

An approach to the semantic representation of the planning strategies

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Abstract - This paper aims to describe a methodological approach to creating ontology that should assist in creation of state development strategies and corresponding action plans (ORS). The ultimate goal of the ontology is to provide semantic description of development strategies, as well as action plans for provincial administrative bodies, i.e., basis for formal, machine-readable representation of development priorities, specific goals as well as answers to questions such as: what development priorities are, how they will be implemented, who is responsible for their implementation, and why they are being implemented in the first place. The proposed approach enables a common dictionary of terms describing the goals and priorities in the process of strategic planning to be formed, which could in turn be used by all participants involved in strategic planning.

I. INTRODUCTION

The research described in this paper encompasses the development of semantic descriptions of state development strategies as a part of strategic planning processes of local and provincial state bodies.

A strategic plan is a document which contains a certain number of strategic goals. It gives guidelines for domain development activities in a given time period (from 3 to 5 years) and determines the direction, priorities, actions and responsibilities of the implementation.

Currently, common development goals and priorities of state and local administrative bodies are [14]: *smart growth*: the development of an economy based on knowledge and innovation. *Sustainable growth*: promotion of an economy which is more efficient in using its resources. *Inclusive growth*: promoting the growth of an economy with a high employment rate and which accomplishes social and territorial cohesion.

The strategic planning process (SP) is defined as the process by which managers analyze internal and external environment in order to formulate the strategy and the allocation of resources to develop a competitive advantage in the industry that enables the successful achievement of the objectives of the organization [11].

From the above definitions and the new needs of the organization, two key issues of formalization should be addressed and resolved in the context of the strategic planning [10]:

1) Formally define conceptual framework that is used to represent information / knowledge extracted from internal and external environment of the organization

and each participant in the process as to create a common vocabulary, which will enable all managers to express/share a unique vision and use this vocabulary to communicate and collaborate.

2) To formalize the strategic planning process itself to determine the steps that comprise this process, type of information / knowledge to be used and who is involved in each case. A schematic description of the course of the strategic planning process is given by Figure 1 [15].



Figure 1. Schematic description of strategic planning workflow [15]

In order to allow for a certain degree of automation and formalization of the strategic planning process, the different tools and software have been utilized like Competitive Intelligence tools (CI) [5] and Business Intelligence (BI) [6]. These tools have not been, however, integrated into all phases involved in strategic planning.

The author of [7] classified ontologies by their level of generalization and has proposed four different types: Upper, domain, task and application ontologies. The development of ontologies in the field of planning is still in an early phase.

The majority of created ontologies is designed for specific purposes: budget planning [1], public health care projects [2], public transport organization, action planning [3]. Methodologies for the development of ontologies used specifically for planning have not been sufficiently researched yet.

The development and transformation of knowledge are the main reason for the relatively small number of different methodologies for creating planning-oriented ontologies. The main advantage of using ontologies to describe knowledge of a continuously changing domain is their ability to develop and transform knowledge [4].

This paper will describe the application ontology and develop a terminology for describing development strategies as a part of the SP. The use of the described ontology in an ontology driven informational system creates possibilities for automation and unification of creating development strategies and action plans in the process of strategic planning in the development area of the analyzed region.

II. RELATED WORK

Authors of [8] define the conditions which need to be satisfied by the developed strategy:

- 1) It needs to be founded on a clear understanding of the current situation and need for development;
- 2) It needs to be relevant and clearly defined;
- 3) Involves both people and institutions;
- 4) It is logically consistent;
- 5) It is realistic and applicable;
- 6) It needs to have a real influence on development processes;
- 7) It enables monitoring and creates the foundations of responsibility and transparency whilst being susceptible to change;
- 8) It is broad enough to encompass all main development problems;
- 9) It is authentic, i.e., reflects the state and development ideas of the specific system that is a planning subject;
- 10) It is understandable for the wider public.

According to [8], the process of strategic planning has the following phases of development:

Preparation, which encompasses forming of the management structure that will direct the process. Concerning the approach proposed in this paper, this should be done in a way to ensure both public and political support, but also to ensure adequate executive infrastructure that will support planning process.

Collection and analysis of information. Information should be collected and analyzed in a way to provide for understanding of the current state and recognition of risks/critical success factors. The approach proposed in this paper suggests SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) as means to ensure that the analysis encompasses all questions emerging from data.

