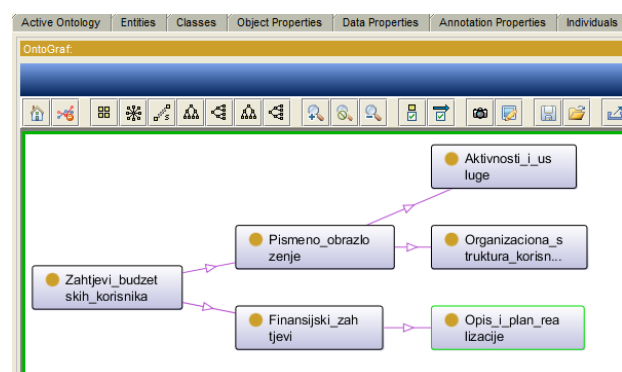


Figure 4: The requirements of budget users

Budget users are required to submit budget requests for next year to Municipal Finance Department by 15th September. The budget request should consist of three parts:

- 1) request for ongoing costs with data on budget user`S current activities
- 2) additional funding request for ongoing activities,
- 3) requests for the purchase of fixed assets and equipment, additional funding for capital projects started in the previous period.

What kind of knowledge should budget planners have? What kind of instructions? Does all the knowledge we list here meet the needs of all budget planners?

The municipal/city assembly adopts the budget and makes a decision on the budget for the next fiscal year not later than 15th December.

By 24th December the Finance Department of a municipality/city submits the adopted budget for the next fiscal year to the Ministry of Finance of The Republic of Srpska.

Municipal/city Revenues are [10].

1. Local taxes: property tax, tax on income from agriculture and forestry, income tax from games of chance and other local taxes established by law.
2. Local fees: municipal/city administrative fees, taxes on utilities and other local taxes.
3. Local charges: land charge, the use of natural and other resources of common interest charge, spatial and urban planning and other local charges.
4. Income from property: rental income, interest income, income from the sale of property that does not endanger public functions and jurisdiction of the municipality.
5. Income from samodoprinos
6. Income from fines imposed in misdemeanor proceedings established by acts of the municipality.
7. Other income: Income from grants, transfers and income from budget users performing regular and supplementary activities in accordance with the law through a percentage that is set by the budget execution and other municipal/city incomes.

All funds from the municipal/cities sources of income belong to their budgets and they may use them freely within their jurisdiction.

8. The relevant municipal and city administrative body submits the draft of the municipal/city budget to the competent executive authority of the municipality or city,
9. The relevant executive authority of the municipality/city (if needed) requires additional information or explanation concerning the draft budget for the next fiscal year,
10. The relevant executive authority of the municipality/city prepares the draft budget and submits it to the Ministry of Finance of The Republic of Srpska,
11. The Ministry makes recommendations to the submitted budget draft,
12. The competent executive authority for the municipality/city submits the draft budget to the municipal/city assembly for their consideration.
13. The Municipal/City assembly accepts or rejects declare the budget draft,
14. The competent authority of the municipality/city decides the final contents of the budget, taking the recommendations it has received into account, and submits it to the Ministry.
15. The Ministry approves the budget proposal and
16. Once the approval of the Ministry has been received, the municipal/city assembly must make the decision to adopt the budget for the next fiscal year.

What kind of essential knowledge is needed for quality planning of budget revenue?

What kind of essential knowledge is needed for quality planning of budget expenditure?

In order to understand the budgeting process of the local self - government units, we can present it in the flow diagram (Figure 6)

According to Article 31 of The Law on Budget System of The Republic of Srpska, municipal/city budget draft and proposal should be carried out according to the following procedure:

1. The relevant municipal and city administrative body submits the draft of the municipal/city budget to the competent executive authority of the municipality or city,

2. The relevant executive authority of the municipality/city (if needed) requires additional information or explanation concerning the draft budget for the next fiscal year,

