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Requirements Management as a Competitive Factor in the it Mid Tier Business Concerning the Implementation of Erp-Software

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***Abstract*—**The success of IT-projects concerning the implementation of business application Software is strongly depending upon the application of an efficient requirements management, to understand the business requirements and to realize them in the IT. But in fact, the Potentials of the requirements management are not fully exhausted by small and medium sized enterprises (SME) of the IT sector. To work out recommendations for action and furthermore a possible solution, allowing a better exhaust of potentials, it shall be examined in a scientific research project, which problems occur out of which causes. In the same place, the storage of knowledge from the requirements management, and its later reuse are important, to achieve sustainable improvements of the competitive of the IT-SMEs. Requirements Engineering is one of the most important topics in Product Management for Software to achieve the goal of optimizing the success of the software product.

***Keywords*—**ERP, Requirements Management

I. Introduction

IT-PROJECTS concerning the implementation of business application software, in case of integrated solutions also called Enterprise Resource Planing (ERP)-Software are complex and not successful too often. A more precise and more efficient support of such IT-projects by software-tools is absolutely necessary. According to the CHAOS Study 2009 [1] 24% of them failed completely. 44% were problem-encumbered with cost-, budget- or time-exceeding. As a main cause for the problems a not-existing match of implemented software product and requirements is detected. Also the Arcway Study concerning requirements management [2] confirms that 63% evaluate the handing over of requirements to the interface between business and IT as poor. At the same time the majority of the interviewees, however, regard this handing over as a most important criteria for the IT-project's success.

Requirements management with a reusable storage of knowledge about the requirements is obviously an important key to the success of a project. It can be assumed that requirements management gets into a more and more important factor also for SMEs. It can be, indeed, questioned in how far this insight is spread also in the producing and applying corporations and if they dedicate the necessary attention to the topic requirements management.

Even if requirements management is regarded to be an important topic in particular corporations, missing knowledge about the theoretical bases of requirements management or its transformation into praxis can lead to an underdeveloped realization.

This can have two considerable consequences: First of all there is the danger that IT-SMEs fall behind bigger competitors. Secondly, an underdeveloped requirements management reduces the project's success and the realization of advantages in terms of efficiency of the applying corporations. Especially amongst SME software-providers there seems to be partly ignorance about the effects an improved requirements management could have on productivity and on customer's satisfaction.

The scientific research project shall detect the status quo of significance, knowledge about, and the actual use of requirements management in IT-projects of SME software-providers, with help of quantitative and empirical methods. On the basis of the obtained data, problems shall be discovered and its causes identified, so that recommendations for action for SMEs as well as possible solutions, also for the reusable storage of knowledge, can be derived.

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II. Requirements Management

A. Definition of Requirements Management

Requirements management is a discipline of requirements engineering, with the goal to make an efficient and almost faultless development of complex systems possible.

To understand the topic requirements management, at all, the notion of requirement has to be understood first. The literature includes a variety of different definitions, in the core meaning the same. The definition of Rupp [3] corresponds, however, to the point of view, represented in this essay:A requirement is a statement about a characteristic to fulfill or an accomplishment to perform concerning a product, a process or the persons involved into a processThese requirements are in praxis given by the customer and should accordingly be fulfilled by the supplier. Here exactly starts the requirements management. It shall help to detect the requirements, to analyse and to document them. The final aim is to define, in stages, unambiguous, faultless and complete requirements out of vague and faulty or incomplete requirements. This can only happen through an intensive cooperation and communication between the persons involved into the project. Therefore the particular persons get divided according to their roles (customer, supplier, developer, specialists, product-managers and so on.) to work out together, the requirements, which are to realize. At the same time it is required, that also with changing requirements, before found agreements are kept up.

Open Science Index, Computer and Information Engineering Vol:5, No:11, 2011 publications.waset.org/13428/pdf

B. Tasks of Requirements Management

The main tasks in requirements management can, according to Schienmann [4], be classified into the three levels of development and realization, management and administration, as well as process-improvement:

In doing so, the level „development and realization" builds the core-process of requirements management with the following tasks, building upon each other and passing after each other:

1) Requirements detection
2) Requirements analysis
3) Requirements communication
4) Requirements documentation
5) Requirements quality assurance

On the next level is the „management and administration" with following tasks, running parallel to all processes of the requirements management:

a. Riskmanagement
b. Changemanagement
c. Realizationmanagement

The „process-improvement" is the last level and serves to optimize all tasks and to continually improve the requirements management.

