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ABSTRACT

Information Technology Service Management (ITSM) delivers IT-based services to organizations. It supports the attainment of business goals by aligning IT activities with business requirements. ITSM is usually implemented by following a process oriented approach that is further specified by dedicated frameworks like the ISO 20000 standard and the IT Infrastructure Library (ITIL) of the Office of Government Commerce. Due to cost effectiveness considerations a complete implementation of such frameworks is not necessarily required, since opportunities for improvements can be located in a limited set of process areas, depending on each organization's individual case. In order to follow this approach, a concept is presented that supports the cost effective implementation of ITSM. It is based on sharing specific knowledge that eases the identification of relevant objectives within ITSM frameworks and furthermore supports the identification of dependencies for implementation planning. Results of the conducted validation case indicate the concept's fitness for purpose.

Keywords

Information Technology Service Management (ITSM), cost effective implementation, ISO 20000, IT Infrastructure Library (ITIL)

INTRODUCTION

A challenge to adopt ITSM frameworks under cost effectiveness considerations is their holistic approach. They cover a wide range of aspects regarding IT-based services (Winniford et al. 2009). Depending on each organization's individual case, opportunities for improvements can be located in a limited set of process areas. For instance, a top IT related issue according to the IT Governance Institute (IT Governance Institute (ITGI) 2006, IT Governance Institute (ITGI) 2008) is the processing of operational incidents that cause disruptions in service provisions to customers. The resolution of such incidents and the prevention of occurrences falls within the scope of the resolution processes within the ITSM according to ISO 20000 and ITIL (IT Infrastructure Library (ITIL) v. 3, Service Design; ISO 20000-1, Information technology-Service management). Therefore, the aforementioned issue can be resolved by focusing the framework's adoption on resolution processes.

This leads to the need for a solution that supports the determination of a case dependent and suitable intensity of framework implementation as proposed by Cater-Steel et al. (Cater-Steel et al. 2006). Since a recent literature scan did not reveal any solutions[1], a joint venture was initiated to develop such a solution in cooperation with an industry firm, which provides practical expertise in the field of ITSM.

The overall aim of this research in progress is the provision of a solution that supports the contribution of information systems to organizations' success. It is reached by designing a concept that supports the application of IT process improvement frameworks within the domain of ITSM. The concept is based on sharing specific knowledge to improve processes (Eppler et al. 1999). The approach roots back to the theory described by Nonaka et al. (Nonaka et al. 1995), exemplifying the role of knowledge to continuously innovate and finally create competitive advantages (Nonaka et al. 1995). Referring to the given problem, the sharing of knowledge facilitates control that enables the IT department to decide on frameworks' objectives for implementation that lead to desired improvements.

The proposed concept supports knowledge sharing as follows: *First*, the externalization of knowledge is supported by using interpretation modes that allow the elicitation of relevant knowledge. *Second*, the internalization of knowledge is supported

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[1] *Springer Science; EBSCO: Academic Search Premier & Business Source Complete; IEEE Explore; ACM Digital Library*

by providing a structured and explicit documentation of gathered knowledge including the visualization of dependencies. The concept is validated in an use case for ISO 20000.

In this paper, the following steps of this research in progress are presented: The methodology applied for the construction of the solution proposal is briefly introduced in the next section. After that, the initial problem is further refined into three aspects that define requirements to be covered by a potential solution. Emphasis is placed on the presentation of the concept and specifically its validation. The results are summarized in the conclusions and further research perspectives are given.

METHOD

The intention of this research complies with findings of March et al. regarding the purposes of design science based research (March et al. 2008). Therefore, a methodology is used to construct (design) a concept that is finally evaluated for applicability by an industry case. An industry based use case was chosen since it allows direct involvement with ITSM processes in a practical context at our cooperation partner. The direct communication with domain experts and ITSM managers eases the identification of relevant issues for the research.