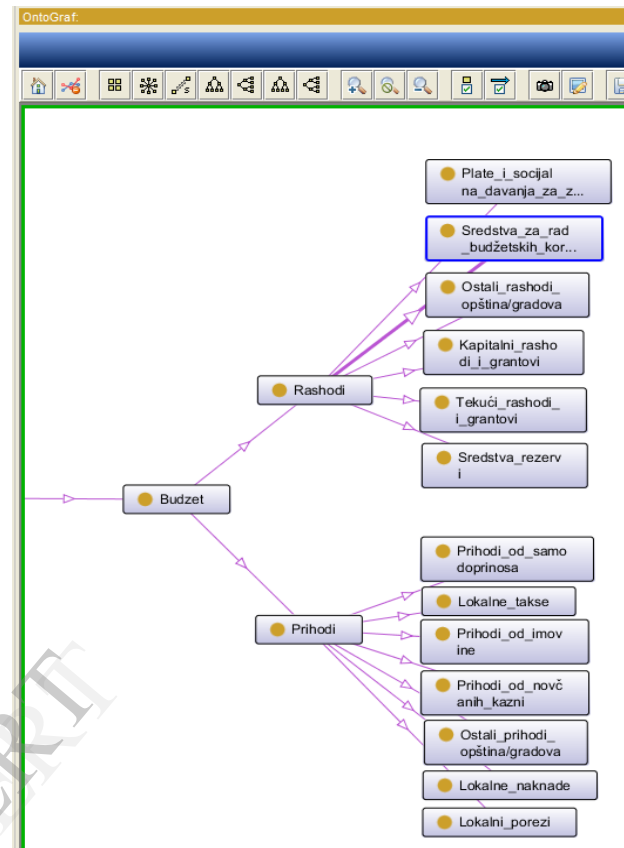


Figure 5 Revenue and Expenditure

3. The relevant executive authority of the municipality/city prepares the draft budget and submits it to the Ministry of Finance of The Republic of Srpska,

4. The Ministry makes recommendations to the submitted budget draft,

5. The competent executive authority for the municipality/city submits the draft budget to the municipal/city assembly for their consideration.

6. The Municipal/City assembly accepts or rejects declare the budget draft,

7. The competent authority of the municipality/city decides the final contents of the budget, taking the recommendations it has received into account, and submits it to the Ministry.

8. The Ministry approves the budget proposal and

9. Once the approval of the Ministry has been received, the municipal/city assembly must make the decision to adopt the budget for the next fiscal year.

IV BUDGET AND BUDGET RESERVES

The budget plan can include budget reserves which are part of the planned budget funds allocated on the basis of specific decisions.

The budget reserves can be used for: covering unplanned contingencies, meeting any excess budget expenditure, temporary payment of financial obligations when due to the reduced size of the budget, funds are available and for any other purpose in accordance with the decisions of the executive body of the municipality/city.

The report on implementation of the budget is submitted to a municipal/city assembly and it must contain:

- Review the budget revenues and expenditures for the previous year approved by the assembly,
- Overview of the budget revenues and expenditures for the fiscal year, presented so the difference between approved and executed/implemented budgets can be clearly seen,
- Explanation of major deviations,
- Information on borrowing and debt management,
- Information on the use of budgetary reserves,
- Information on guarantees issued during the previous year,
- Initial and final state of the treasury single accounts and special purpose accounts, as well as
- Data on completed reallocation.

Here we list a just a few of the annual obligations related to the budget of the local government:

By 15th September budget users are required to submit a budget request for next year to a Municipal Finance Department.

By 15th December, the municipal/city assembly makes a decision on the adoption of the municipality/city budget for the next fiscal year.

By 24th December, the Municipal Finance Department submits the adopted budget for the next fiscal year to the Ministry of Finance of The Republic of Srpska.

The executive municipal/city bodies respond to assemblies for budget executing.

Mayors/Municipal Chiefs are responsible for the accurate and timely preparation and presentation of annual financial reports.

By 5th April municipalities/cities are bound to submit an annual financial report for the previous fiscal year to the Ministry of Finance of The Republic of Srpska.

In order to support intelligent business it is necessary to link the calendar of events with the knowledge base in the information system so that people working on the budget can be informed on the deadlines and necessary activities.

V BUDGET EXECUTION

The execution of a budget for a fiscal year includes funds and budgetary expenditures made by the 31st December of the current year and all revenues from that date up, but no later than the deadline for the preparation and submission of annual financial statement. Budget liquidity is planned based on projected revenues and expenditures contained within the financial plans for the execution of the budget. These plans give an overview of the revenues and expenditures for a given period of less than one fiscal year. The execution of municipal/city budgets begins after a decision of the assembly to adopt and execute the budget. Budget users utilise the planned budgetary resources based on the priorities established by the operational financial plan.