Development of a strategy (visions and goals of the action plan). Strategies need to represent a sequence of goals which grow progressively more detailed, and finally develop into a detailed action plan. There are three levels of goals: strategic goals, priorities and specific goals. The model of strategic goals, priorities and specific goals and, finally, the action plan needs to be logical and hierarchical. Higher goals need to logically lead to lower goals and lower goals need to contribute to the accomplishment of higher goals. Priorities and specific goals in the framework of every strategic goal need to

support and supplement priorities within these strategic goals.

Finalization (conclusion and implementation of the strategy). Finalization of the Strategy document and its adoption by the competent bodies/individuals.

Again [8] defines the requirements every development strategy needs to fulfill:

- 1) *Consistency* - All strategic goals, priorities and specific goals must be in mutual accordance.
- 2) *Relevance* - Goals must be relevant to the given situation. *Specificity* - Priorities and goals need to be specific enough in order to ascertain whether or not they have been accomplished.

Authors in [9] define the principles of designing planning-oriented ontologies:

- 1) Ontologies need to have a well-defined goal and support a defined group of usage cases;
- 2) Ontologies need to have a minimal amount of different concepts and traits;
- 3) Ontologies need to be higher than simple domain concept taxonomies;
- 4) They need to enable import/export of concepts and traits from other ontologies.
- 5) The goal of COA ontology described in [9] is to describe plans which could be used by different tools and applications.

Authors in [10] define the strategic planning (SP) process as one which analyses internal and external factors with the goal of forming strategies and allocating resources. Figure 2 shows a graphical representation of the model of SP as proposed in [11].

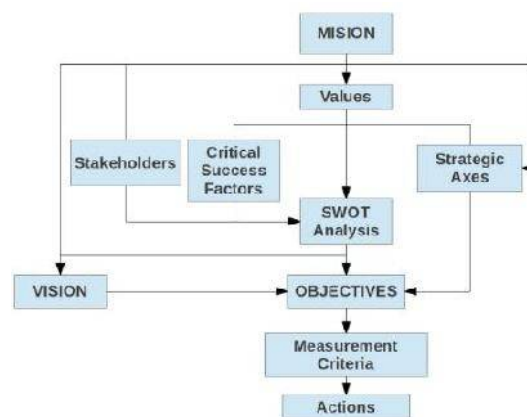


Figure 2. SP model proposed in [11]

Same source presents the ontology formalized by OWL which meets the standards approved by the World Wide Web Consortium (W3C) and is used for the formalization of the SP process, the knowledge that is created, and flows between the participants in the process.

Figure 3 shows the concepts and relationships contained by ontology structure, as well as entries of lexicon, which constitute the common vocabulary with which to refer to them.

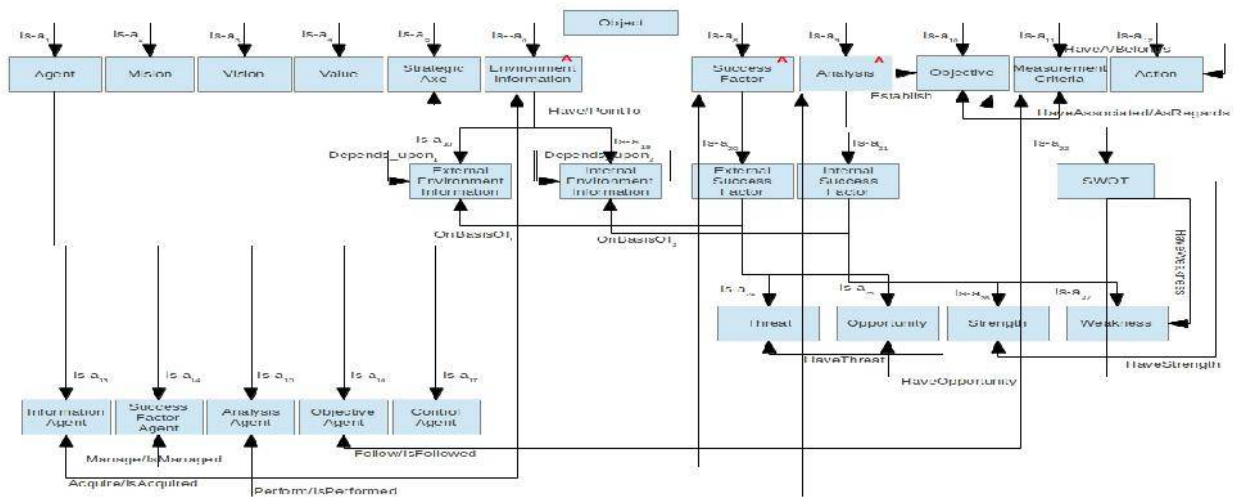


Figure 3. Ontology for SP process from [10]

