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4DSA: 4-DIMENSIONAL PRESENTATION OF STAKEHOLDER ANALYSIS IN LARGE SOFTWARE PROJECT

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***Abstract**: Stakeholder analysis activities are essential for project success and have to be implemented from its beginning. This paper describes the stakeholder analysis method as a permanent process. It begins in the early project stage and containes ten subprocesses. Method itself was developed, tested and used in the ERP project PIVIS. Also, this paper presents a technique for simultaneous presentation of 4 variables in one plane (4DSA), which facilitates the permanent stakeholder supervisions.*
***Key words**: four-dimensional stakeholder analysis (4DSA), Enterprise Resource Planning (ERP), software engineering, project management, software project*

1. INTRODUCTION

Each software project may have different types of stakeholders (PMI, 2008), (Sommerville, 2007). Their roles in project and their primary concerns around these projects differ substantially. Evaluating their attributes, understanding and managing their interrelationship appropriately have a strong impact on the project success. Large software development projects are sensitive to such stakeholder influences because even small deviations in the beginning can cause problems in later project phases.

To avoid this it is necessary to have a strategy for stakeholder contributions mapping, as well as to perform adequate management activities during the whole project.

In this paper we describe a stakeholder analysis (SA) approach applied on Enterprise Resource Planning (ERP) development project PIVIS. The main contributions of this paper are: (i) organizing SA activities into ten (sub)processes and (ii) graphical presentation of four stakeholder attributes on two-dimensional diagram. The rest of this paper is organized as follows: Section II presents the related literature. In Section III we discuss SA from the process point of view. In Section IV we present the model developed in the project. Section V presents gathered data, our conclusions and describes the future work.

2. LITERATURE OVERVIEW

Traditional software engineering literature mostly agrees in naming the key stakeholders as end-users, customers, sponsors, managers, team members, suppliers, domain experts or the public (IEEE, 2004), (Sommerville, 2007), (Williams et al., 2010). The stakeholders are included in the project from the Requirements Engineering (RE) phase (IEEE, 2004) (Sommerville, 2007). The key term concerning stakeholders is ótakeholder identification ô or ótakeholder identification process ô (SIP). They mostly agree about SIPôs gathered data is presented in Tab. 1. It is possible to observe a (Pacheco & Tovar, 2007). A prerequisite for this is that all the stakeholders are identified, the nature of their ótake ôanalyzed, and their requirements elicited (IEEE, 2004).

From the management point of view, it is critical for project success to identify the stakeholders *early* in the project (PMI, 2008), (Smith, 2000) and to identify their roles, cooperativeness, specific knowledge and similar attributes. Once such activities are made then overall stakeholder impact on project and stakeholder analyses with corresponding stakeholder strategy can be developed.

3. STAKEHOLDER ANALYSIS AS PROCES

Stakeholder analysis in the early project phase may not include all stakeholders or provide enough information about all their characteristics, but it should provide initial data for other project documents (like teams forming, risk analyses, project plan or communication plan.) This is especially important in large projects because small failures in the early phases can have large implications on project success. In fact, large software project usually includes huge number of stakeholders and it is necessary to identify all relevant stakeholders and their roles in early project phase, in order to be able to make good requirements and expectation elicitation. Completeness, correctness and consistency in the Software Requirement Specification Quality (SRSQ) can be significantly ensured by applying proper SA (IEEE, 1998).

During the project, SA is updated with additional information (like new stakeholders, or new knowledge about old ones). For example, stakeholder registry on large project could be long, and missing to identify or even wrongly evaluate some stakeholders. That means that SA could be described as a set of activities performed during the whole project. In the literature the SA is described rather as an *activity* then as a *process*. In fact, SA activities can be organized into several (sub) processes (simultaneous or consecutive), with their inputs and outputs.

4. SA APROACH USED ON PIVIS PROJECT

SA approach on the ERP project PIVIS is presented in Fig. 1. Activities in this approach are organized through ten subprocesses (from initial stakeholder identification to continuous monitoring). Some of them appear just once (like *registry establishment*) while others are repetitive (it means: they appear several times during the project) (like *stakeholder identification, attributes identification, data gathering*, etc.) or permanent process (*stakeholder monitoring*). Prerequisites for this permanent process should be designed and organized wisely in order to manage monitoring effectively. That way SA and stakeholder monitoring as its subproces contribute to the project success.

Structure of the stakeholder registry of PIVIS project, with four the most important stakeholder attributes, their metrics and gathered data is presented in Tab. 1. It is possible to observe a more interesting combination of two attributes displayed in four quadrants (PMI, 2008), (Williams et al., 2010). According to the equation (1), in this case it is necessary to have six diagrams (six combinations) for the stakeholder strategy definition.