Especially in the early phase of a project, requirements management is applied. There should, accordingly, be much time invested, to avoid high costs for the removal of faults, later. According to different examinations of Davis [5], the costs for the correction of mistakes increase rapidly with the progress of the developing phases.

To avoid mistakes later, knowledge arising from the processes of requirements management shall not get lost, but first get stored on the basis of the requirements management tool.

C. Requirement Management Tools

Requirements management tools try to support the tasks mentioned in the pre-chapter, and increase the efficiency of the projects, in computer-technical form. So, with the most on the market available tools, requirements can be raised and administered. Currently in many projects Word and Excel from Microsoft are still used for these tasks.

Other requirements management tools offer, however, more possibilities to manage requirements, so, the greatest part of them offer integrated visualisation-tools. Consequently, with different programmes also UML-diagrams can be drawn.

The reason for the introduction of a requirements management tool is based on the possible efficiency-improvement of IT-projects and the interconnected cost savings. So are, according to a study, efficiency-improvements up to 20% are possible [6] with help of process-improvements, which are supported by the right software tools.

III. Knowledge Based Systems

Knowledge has always been an important requisite for success and competitiveness of companies. „Knowledge" about products, technological development, methods, customers, markets and also cultures has become even more important in time of globalization.

This trend has induced an interdisciplinary area of research – Knowledge Management (KM), which one of the domains in several disciplines, such as organization and management research, computer science and business computer science, psychology, pedagogy and sociology [7].

In business computer science, attention is focused predominantly on the use of software for supporting KM and on potentials which result from this support. For example:

- Simple replication of data
- Support of visualization
- Support of data allocation
- Support of data servicing and
- the last but not least: automatic evaluation / use of data

The term „knowledge" is characterized by the fact that it can implicate several different meanings. A precise definition of the term knowledge can be found in an semiotic dictionary: „A piece of information based on previous experiences or logical assumptions" [8].

Expert systems (XPS), in which „knowledge" is saved as „data", uses human knowledge to understandably solve problems which would otherwise require human intelligence. Therefore data must be formalized under a detailed piece of knowledge in a given area of application and represented appropriately in a software system [9].

The difference between databases and expert systems, which include knowledge-based databases, lies in the fact that knowledge from expert systems can be questioned not only like data, but also be used for the solution of various problems (or for automatic generation of data structures, script programs, printing) [10]. Knowledge differs from data by the fact that it is coupled with instructions about his use.

A widely used description of basic modeling of a knowledge-based system (expert system) can be found in [9], [10] and it is presented on the figure below:

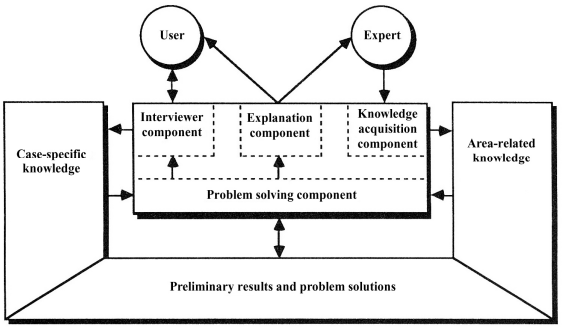


Fig. 1Basic model of a knowledge based system

Open Science Index, Computer and Information Engineering Vol:5, No:11, 2011 publications.waset.org/13428/pdf

The illustration describes different modes of an expert system and its relations to each other as a complex system. Contrary to conventional application systems, in which algorithms are used to generate data, expert systems use data to solve problems. Therefore data and strategies for problem solving are separated in the structure of an expert system [10]:

- Case-specific and area-related knowledge: In the figure 1 the knowledge base consists of two parts, which are represented by case-specific and area-related (expert) knowledge, depending on their origin.
- Problem solving component: this component interprets knowledge from a knowledge base in order to solve the problem which has been specified by the user.
- Interviewer component: this component leads a dialogue with the user or automatically collects acquired data.
- Explanation component: this component delivers the user reasoning for the found solution. It is a useful tool for the expert if a wrong solution has been derived from the knowledge base.
- Data retrieval component: this is an interface to human experts for implementing the knowledge in the knowledge base.

The most common form of knowledge representation and knowledge processing is described through production of rules. Rules consist of prerequisites and actions. An action can be expressed as an implication or activity. By implication relevance of statements is deduced, by activity situation is changed. Rules are expressed as a modal condition „if" - „then". Division of data into as small „knowledge parts" as possible makes a knowledge base modular and hence easily understandable. [10].