The concept is designed by following a staged methodology that covers the entire development lifecycle from problem formulation to evaluation (Eder 1998; Gass 1983; Kramer et al. 1998; Law et al. 2000; Balci 2003). The construction is initiated by a problem formulation that provides an explicit understanding of a current situation requiring change. In general, the context in which the problem arises is to be defined and specifically undesired aspects of the status quo are to be identified. The proceeding requirement specification is a derived collection of needs in order to change the current problem situation as desired. The concept provides a solution attempt in the state of an idea whose application is intended to solve the problem. Finally, the concept is evaluated to analyze its fitness for purpose. In this specific case, a use case is chosen for validation, because it allows direct involvement with ITSM processes in a practical context at our cooperation partner. The direct communication with domain experts and ITSM managers provides valuable feedback to the construction process of the solution concept.

Since designing concepts is a rather iterative process (Hevner et al. 2004), it might be necessary to traverse the aforementioned stages several times until satisfying results are obtained. In this research in progress, the results of the first iteration are presented. The results provide orientation on directing the continuation of this research.

PROBLEM REFINEMENT

Information Technology Service Management (ITSM) is a process-oriented approach to deliver IT-based services to organizations *(ISO 20000-1, Information technology-Service management)*. It supports the attainment of business goals by aligning IT activities with business process requirements (Winniford et al. 2009). ITSM is usually implemented by following the prescriptions of dedicated frameworks like the ISO 20000 standard (ISO 20000-1, Information technology-Service management) and the IT Infrastructure Library of the Office of Government Commerce (IT Infrastructure Library (ITIL) v. 3, Service Design). In general, these frameworks define objectives that specify what or how the entire service provision should be realized. In addition, guidelines can be provided on implementing effective processes (Willson et al. 2009). The use of prominent frameworks yields the possibility to conduct cross-organizational benchmarks by comparing organizations' process development (Debreceny et al. 2009). Moreover, the use of prominent frameworks results in a standardization effect that improves cost control (Dameri 2009), e.g. by enabling transfers of gathered experience. Since prominent ITSM frameworks take a holistic approach to ITSM, a multitude of improvement opportunities is provided. This challenges organizations to identify improvements that deliver required provisions. According to Cater-Steel et al., this is specifically important in respect to a cost effective implementation of ITSM (Cater-Steel et al. 2008; Cater-Steel et al. 2006).

Since a literature review failed to reveal solutions that support a cost effective implementation of ITSM, a problem refinement was conducted to divide the problem into three aspects:

1. How can be determined whether further process improvements according to the prescription of consulted ITSM frameworks are beneficial regarding quality and cost aspects?

2. If further process improvements are indicated, which objectives of consulted frameworks are considerable options in a specific case?

3. Which dependencies are to be taken into account? For instance, a chosen objective might require other additional implemented objectives within a framework.

Regarding the first question, a model has been developed that can be applied within IT to heuristically determine optimal intensities of framework implementations (Deutscher et al. 2009). The term intensity serves as proxy for a degree of

implementation. Specifically, the model guides decisions whether further process improvements are beneficial based on cost and quality considerations.

The literature review failed to reveal solutions of the second and third question, though they are relevant for particularly two reasons: *First*, partial implementation of frameworks according to the needs of an organization makes it is necessary to assess each objective for its potential contribution incurred by implementation. This will enable organizations to focus on required aspects of frameworks and therefore invest in IS related capabilities that provide value to its respective organization. *Second*, processes of frameworks might depend on other processes that require implementation in advance. Therefore, possible dependencies need to be identified and considered when implementing frameworks. For instance, a complete implementation of *problem management* requires input from *incident management* to coordinate a proactive prevention of incidents disrupting service provisions *(ISO 20000-1, Information technology-Service management)*.

Therefore, this research in progress is motivated by the need to develop a concept that supports the tasks related with the second and third question. The proposed concept of this research in progress is introduced in the next section.