[illegible] (1)

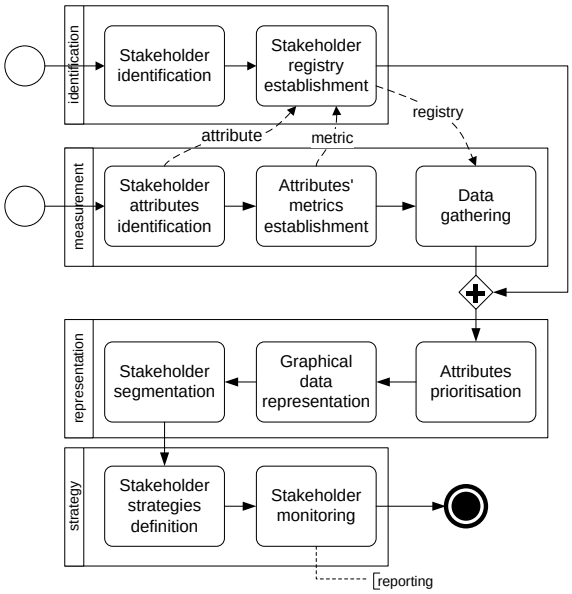

Fig. 1. Stakeholder analysis process

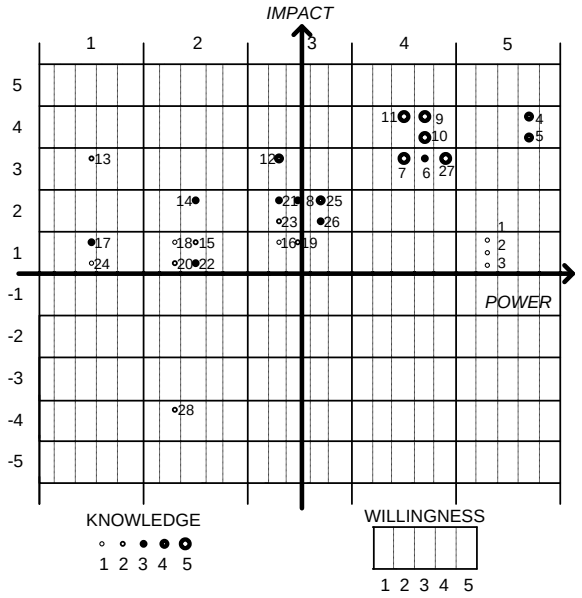

Fig. 2. 4D stakeholder analysis (4DSA) for PIVIS project

In order to facilitate results presentation and their later monitoring we have put all four attributes in one diagram (Fig. 2). The most influential attributes (*power* and *impact on project*) are the on the main axes (*x* and *y*). The third attribute (*domain knowledge*) is presented by the size of the circle. This way, three dimensions are incorporated, but still the forth one is required to present and monitor stakeholder attributes easily. Further we have applied a new attribute (*the willingness to cooperate*) as a fourth variable in the diagram. It is presented as follows: cells that derive from discrete values of x and y axes when they are divided into five horizontal columns. Left indicates little willingness, while the right indicates a high willingness. It produced several areas for 4-dimensional stakeholder analysis. People placed more on the right side of x axis are influential ones. Besides positive influences are presented on the positive part of y-axis, while negative influence are on the negative part. The degree of knowledge and interest are nuances that will ultimately determine which management strategy should be applied to particular group.

5. DATA ANALYSIS AND CONCLUSION

Once when all attributes (i.e. variables) are elaborated then gathered data can be processed and presented in the diagram. The SA for 28 stakeholders on PIVIS project is presented in Fig. 2. Some different groups are identified. The ***labile*** group of three stakeholders (ID: 1, 2 and 3) is important, because they are very influential and on the edge of positive impact, very little knowledge and willingness.

Stakeholder ID	Power (1 ï5)	Impact (-5 ï+5)	Knowledge (1 ï5)	Willingness (1 ï5)
1	5	1	1	2
2	5	1	1	2
3	5	1	1	2
4	5	4	4	4
5	5	4	4	4
6	4	3	3	4
7	4	3	5	3
8	3	2	3	3
9	4	4	5	4
10	4	4	5	4

Tab. 1. Top ten stakeholder analysis of PIVIS project

The next group (ID: 6, 7, 9, 10, 11 and 27) has a highly positive impact. In addition, stakeholders from this group are very cooperative and have high domain knowledge ï these are the ***key users***. Close to this group are two stakeholders (ID: 4 and 5) with very high power and slightly smaller other attributes ï they are also important team members with special treatment. On the other hand there is a single person (ID: 28) with a highly negative impact, but fortunately negligible other attributes. Appropriate strategy was defined for each stakeholder group.

Generally, large project like ERP software development involves many stakeholders with different characteristics and preferences towards the project. Some of characteristics may change during the project. It is therefore necessary to continuously monitor important characteristics for key stakeholder groups.

Further research will be directed to the application of 4DSA techniques to other areas of the project PIVIS (the first step is continuous monitoring of project risks) and finding the appropriate metric for measuring the productivity of small software team.

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