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An Ontology for Case-based Project Management

Master Thesis Proposal

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Diplom-Ingenieur/in

Software Engineering & Internet Computing

submitted by

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1. Problem Statement

Almost every organisation, regardless its type and domain (technical, educational, social, governmental, etc.) has to deal with numerous projects. In order to better structure their work, organizations nowadays almost always organize it in the form of different projects. Depending on the final goal of the projects, they can be classified in different categories, but the common thing is that they are timed (have a specific starting point and have to, at some point, end) and at the end they reach some kind of goal (deliver some form of result). Usually people from different areas of the organization take part in a project, which also have different knowledge and competences. Very often those people are not familiar with every single aspect of the project, they just know the part they are part of. In project-oriented organizations, it's everyone's job to help the management and contribute to bettering the projects. But despite different measurements taken in that direction, organizations still have the problem of transferring the mistakes of one project to the new ones, repeating them over and over again, instead of learning from them [5].

Although the disciplines of Project Management and Business Process Management offer two different viewpoints on the organization's work, they are very often correlated. Unlike projects, processes are repeatable. The projects on the other hand are unique (although some project may often resemble other projects). Typical process involves a number of actions (or simple tasks), different actors, which may be human actors or some computer systems/machines, various decision points and at the end some (or many) outcome(s) [6]. Projects often make use of numerous processes, in order to simplify the project flow and automate the completion of tasks. The field of Business Process Management (BPM) is relatively young discipline, but it is already accepted as a standard manner for improving the way organizations of different industries and sizes perform their everyday work. In the Information and Communication Technologies (ICT) world, it brings together the technical and business point of view, in order to optimize the way companies and organizations do their business. It involves different techniques for managing and monitoring processes, in order to enable process re-execution, automation and optimisation. The main goals of both the disciplines of Project Management and Process Management are to improve the organization's effectiveness and performance, to increase the quality and time to market of its products/services, to reduce the needed costs, production time (and many other negative aspects) and in general to make the organization more competitive on the market [6].

Despite all of the measures taken in order to improve the processes within organisations and minimize the percentage of errors, still the majority of projects are doomed to fail due to various reasons. The most common of those reasons include: insufficient planning and risk management, not accurate cost, time and effort estimations, poor project management and leadership, lack of communication. Discenza [3] classifies this reasons in 7 categories and according to him, failure reasons also often include: dealing with unambiguities, insufficient customer involvement, lack of motivation and inadequate tools and technology. Even more general, the failure reasons may be categorized into three categories: people, processes and communication. Attkinson [1] also classifies the criteria into three categories - time, cost and quality, to which he referred as the “Iron triangle”. Defining failure criteria is extremely important, in order to overcome those failures.

As opposite to other projects, Information Technology (IT) projects have to face additional problems concerning the constantly changing requirements and the expansion of the project scope [7]. Furthermore, the ever evolving technology presents uncertainty, which additionally increases the risk levels of a project. According to a study performed by the IT company Geneca in 2011 [8] on 600 executives, approximately 75% of the people believe that the projects they are working on are fated to fail. According to the survey many believe that their projects differ from the requirements, that they spend to much time on reworking things and they even admit that the aims of the project are not fully clear to them [8], [14].

In today’s technologically developed world, computers have the abilities to retrieve and store large amounts of data. The data from projects can be stored and this data can be used in the future to learn from the experiences of the past projects and implement the learned lessons into the new ones. Case-based Reasoning (CBR) is a technique that uses old experiences for solving new problems. Those problems may vary from very simple everyday actions to very complex ones. The method stores knowledge from problems as cases and then uses those cases to derive some conclusions, that can be used for solving new similar problems. This approach is used in the field of Project Management to support managers (and everybody working on a project) to make better decisions about new projects, based on experience of previous ones. Having a comprehensive knowledge about the project domain can be very beneficial for everyone working on a project. In computer science, ontologies are the gathering and representation of knowledge (concepts) from a specific domain (or several domains), which make the understanding of those concepts, their classes and the relations between them a lot more understandable. Such a domain theory may further help

Case-based Reasoning approaches, in order to simplify and optimize the finding of similarities between cases and to derive better conclusions [13] [15].

The goal of the thesis is to answer the following research questions:

- Which are the most important concepts of the management of projects (and in particular the management of Workflow Management System projects) and their interconnections?
- Can an ontology on Project Management help derive better conclusions in Case-based Reasoning (CBR)?

2. Expected Results

This thesis should answer the research questions from the previous section by firstly exploring the literature sources regarding the topics. It should investigate the fields of Project Management and Business Process Management (their interconnection and differences) and identify common factors for project failures. It should define a set of conclusions, that most often will lead to the failure of the project or its success.