CONCEPT

Nonakas dynamic theory of organizational knowledge creation serves as foundation of the concept. The theory exemplifies the role of knowledge to continuously innovate and finally create competitive advantages (Nonaka et al. 1995). Furthermore, Eppler et al. analyzed the exceptional importance of knowledge to conduct process improvements (Eppler et al. 1999). Therefore, in this research in progress sharing knowledge is understood as vehicle to provide process-transparency in organizations required to improve processes (Beimborn et al. 2009).

The proposed concept emphasizes is structured according to Nonakas proposal of knowledge sharing in organizations:

1. The *externalization of knowledge* is supported by using certain interpretation modes. Each used mode is intended to elicit certain aspects of the subject under consideration. This approach is based on interpretation modes used in roman and specifically German jurisprudence (Larenz 1991). In order to attain the objective of this research, the following subset of modes is used:

    - <u>Literal interpretation</u>: The *literal meaning* of the objective is a general explanation of the respective objective. This includes, as necessary, definitions of the terms and the objective's scope. The main question for elicitation is "What is the meaning of the objective?"

    - <u>Purposive interpretation</u> (also known as teleological interpretation): The *capabilities gained* by the objective's attainment express its purpose. The main question for elicitation is "Which capabilities will the organization gain by attaining this objective?"

    - <u>Hierarchical interpretation</u>: The *capabilities required for attainment* express preconditions that are necessary for implementing the objective. This interpretation mode is a preparation to determine an objective's role within a system of interrelating objectives. The main question for elicitation is "Which capabilities are required to attain the objective?"

2. The *internalization of knowledge* is supported by providing a structured and explicit documentation of gathered knowledge that is intended to provide a single point of truth to teams. It serves as starting point for the individual internalization process embedded in a social context of action (Nonaka et al. 2009), i.e. using the documented knowledge to acquire solutions of practical problems. Figure 1 provides further explanation of the approach: Objectives are enriched by knowledge, gathered according to the aforementioned interpretation modes that additionally allow inferring interdependencies. These interrelations in terms of dependencies allow the identification of possible implementation sequences by sorting out sequences that violate dependencies.
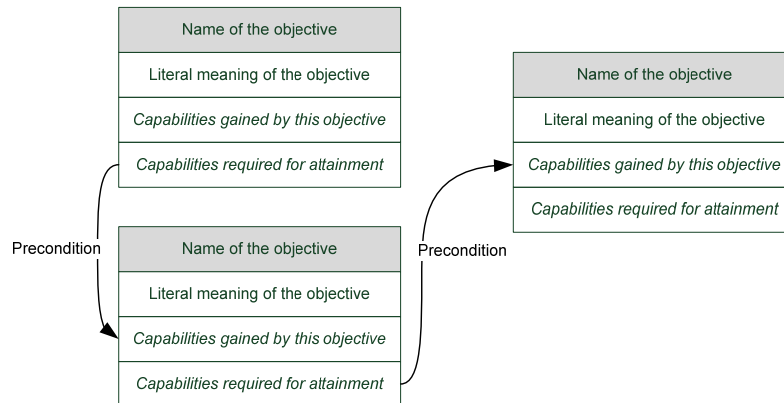
Figure 1. Structured documentation of knowledge gathered by proposed interpretation modes

Furthermore, the following workflow is provided to apply the concept in a practical context:

1. The assessment of objectives starts with the identification of objectives for interpretation. Then, domain experts are consulted in interviews using the interpretation modes of the concept. The gathered knowledge is documented in a structured fashion as demonstrated in Table 1. Additionally, the results are visualized as proposed in Figure 1 and completely pursued in the *validation case,* as depicted in Figure 2. Finally, the gathered knowledge is reviewed by domain experts and corrective actions are taken, if necessary. This may include the need for additional iterations of this stage.

2. During the analysis of specific needs, objectives are identified whose implementations provide required capabilities to the organization. Methods supporting this step are within the domain of system analysis / business analysis and beyond the scope of this paper. An overview of such methods is provided by the International Institute of Business Analysis (International Institute of Business Analysis (IBA) 2006). At the end of this stage objectives are identified that can be implemented through the attainment of objectives defined by frameworks.

