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ITSM ProcessGuide – A Longitudinal and Multi-Method Field Study for Real-World DSR Artifact Evaluation

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Abstract. Process guidance supports users to increase their process model understanding, process execution effectiveness as well as efficiency, and process compliance performance. This paper presents a research in progress encompassing our ongoing DSR project on Process Guidance Systems and a field evaluation of the resulting artifact in cooperation with a company. Building on three theory-grounded design principles, a Process Guidance System artifact for the company's IT service ticketing process is developed, deployed and used. Following a multi-method approach, we plan to evaluate the artifact in a longitudinal field study. Thereby, we will not only gather self-reported but also real usage data. This article describes the development of the artifact and discusses an innovative evaluation approach.

Keywords: Process guidance, Longitudinal field study, Multi-method evaluation, Design science research

1 Introduction

Design Science Research (DSR) is about solving a problem by designing and evaluating a possible solution iteratively. In his work, Hevner [1] proposes the three cycle view on DSR in order to address the research problem from (1) a practical, (2) a theoretical, and (3) a design perspective. Within the design process, the solution of a research problem should base on theoretical findings – referred to as kernel theories [2]. Existing (research) knowledge should be leveraged in order to propose a solution to the given problem and to increase the rigor of the solution [1]. In addition, the designed solution should be evaluated to demonstrate its feasibility. The real world can and should be included in this process improving the relevance of the design process [1]. Thus, DSR has the capability to connect researchers and practitioners in order to solve problems from two distinct perspectives: the practical and theoretical perspective [1].

Looking at existing research, one can observe a rare communication of multiple iterations of a design. Moreover, the evaluation in a real-world setting improving the relevance, is done scarcely [3]. In line with Hevner [1] and Peffers et al. [3], we believe DSR should ultimately attempt to solve a problem having practical and theoreti-

cal relevance. Thus, an evaluation in a real-world environment is an important necessity.

In this paper, we present our ongoing DSR project addressing the concept of process guidance. Thereby, the overall DSR project follows the suggestions by Kuechler and Vaishnavi [2] and is divided into three design cycles – each of them having an evaluation stage. The results of the first cycle base on the one hand on theoretical findings already existing in research and on the other hand on a qualitative interview study conducted with experts. In the second cycle, we adapted the design principles and evaluated the resulting artifact by conducting a laboratory experiment having high internal, but only low external validity [4]. While in the first cycle, our case company served as input for the problem analysis and the evaluation of the artifact design, in the second cycle undergraduate and graduate students have been employed to evaluate the validity of our design principles. In the third cycle, a new artifact will be evaluated again by engaging employees of our case company in order to provide feedback on the artifact as proposed by Peffers et al. [3]. Thereby, the evaluation of the third cycle bases on the framework for explanation use by Dhaliwal and Benbasat [5] as theoretical foundation. In addition, the artifact is used to solve existing challenges in the case company.

Summarizing, in this paper we briefly report our research results of the first two cycles and present the planned evaluation of the third cycle in more detail. By reporting our research results and planned activities, the article contributes to the DSR as well as Information Systems (IS) community. First, the article contributes to research since it applies the explanation use framework in a real-world environment for the context of process guidance. To our knowledge, such an application of Dhaliwal and Benbasat's [5] framework in the process guidance context is the first attempt to evaluate the effects of process guidance in a real-world setting. Second, our research aims to develop a design theory [6] for the class of Process Guidance Systems – which is at the moment missing in the current body of knowledge. Third, the presented DSR project serves as an example describing how to conduct a DSR project in a case company in order to improve the relevance of the research. The remainder of the paper is structured as following. First we present our DSR project and shortly summarize the first two cycles. Next, the ITSM ProcessGuide design and development is discussed. Subsequently, we introduce the multi-method evaluation approach before we conclude the paper.

2 The DSR Project Process Guidance

Process guidance supports users in increasing their process model understanding, process execution effectiveness as well as efficiency, and process compliance performance. Users are supported in their process execution by visualizing the process model and the provision of additional information as well as explanations about the process. Building on existing research addressing the concept of guidance in IS research (decisional guidance [7], explanations [8], and decision aids [9]), our research project aims to design a Process Guidance System (PGS) enabling its users to execute

the processes properly and thereby increase their process execution effectiveness and efficiency, process model understanding, and thus their process compliance performance. Overall, our research is guided by the following research question:

Which design principles of process guidance systems increase the users' process compliance performance?

