User-centered Requirements Elicitation for Business Intelligence Solutions

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Abstract

The implementation of Business Intelligence solutions, which support the planning, controlling and coordination processes of a company have been a high priority in the project portfolio of many IT departments in the last years. However, many of these projects could not fulfill the expectations due to an insufficient match with the actual business requirements. The research project described in this paper aims at closing this gap by developing an integrated, domain-specific method and tool support to enable user-centered requirements elicitation for BI solutions.

1   Motivation and research issue

As more and more decision makers demand computerized support of their work, Business Intelligence (BI) software has become a shared commodity across organizations. However, in the design process of BI software and especially in the requirements engineering phase a lot of questions remain unanswered, resulting in BI projects that do not match project goals. According to the Business Intelligence literature, one of the main problems seems to be that **business departments have difficulties to define their BI requirements.** This problem is reported both concerning the general outcome of the process (Paim & Castro, 2003) as well as for the sub-processes BI requirements elicitation and BI requirements documentation (Strauch & Winter, 2002).

To be more specific, in the elicitation phase, one of the main questions to be answered in a BI project is the question, which reports and which key figures are needed. These kinds

of requirements often cannot be articulated by the users of the BI system, and decisions often follow gut instincts instead of a methodic approach (Röglinger, Reinwald, & Meier, 2009). Another aspect of this problem is the fact, that business requirements often focus on functional requirements and non-functional requirements like usability and user experience goals are neglected (Chung & do Prado Leite, 2009).

Solutions, which are developed following these vague requirements, in many cases do not solve the underlying business needs, resulting in project failures. This is why well-defined information and systems requirements are stated as one of the top ten critical success factors for BI systems (Arnott, 2008). One of the causes of this problem is the fact, that substantial expert know-how is needed to run the BI requirements elicitation process, which is often resulting in comprehensive demand for training measures and/or expert resources (Kauppinen, Vartiainen, Kontio, Kujala, & Sulonen, 2004).

The depicted problem shall be resolved by the definition of an integrated, domain-specific method and tool support to enable user-centered requirements elicitation for BI solutions. Within the BI domain, the research will focus on reporting and data warehouse applications. To be able to design this artifact the following research question needs to be answered:

How can the elicitation of BI requirements be optimized to enable BI solutions with increased user acceptance and decreased implementation efforts?

2   Related work

By analyzing the Business Intelligence literature, the following perspectives have been identified to evaluate related work:

Scenario: Does the approach only cover Enterprise BI, or also smaller solutions, which are not necessarily developed in projects? The latter BI solutions aim at providing analytics functionality for a single department or even a single person and typically have less complex architecture, data modeling and transformation requirements. Nevertheless, the reporting requirements of these solutions might be as complex as in the Enterprise BI scenario, demanding for equivalent requirements elicitation support

User experience: Does the approach explicitly consider aspects of user experience?

Elicitation support: Is the elicitation of requirements supported by methods or tools?

Becker, Seidel, & Janiesch (2007) describe a model based approach to requirements specification for reporting using the H2 modeling language to document data warehouse and reporting requirements. Kumar, Gosain, and Singh (2009) focus on the early phases of requirements for data warehouses and propose an agent-goal-decision-information model

to visualize dependencies amongst the stakeholders. Paim and Castro (2003) present an approach for data warehouse requirements definition and management, explicitly incorporating non functional requirements. Jürck, Förtsch, Jahn, and Ulbrich-vom Ende (2009) describe the usage of recommender systems for a personalized selection of reports and present a prototype supporting this process. Röglinger et al. (2009) present an algorithm and a prototype to select key figures based on empirical relations like the number and weight of connections to other key figures and to the top key figure of the company. Few (2006) provides guidelines for effective, visual communication of information using BI dashboards and describes which visualization (e.g. bar graph, line graph) is appropriate in which information scenario (e.g. lookup, comparison, trend analysis).

	Scenario	User Experience	Elicitation Support
(Becker et al., 2007)	Enterprise BI	no explicit consideration	suggestion of existing methods / limited tool support
(Kumar et al., 2009)	Enterprise BI	no explicit consideration	only abstract model / no tool support
(Paim & Castro, 2003)	Enterprise BI	general consideration of non functional requirements	suggestion of existing methods / no tool support
(Jürck et al., 2009)	Enterprise BI	no explicit consideration	yes (but only existing reports)
(Röglinger et al., 2009)	Enterprise BI	no explicit consideration	yes (but only for key figures)
(Few, 2006)	Enterprise BI	yes	yes (but only for visualization) / no tool support

Table 1: Evaluation of related work

The table shows, that none of the approaches differentiates between different BI scenarios. User experience is only explicitly considered in Few's (Few, 2006) approach and tool support is also just considered in three approaches ((Becker et al., 2007), (Jürck et al., 2009) and (Röglinger et al., 2009))

3   Conceptual architecture

As stated earlier, the research project aims at developing an artifact to overcome the described problems. This artifact shall satisfy the following requirements:

Scenario differentiation: The solution will provide support for Enterprise BI, Departmental BI and Personal BI scenarios.