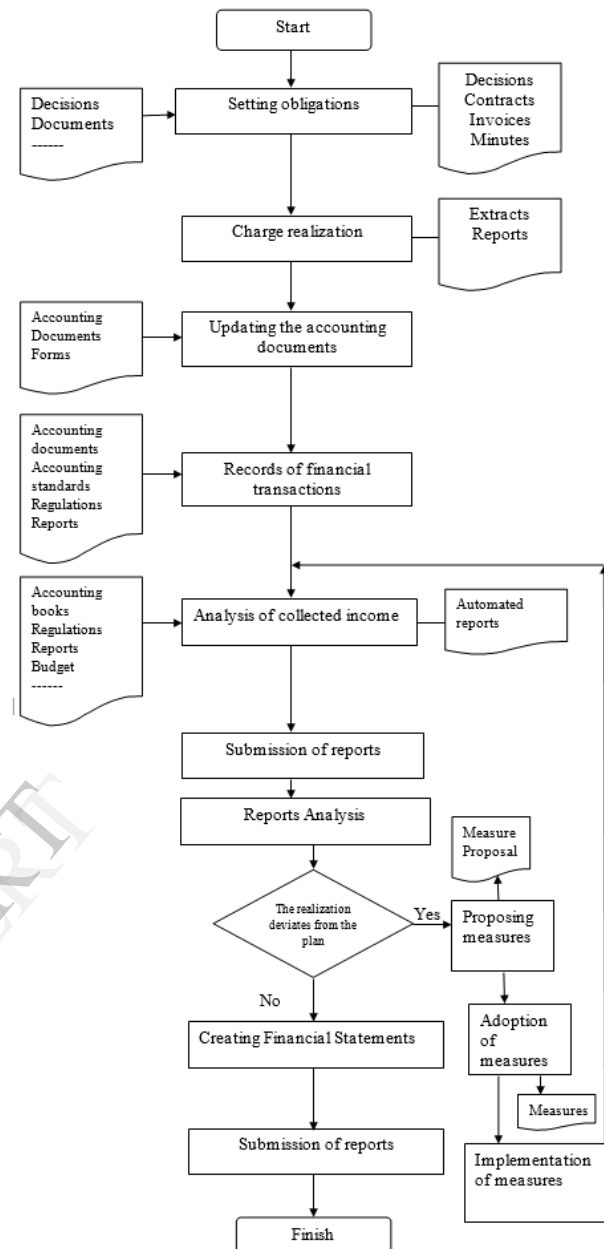


Figure 6 Budget Adoption Process

If, during the fiscal year expenditures increase or revenues decrease, the municipal/city executive body may decide to temporarily suspend execution of the budget for a period not exceeding 45 days.

„The Decision to temporarily suspend the execution of a budget allows the municipality/city to [11]: stop making part payments of short-term obligations, propose extensions to repayment schedules, stop an approval to conclude a contract and stop the planned transfer of funds as outlined for the quarter, or other period.

The municipality/city executive body informs the assembly on The Decision on temporarily suspension of budget execution. Temporary suspension measures must be applied to all budget users.

The budget can only be implemented after it has been adopted. If it is passed before the start of the fiscal year, it is

applied from its start. The budget adopted during the year can be applied only after its adoption and publication in the Gazette.

The process of budget execution begins with the first payment to the public revenue. Providing funds creates the conditions for the execution of the expenditure and the authorities are responsible for it. These are bodies that take care of the budget execution and have the right to use the funds collected. They will, on the basis of the implementation plan, transfer funds to the budget users.

The allocation of resources takes place on the basis of periodic plans. First, plans are made quarterly and monthly if needed [12]. The competent authorities are responsible for the process of payment of public revenue.

The budget execution is carried out according to the budget execution plan. The budget execution process is documented and all relevant authorities are of it in a timely manner.