There exist techniques that make use of Case-based Reasoning, which help organizations to learn from the experiences from past projects, in order to achieve more successful projects in the future. The current thesis will propose an ontology, which will include the most important concepts of the Project Management domain. The proposed Ontology should model the reality of a project in a best possible way and will additionally contribute to understanding the environment surrounding the project and will clear the structural characteristics of a project.

The current thesis will show if such an ontology (and the domain knowledge in general) can help derive better conclusions in existing Case-based Reasoning approaches and if the domain knowledge can contribute for better identification of cases by improved measurement of the similarities between cases, and later repararment of those cases, which finally should lead to the improvements within the organization in general.

In the final part of the thesis, it will be evaluated, if the proposed ontology can somehow contribute for improving Case-based Reasoning and Project Management in general.

3. Methodology and Approach

The results from the previous section will be achieved using the following methodological approach:

- Literature research - literature will provide a comprehensive overview of the topics of Project Management, Business Process Management, Case-based Reasoning, Knowledge Management, Ontologies, etc..
- Defining possible conclusions - finding the most relevant success/failure factors of projects and investigate the importance of continuous optimization
- Ontology - in the practical part of the thesis, an ontology on the Project Management domain will be proposed. The individual steps of the ontology creation will be fully described, including:
    - Choosing of an approach for building an ontology
    - Defining and fully describing all of the important domain concepts and their interconnections
    - Describing the process of mapping the ontology concepts to the actual project concepts
- Evaluation - The importance of the proposed Ontology will be evaluated by the typical conclusions derived from the CBS. The results of existing CBR methods that make use of the ontology will be compared to the results of those methods without it, in order to evaluate its contribution.

4. State of the Art

In recent years there has been tremendous transition to process orientation within companies and organizations [2]. The main role of processes is to characterize what will each person do within the organization, how will he/she do it and with what aims. It shapes the responsibilities of each employee and decides which tasks is he/she supposed to perform. The Business Process Management arises in the early 90s with the trend of organising business around processes. The basic idea behind it is that each product or service, delivered to the market, is the result of many actions and decisions, taken by different actors. Each process takes some input, performs some tasks on it and some output is expected, which should bring value to the customer. For the business is extremely important to understand the interactions between those activities, in order to improve the

corresponding processes. Basic characteristic of successful company is the ability to adapt existing products to the market demands and to promptly create new functionalities and products, when needed [16].

Different people divide the lifecycle of a business process into different phases, but in general the last phase always includes process optimisation. By re-engineering and re-designing processes the organisation can achieve process management optimisation and overall optimisation of the organisation. Business Process Reengineering (BPR) is a relatively new discipline, which concentrates on analysing workflows, identifying errors or inefficiencies within processes that occur often and proposing methods for fixing those errors. The term BPR originates from the 1990s, when Michael Hammer publishes his article: “Reengineering Work: Don’t Automate, Obliterate” [12]. He states that there are a lot of organizations that use new technologies to automate processes, which are essentially not effective, and not trying to build new processes using those new technologies. A few years later in his book Hammer [11] uses the term “reengineering” as the aim of an organization to improve its strategy, to become more customer oriented and to start to “think” in a process oriented way.

One of the most important things that need to be done for improving the projects (and processes) within organizations are to analyse the situation before starting the project, to not start in a way that is doomed to fail from the beginning. For that reason, learning from past projects and past experiences is crucial for improvement in the future. But in order to be able to make this comparison at all, the information from old projects must be stored somewhere. Case-based Reasoning is a method for solving those problems. It is a process of finding solutions for problems and approaching new projects, by considering old experiences, that are stored as Cases. A Case usually contains a problem and the corresponding action that is taken. This action can be a possible solution for the problem, but also an action that led to other problems [5], [4].

Ontologies are a appropriate method to capture the most important domain terms of a business process, which can further contribute to improving the process of Case-based Reasoning. In the field of Computer Science, Ontologies are defined as representation of concepts within a specific domain (or combination of domains), which should define the properties of each concept and the relationships between different concepts. Gruber [10] simply defines an Ontology as “an explicit specification of conceptualization”. Ontologies

combine different methods from Software Engineering, the WWW, Artificial Intelligence, Formal Logic and Automated Reasoning [9]. They make domain knowledge understandable for machines by representing it as an explicit conceptual knowledge model. In the field of Semantic Web, they serve as a mean for making websites understandable from information systems.

5. Relevance to the Curricula of Software Engineering & Internet Computing

The thesis will combine the fields of Project Management, Business Process Management and Knowledge Management. The aim is to propose an Ontology for Case-based Reasoning, which will contribute for learning from past experiences and improving the projects of an organization. The most relevant courses are the following:

188.924 Workflow Modelling and Process Management

188.483 Knowledge Management

188.399 Introduction to Semantic Systems

188.387 Semi-Automatic Information and Knowledge Systems

6. References

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