User centered approach: The targeted requirements elicitation process follows the principle of user-centered design and aims at empowering end-users to specify their BI requirements with no / low involvement of IT experts. This shall be realized by the usage of supportive structures and algorithms, which will be explained below in more detail. The second consequence of the user-centered approach is the explicit consideration of user experience aspects as requirements for the BI solution. This shall be realized by the incorporation of design guidelines, which will be explained below in more detail.

Elicitation method and tool support: Different methods shall be used to support the requirements elicitation process. These methods shall be integrated into a guided process, implemented in a tool.

Supportive structures: Supportive structures may consist of question and wizard structures, implemented in a software tool which guides the user through the process of requirements elicitation. Similar to other software guided processes (like e.g. tax statement software solutions) the structures shall also provide the user with background information about the specific step he is currently working on.

Guidelines and dependent requirements: In some cases the definition of a requirement depends on other requirements (Hildenbrand & Geisser, 2005). For example a user demands for a graphic visualization of defined data but cannot articulate the concrete form of the visualization. In cases like this, there are sometimes guidelines, which can be used to derive a dependant requirement (in this case a specific visualization, e.g. a pie chart) from an independent requirement (in this case the requirement for visualization in general). One of the concept tasks will therefore be the incorporation of guidelines into if-then-routines that determine the described dependent requirements.
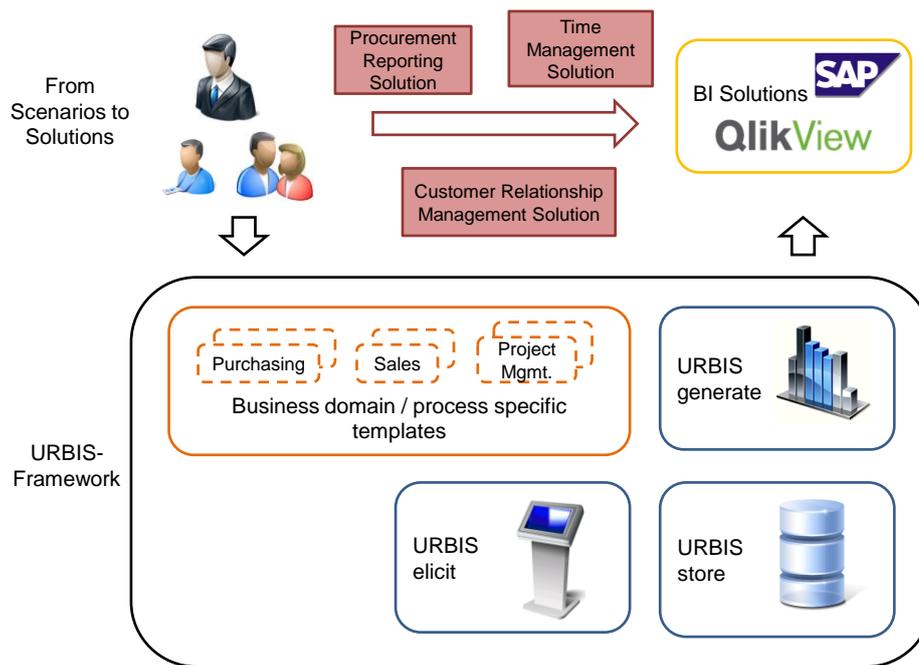
Figure 1: URBIS framework and usage scenarios

Fulfilling the depicted requirements, the artifact shall enable **u**ser-centered **r**equirements elicitation for **BI s**olutions (URBIS). The centerpiece of this artifact will be a module that supports the elicitation process, connected to a database which stores the defined requirements. The business /domain content to elicit the requirements shall be analyzed in the research project for one or two sample domains and be supplied in dedicated templates which are used during the elicitation process. A potential add-on to this architecture would be an interface to generate BI applications / prototypes for dedicated BI tools based on the defined requirements.

4   Summary and future work

Many BI projects do no fulfill the set expectations due to a mismatch with the initial business requirements. This paper presented the approach of a recently started research project to close this gap by developing an artifact that enables the end-user to elicit BI requirements in a guided process. The project will proceed by further analysis of the state of the art in requirements elicitation within the BI domain and the corresponding problems. This analysis will be followed by a further limitation of the scope to a specific application domain (e.g. sales reporting within high tech industry), which will also determine the group of relevant experts for the following interviews. Subsequently, the proposed artifact will be conceptualized, implemented and evaluated iteratively. The project

is following a design science approach, focusing on artifact development and using existing theories like the Technology Acceptance Model as a reference framework (Davis, 1989).

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