3. Finally, additional objectives are inferred based on interdependencies. These objectives are required to implement the capabilities identified by the analysis of specific needs (previous step). The concept supports the inference of these dependencies through linking objectives by their *purposive* and *hierarchical interpretations.*

Based on this workflow the concept was evaluated. The results are presented in the next section.

VALIDATION

The validation's intent is to confirm whether the proposed solution is capable of solving assigned tasks (Balci et al. 1982; Carson 2002). This can be achieved through testing the solution proposal (Sommerville 2007). Therefore, the proposed concept is evaluated by a practical application that is conducted in cooperation with an industry firm.

Our cooperation partner[2] aims to reduce service disruptions caused by operational incidents through improving ITSM according to the ISO 20000 standard. The decision for improvement received further confirmation by using the model proposed by Deutscher et al. (Deutscher et al. 2009). The results indicate that process improvement actions would be beneficial in regards to quality and cost aspects. By using the model, the first aspect expressed by question 1 in the introduction is covered. The remaining aspects (question 2 and 3 of the introduction) are covered by the solution presented in this contribution. The validation is conducted following the workflow as proposed in the concept stage.

The validation is initiated by the assessment of objectives. The interpreted objectives are the requirements defined by the ISO 20000. Since our cooperation partner provides consulting services for ITSM, several certified experts are available for

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interviews. The results of the interviews by using the interpretation modes are documented in a structured fashion as presented in Table 1:

Objective no. 3.1.3: "Procedures shall define the recording of all incidents" (ISO 20000-1)	
Interpretation mode (see Concept)	*Interview results*
Literal interpretation:	The recording of incidents should be defined by procedures. A bypass of event message processing is to be excluded. An incident is provided by a customer, for example via mail, telephone or fax. The incident will initiate the opening of a new ticket and all required information will be recorded by the service desk.
Purposive interpretation:	Incidents embodied by the same message type will be recorded uniquely and the recording is independent of individuals. The procedures serve as foundation for a workflow that can be supported by IS. Furthermore, statistical analyses can be conducted, for instance to document the fulfilment of service level agreements (SLA's).
Hierarchical interpretation:	The requirements for incident processing are to be available and reviewed on a regular basis. Furthermore, input from service level management and operations management is required.
Objective no. 3.1.2: "All incidents shall be recorded" (ISO 20000-1)	
Interpretation mode	*Interview results*
Literal interpretation:	All incidents are to be recorded. An incident may be a false report (a non-agreed service or performance is not met), fault (an agreed service characteristic is not met) or a note (the agreed services are delivered, but the customer addresses from his point of view a proposal for improvement).
Purposive interpretation:	No incident gets lost. The complete recording allows creating reliable statistics for the coordination of improvements. Accumulations of quality deviations can be identified and the issue can be clearly addressed to responsible units / teams.
Hierarchical interpretation:	It is to be defined how and what is to be recorded. This information is to be updated, if changes occur.

Table 1. Sample result of the concept's application in the domain of ISO 20000 for ITSM