Some of the knowledge that employees who work on the adoption of the budget must have include: understanding the system of municipal/city revenues and expenditures, recognizing and understanding the factors that contributed to revenues and expenditures in previous years, access to the latest financial information and projection data, as well as the access to the use of experience and intuition of consultants/experts. These along with other knowledge not mentioned above must be entered into the knowledge base, regularly updated and used when needed. Figure 7 shows a

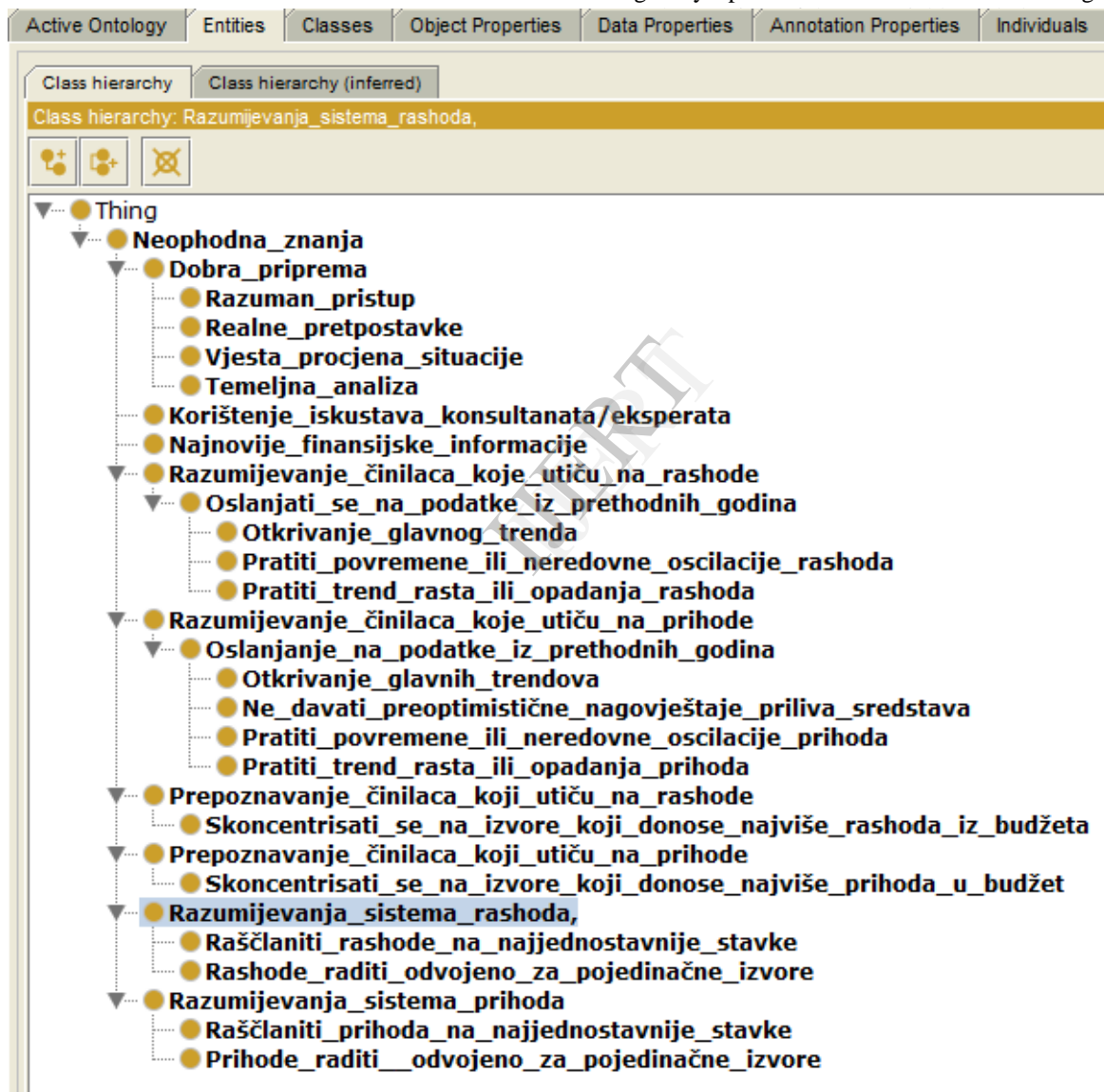


Figure 7 Essential Budget Knowledge

CONCLUSION

Using ontologies, knowledge bases and new tools can improve the process of creating and adopting budgets. In this paper we argue for the use of the ontological model that is still not fully applied in all municipalities/cities in The Republic of Srpska. However, the pilot implementation of such tools demonstrate encouraging results. Full implementation will take a little longer. This or a similar model could be applied to other areas but we have yet to show adequate results to demonstrate this. This will provide very interesting subjects for future studies. The proposed model is not complicated, the necessary financial data can be simply found, it allows the observation of trends, to accurately calculate the projections of revenues and expenditures, enables easy correction and production of wide variety of projections.

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