III. THE ORS ONTOLOGY

The goal of ORS ontology is to ensure a formal, computer-readable representation of development priorities, specific goals as well as give answers to questions such as: *what* development priorities are (strategic elements), *how* they will be implemented (action plan elements), *who* is responsible for their implementation (action plan elements) as well as *where* and *why* they are being implemented in the first place (strategic elements).

As the basis for the ORS construction we used ontology structure shown on Figure 2 [10]. The semantic representation of the SWOT analysis from [10] as a part of the strategic planning process is extended with ontology concepts of the regional administrative bodies and development funds given in [12] as well as the SCORE ontology given in [13], which describes the development goals and socio-economic parameters of the region. The main concepts of the ORS ontology which semantically represent a SP process and planning strategy are shown on Figure 4.

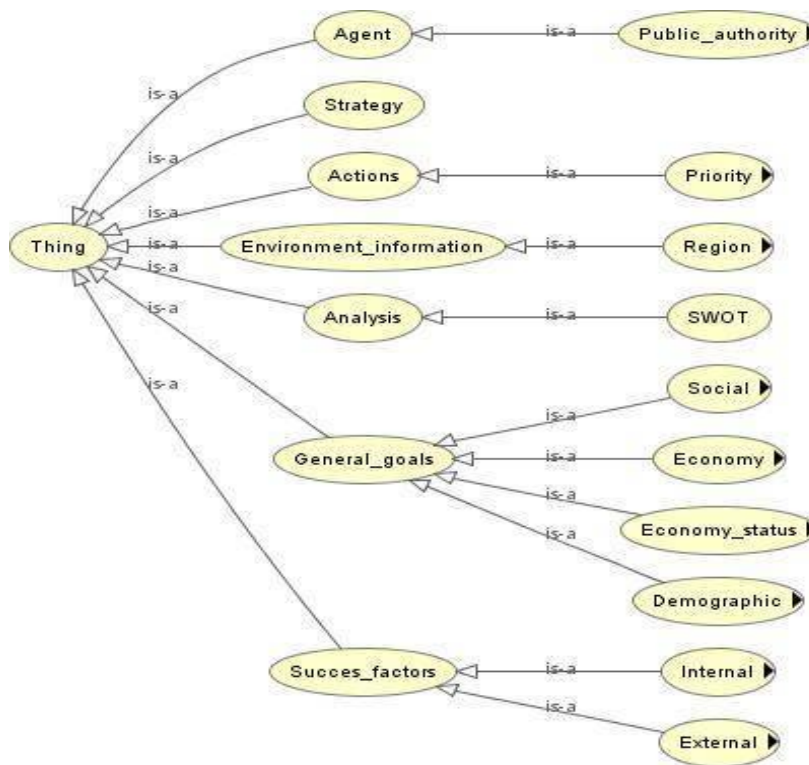


Figure 4. ORS ontology

As shown by Figure 4 the ontology proposed in [10] is extended in the following manner.

In the first step we create ontological concept that describes spatial aspect of the analyzed domain that includes populated areas and their administrative organization (county, municipality) and extend *Environment Information* concept from [10] with identified instances as shown on the Figure 5.

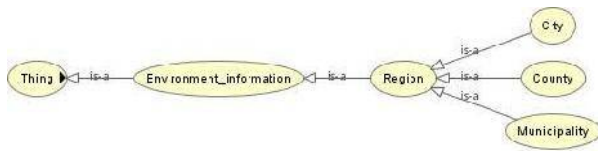


Figure 5. Region concept from ORS

In the second step we create *General Goals* concept. This concept describes the socio-economic parameters of the relevant region. It gives an insight into the current state and enables problems and limits of development to be identified. This concept is associated by relations *isThreat*, *isOpportunity*, *isStrenght* and *isWeakness* with the concept *Success Factors* from [10].

In the third step we create *Public Authority* concept. This concept describes hierarchical links of regional administration, funds and other organizational bodies of state administration which have the task of implementing strategic plans. The *Agents* concept from [10] is extended with created *Public Authority* concept.