The second objective requires capabilities that can be provided by implementing the first objective. This is deduced by searching capability provisions of other objectives that can deliver the capabilities required of an objective under consideration. Therefore, the second objective gets the first objective assigned as precondition. An objective may have any number of preconditions (including none). The identification of preconditions is performed after all objectives have been interpreted according to the specified interpretation modes (as proposed in this concept). Additionally, the documented interpretations of the objectives are visualized as proposed in the concept stage. Figure 2 shows an excerpt of the results:
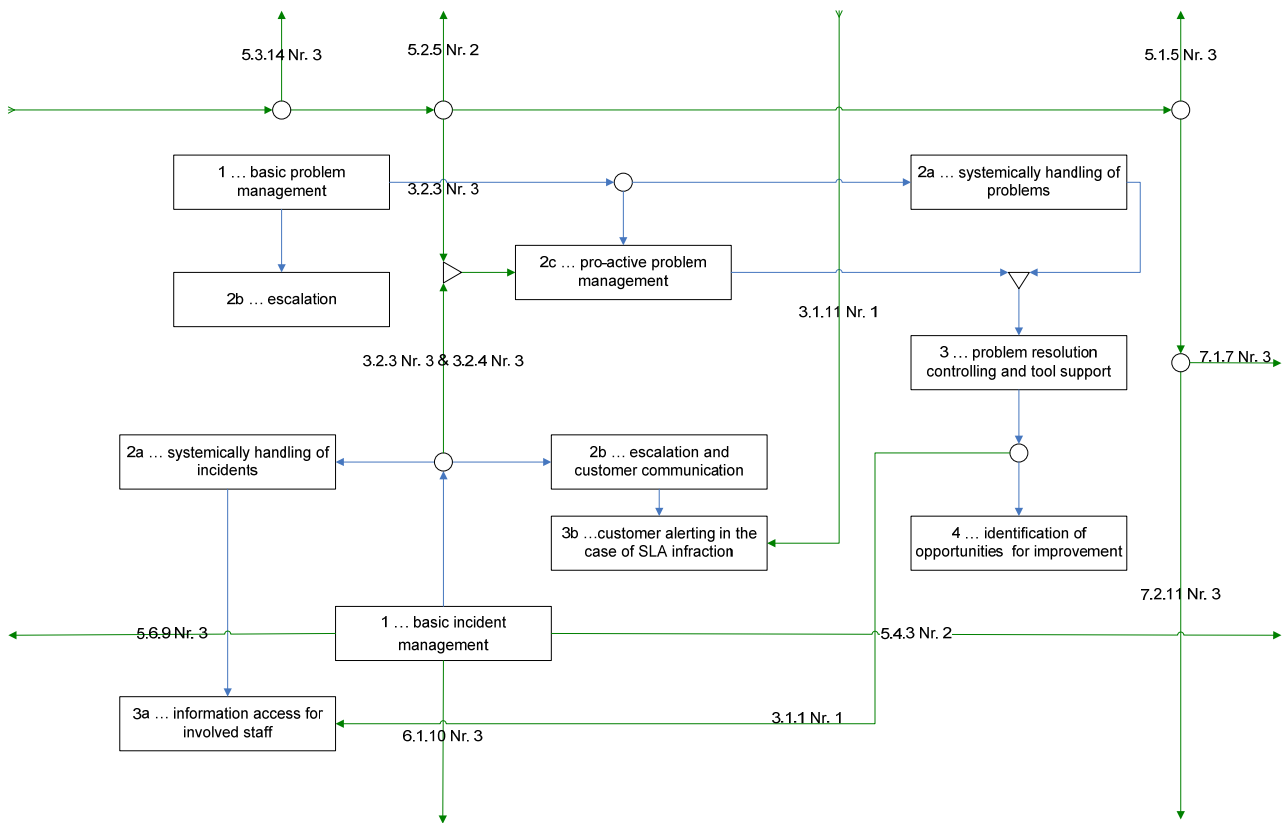
Figure 2. Visualization of dependencies inferred by application of the concept's interpretation modes to the objectives in the industry case for ISO 20000

The lines between the boxes represent dependencies between objectives. They are inferred based on the gathered knowledge by purposive and hierarchical interpretation modes (see Concept). The circular shaped line connector serves as distribution point for one dependency. For example, *basic problem management* serves as precondition for *pro-active problem management* and *systematic handling of problems*. The rectangular shaped line connector denotes an alternative regarding the path that can be taken for implementation (understood as logical or). For example, *problem resolution controlling and tool support* can be implemented by *pro-active problem management* and/or by *systematic handling of problems*. The shown boxes represent groups of dependent objectives that provide relevant capabilities to the IT and its organization. They are identified with domain experts from our cooperation partner based on inferred dependencies and on qualitative reasoning of objectives that create relevant capabilities. For example, the group *systematic handling of problems* comprises the objectives "Procedures shall define the classification of all problems" and „Procedures shall define the resolution of all problems", because classifying problems without acting accordingly would not lead to any benefits. Furthermore, procedures should clearly define how problems are to be resolved whereas the applied resolution procedure depends on the problem's classification.