Admission of knowledge (Knowledge acquisition) for construction of a knowledge base can be generally carried out in four ways [11]:

a. Indirect knowledge acquisition: The process starts with questioning of an expert by a skilled IT-professional who assumes formalization and implementation in the expert system
b. Direct knowledge acquisition: The expert formalizes and implements his/her knowledge on his/her own and at the same time communicates directly with a knowledge acquisition component of the expert system.
c. Automatic knowledge acquisition: The expert system learns knowledge without human involvement from problem data and respective solutions. This method cannot be put in use by initial production of a knowledge base. Its application is restricted to knoeledge base servicing and maintenance.
d. Model-based knowledge acquisition: In this case knowledge can no more be directly acquired independently from implementation and therefore so-called conceptual models are acquired or even interactively constructed. The goal is to produce a knowledge model through mutual learning between a machine and knowledge modeler.

Conceptual models, such as business process descriptions, object models as well as data models are not used solely for the development of business information systems. As they help to overcome bridges between users´ and developers´ points of view, they can also be used as knowledge bases [12].

Amount of commercial software solutions in the area of knowledge management is also on the rise. These solutions can take as many forms as knowledge management itself. Important system classes definitely include software for supporting document management inclusive document archiving, content-management-systems, databases and business intelligence software solutions used for analytical management decisions based on „data warehouses". Nevertheless, none of these systems is fully capable of administering knowledge [12].

IV. Research Interest and Initial Hypothesis

Requirements management is an important key to the success of a software implementation project. Connected to this is the research interest to answer the question why the potentials of requirements management, especially in the IT SMEs in Germany, are not realized, although especially the competition with bigger and international corporations intensifies within the bounds of globalisation.

The initial hypothesis is that requirements management in IT-projects is not applied structured or software-based. Furthermore practically orientated concepts or tools, offering support for the overcoming of obstacles, are missing. As possible obstacles, amongst others, investment-, time- and personnel expenditure, as well as unclear benefit of the requirements management were identified.

V. Analysis Method and Issues

In the research project, IT SMEs shall be interviewed, within the bounds of a primary market research. While doing so the status quo of the significance, the knowledge about, and the actual employment of requirements management in IT-projects shall be examined.

The collection of data for this special research purpose will be carried out in form of a quantitative, standardised, written questionnaire for IT SMEs. Through clearly posed questions, a high reliability can be derived. To increase the efficiency of the questionnaire, it will be carried out as an asynchronous online-questionnaire, because the target group keeps a high affinity to information technology.

To ensure the validity of the results of plausibility checks and filtering are intended. So, answered questionnaires are filtered, which were answered in unrealistically short time or have given contradictory information on check issues.

Open Science Index, Computer and Information Engineering Vol:5, No:11, 2011 publications.waset.org/13428/pdf

A sample should be generated that represents a satisfactory image of all German medium-sized software companies. Structure data of companies such as company size and business activity profile are queried and compared with data from the Federal Statistical Office.

As regards content the scientific questioning should be split in different fields. The first step is to learn about the market environment and business activities of the company surveyed. A questioning follows to the project management-methods in software implementation projects used in the enterprise. The questioning should furthermore deliver important information to the meaning of Requirements management in general and to the software support with Requirements Management Tools. Still is examined, which employees how selected and trained, in order to ensure requirements management.

Also the exchange with the enterprise sphere and the knowledge springs of the enterprise should be asked. Appraisals to the customers and users of the questioned enterprise and the used measuring criteria to the project success round the questioning. Last but not least, General questions are asked about the company, as well as on the status of the interviewee.

VI. Possible Problem-Solving Approach

On the basis of the obtained data problems for a too low distribution of the application of requirements management shall be discovered and its causes shall be identified, so that recommendations for action for SMEs as well as proposals for a solution can be derived.

Likewise the knowledge of the requirements management, which arises from the early stage of an IT-project, concerning the implementation of ERP-Software, shall be stored. This knowledge shall be provided, to reuse it in a later stage, for example for the implementation, maintenance, care, further development or documentation of the software. To this, the knowledge of the requirements management has to be implemented in a central model for the knowledge-stance, into a knowledge-base.

A requirements management tool can build the later knowledge-acquisition-component in a knowledge-based system of an integral possible solution. So, the knowledge, stored in the requirements management tool can be transmitted to the knowledge-base.

The before-mentioned effects altogether lead to a better quality and lower costs for all participants, especially on the side of IT SME software-providers, and consequently also to a strengthening of its competitiveness against the IT-industry.

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