Extension of the concept *Action* from [10], with *Priority* concept described in [14] is a *fourth step*. *Priority* concept describes regional specifics, i.e. development priorities.

Once the ontology is formally defined and exactly specified (using an instances), and all information of the analyzed region are stored in ontology, ORS ontology can be reused for creation of a subsequent strategies.

IV. CONCLUSIONS

The proposed approach in creating ORS ontology ensures a formal, computer-readable description of elements of the process of strategic planning. The proposed methodological approach creates a common dictionary of terms used by all participants in the process of strategy-development.

The ontological representation of development strategies (the process of creating development strategies is specified by a group of concepts and concept instances) creates conditions for re-use of semantically described strategies in the process of creating new strategies for the relevant domain. Instances which populate the ontology in the strategy development process are machine-readable and may be used in the creation of a new strategy or redesign of a current strategy.

Creation of the described ontology is the first step towards a model of the software tool aimed to facilitate creation of development strategy. The semantic representation of SWOT analysis enables the creation of graphic tools that could simplify the process of strategy and action plan generation. Additionally, use of the ORS ontology in an ontology-driven information system could enable automation and unification of development strategies and action plans creation within the framework of designing strategic plans for the development of the analyzed region.

REFERENCES

- [1] Brusa, G., Caliusco, M. L. and Chiotti, O., 2006. A Process for Building a Domain Ontology: an Experience in Developing a Government Budgetary Ontology. AOW '06 Proceedings of the second Australasian workshop on advances in ontologies. 72. pp.7-15.
- [2] Ali, A.,2010. Fareedi Ontology-based Model For The "Ward-round" Process in Health Care (OMWRP). LAP LAMBERT Academic Publishing.
- [3] Darr, T. P., Benjamin, P., and Mayer, R., 2009.Course of Action Planning Ontology. Ontology for the Intelligence Community.
- [4] Houda, M., Khemaja, M., Oliveira, K., and Abed, M., 2010. A public transportation ontology to support user travel planning. In: International Conference on Research Challanges in Information Science (RCIS), pp. 127.
- [5] J. F. Prescott and S. H. Miller. Proven Strategies in Competitive Intelligence: Lessons from the Trenches, Ed. Wiley, 2004
- [6] C. Howson. Successful Business Intelligence: Unlock the Value of BI & Big Data, Ed. McGraw Hill Education, ISBN: 978-0071809184, 2013.
- [7] N. Guarino. "Formal Ontology in Information Systems". In Proceedings of FOIS'98, Trento, Italy, IOS Press, Amsterdam, 1998.
- [8] P.Bolton. Vodič za Strateško planiranje za gradove i opštine, MIR2 2007.
- [9] Timothy P. Darr, Perakath Benjamin, Richard Mayer. Course of Action Planning Ontology, Ontology for the Intelligence Community 2009 (OIC 2009).
- [10] Juan Luis Dalmau-Espert, Faraón Llorens-Largo and Rafael Molina-Carmona. An Ontology for Formalizing and Automating the Strategic Planning Process. eKNOW 2015 : The Seventh International Conference on Information, Process, and Knowledge Management
- [11] F. Lorens. Strategic Plan of the University of Alicante (Horizonte 2012) <http://web.ua.es/es/peua/horizonte-2012.html>, 2007. N. Pahl and A. Richter. Swot Analysis - Idea, Methodology and a Practical Approach, Ed. Books on Demand, 2009.
- [12] S. Arsovski, B. Markoski, P. Pecev, N. Petrovački, D. Lacmanović (2014). Advantages of Using an Ontological Model of the State Development Funds, INT J COMPUT COMMUN, ISSN 1841-9836, 9(3):261-275.
- [13] Laszlo Ratgeber, Saša Arsovski, Petar Čisar, Zdravko Ivanković, Predrag Pecev, Ontology driven decision support system for scoring clients in government credit funds, INTERNATIONAL Conference on Applied Internet and Information Technologies (2 ; 2013 ; Zrenjanin), pages (369-373), ISBN 978-86-7672-211-2
- [14] CODEX , Coordinated Development and Knowledge Exchange,on Spatial Planning Methodology, Broj projekta: HUSRB/1203/213/151, 2013.
- [15] Bryson, John M. and Farnum K. Alston, Creating and Implementing Your Strategic Plan. Jossey-Bass Publishers, San Francisco,1996.