This approach provides two benefits: *First*, the visualization of complex interdependent object groups is eased due to a reduced number of elements to be drawn. *Second*, more high-level capabilities are defined by creating groups that ease the selection to solve the needs/lacks that are identified in the succeeding stage of the workflow.

The succeeding activity in the proposed workflow is the identification of potential objectives. The cooperation partner has identified the need to improve the resolution processes that are intended to resolve service disruptions and thereby restore the usual service provision (ISO 20000-1, Information technology-Service management). In particular, improvement opportunities were considered that could reduce the cost of resolution processes. The results highlight a lack of support in documenting *known errors*. A *known error* is a service disruption for which the cause is found or a workaround exists. Without documentation of *known errors,* issues cannot be identified as reoccurring for which solutions are on hand. This results in high-resolution times through not using gathered experience. Therefore, the specific need in this case is to reduce

costs by an improved support in documenting *known errors.* In order to reduce costs, an access to a database that embodies all known errors can reduce time required to restore service operations. Summarized, the analysis of specific needs revealed that capabilities to implement a *known error* database are provided by the objective *problem resolution controlling and tool support* (see Figure 2).

The final stage of the workflow is the identification of interdependencies. The implementation of the objective *problem resolution controlling and tool support* (see Figure 2) has several preconditions. They can be fulfilled by other objectives within *problem management*, a sub-process of the *resolution processes* (ISO 20000-1, Information technology-Service management). In order to identify additional objectives – representing required capabilities – the figure is read as follows: Several dependency-paths can be traced by starting the navigation at the identified objective *problem resolution controlling and tool support.* Required objectives are *pro-active problem management* and*/or* *systematic handling of problems.* Again, these objectives require themselves other capabilities for implementation. Thus, dependency-paths can be traced to *basic problem management* and *basic incident management.* They are initial points for a process development within the resolution processes.

The cooperation partner implemented *problem resolution controlling and tool support* in compliance to the identified dependencies. The resolution processes were improved as expected and resolution costs were lowered by 13 % due to an improved processing of known errors (see Figure 3).[3]
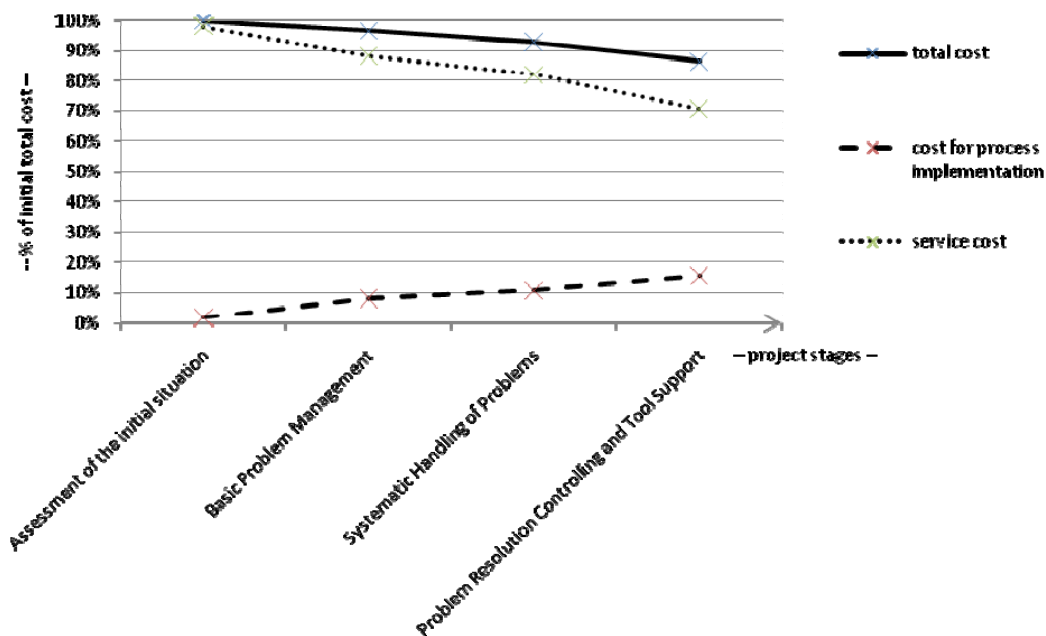

Figure 3. Cost reduction of the resolution processes due to an improved processing of known errors

The costs were measured by activity based costing to analyze changes based on staff-hours required for task accomplishment (Bhimani et al. 2008). The solid line denotes the total cost that is combined of the service cost itself and the cost for process implementation and maintenance. All cost are periodically accounted taking a project with 36-month duration as reference. The project is considered as success, because improvement options conducted lead to a monthly total cost reduction of approximately 13%. This was specifically achieved by the ability of the concept to ease the assessment of measures that yield to desired improvements. Therefore, the cooperation partner valued the concept as capable to support a cost effective implementation of ITSM.

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[3] *Basic incident management was implemented in advance of the validation project. It is part of the initial situation where specific improvement actions of the validation project were initiated. Therefore, basic incident management is not explicitly considered in Figure 3.*

DISCUSSION

The aim of the first design approach of the concept is primarily to allow investigating in the aspect of draft implementing the knowledge provision as relevant key process to cost effective ITSM implementation. Additional insights through continued research as well as the concept's application will help to refine the design.

Furthermore, it seems to be interesting to analyze users' valuation of the approach after several repeated applications. By this, stronger opinions regarding opportunities for improvement can evolve, because users become fully acquainted to the approach.

The industry validation case is a single case study used for validation, whereas general conclusions regarding the validity of the concept are to be drawn with caution. Instead, repeated application is required to provide more insights in ITSM processes as well as the concept's behavior in its intended field of application. Still, the first results indicate the approach to be promising.

CONCLUSIONS

The main contribution of this research in progress is the presentation of a concept proposal that supports a cost effective implementation of ITSM as promoted by Cater-Steel et al. (Cater-Steel et al. 2006). The initial problem was refined by three research questions that further specify requirements of a potential solution.

Since a solution is available to the first question (see Problem Refinement), this contribution focuses on the second and third question, which are the selection of objectives in ITSM frameworks and the consideration of interdependencies for implementation planning. The concept proposed in this paper is based on sharing specific knowledge, whereas the roots of the concept lay in the theory described by Nonaka et al. (Nonaka et al. 1995).

The findings of the conducted validation indicate the concept's fitness for purpose, i.e. the ability to provide required capabilities. The concept's application in an industry use case enabled a cost reduction of the cooperation partner's resolution processes by approximately 13%. This is accomplished by providing an explicit and shared understanding of framework objectives. Therefore, relevant improvement options are identified in less time. Furthermore, the solution ensured an enhanced implementation planning by the identification of objectives' preconditions. As a result, there are only those measures taken that contribute to the attainment of the desired improvement. This tailors a framework based ITSM implementation to organizations' particular needs.

The research methodology supports the collaborative approach that is chosen for the concept's construction. Since several stages are defined, tracing the construction process is eased. This allows involving users who provide valuable feedback to the concept development even though they are less familiar with methodological aspects. As a result, it is possible to focus on the concept's practical application since all stakeholders attended the construction process. Furthermore, the chosen methodology supports frequent assessments of interim results. This assures that corrective measures are quickly identified and effectively applied.

To fulfill the overall aim of this research in progress, the provision of a solution that supports the contribution of information systems to organizations' success, several aspects require further elaboration: Since Espindola et al. have shown that proper framework implementation does not in all cases lead to desired results (Espindola et al. 2009), risk related aspects might require consideration for integration in this concept. In order to judge on this aspect, repeated application of the concept is required providing more information. Moreover, the concept is to be tested across ITSM frameworks to analyze, if the approach is a feasible attempt to partial ITSM framework based implementations in general.

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