In order to ensure not only high theoretical but also high practical relevance, we conducted the entire research project in collaboration with an industry partner which also serves as our case company. Our industry partner is a global supplier, development, and service partner for customers in various sectors such as automotive, civil aviation, and engineering. In 2013, the case company employed 13.301 employees and had sales of more than 1.7 billion €. The company provided input for various activities in all three cycles and supported us in the evaluation of the research outcomes.

The research project described in this paper follows the DSR methodology as proposed by Kuechler and Vaishnavi [2] and is divided into three cycles. **Fig. 1** depicts the three design cycles with the respective activities within each cycle. While the activities of cycle one and two are already completed, the third cycle is highlighted as the current cycle reported in this paper.

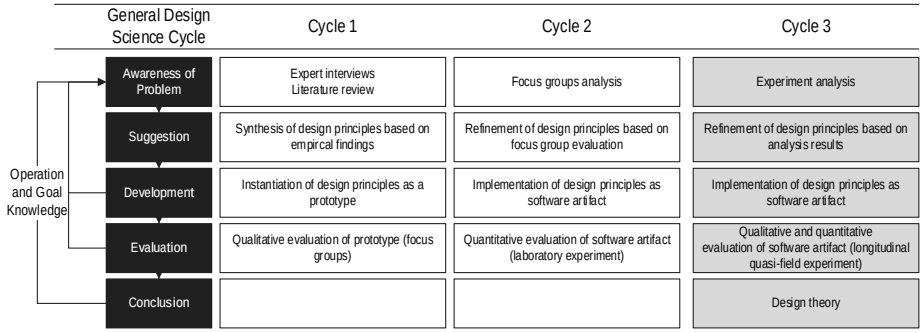


Fig. 1. DSR project's design cycles

In the **first cycle**, we analyzed the current situation in our case company with respect to the execution of document-related processes [10]. The conducted expert interviews revealed that the employees have difficulties in executing processes according to their definitions as well as suffer from a lack of understanding the underlying process models. In particular, one of the interviewees requested some *"...guidance, claiming the system which needs to be used in a particular business process step"* [10, p. 497]. Such guidance should aim to support the users in their process execution. Building on an extensive literature review on guidance in IS research [11], we propose the concept of process guidance to support users' in increasing their process model understanding,process execution effectiveness as well as efficiency, and process compliance performance. Thereby, we identified three theory-grounded design principles for PGS identified within existing guidance literature in IS research [7–9]. The design principles have been qualitatively evaluated in a series of expert inter-

views being employees of the case company [12]. **Table 1** lists the three design principles of PGS.

The **second cycle** mainly aimed at the adaption of the first cycle's results in order to refine the design principles. For the evaluation of the design principles, we realized a PGS prototype by identifying design decisions being appropriate to fulfill the design principles. Therefore, we again intensively studied existing literature. Since the evaluation is conducted as a laboratory experiment with 92 undergraduate and 28 graduate students from a German public university, we adapted the context of the prototype to the ticketing process of our case company. To apply the concept of process guidance in a quasi-real case situation, we developed simplified versions of the applications used within the case company's ticketing process for the experiment. In order to prepare the students, the experiment participants received an introduction session to the company's ticketing process by an employee of the case company before the experiment. Within the experiment, the participants had to execute eight processes. Thereby, some of the participants received guidance, while others did not. In total, the laboratory experiment revealed that in particular novices can benefit from additional explanations since they have only little process knowledge. Providing additional explanations supports novices to understand the process model and increase their process execution effectiveness and efficiency. In addition, the visualization (DP2) of process guidance can exploit its highest potential when being combined with the provision of explanations (DP3).

Table 1. Design Principles of Process Guidance Systems

DP1	PGS should provide user-requested, predefined and suggestive process guidance based on the monitoring and the analysis of the user's business process context
DP2	PGS should visualize the process models as lean and precise in the users' working environment.
DP3	PGS should provide detailed information about the process model as well as the process tasks and required resources to the user.

While the design principles have been evaluated in cycle one qualitatively by expert interviews and in cycle two quantitatively as a laboratory experiment, **cycle three** targets the evaluation in a real-world setting as a quasi-field experiment. Since the main goal of this article is to report our planned research activities in order to evaluate the concept of process guidance in a longitudinal field study, the remainder of the paper describes the PGS implementation in our case company and the ongoing evaluation.

3 The Design Cycle Three Artefact: ITSM ProcessGuide

For implementing the PGS in our case company, we cooperated with its Information Technology Service Management (ITSM) team. The ITSM team follows the ITIL framework to structure their offered IT services. In total, there are four different types of tickets defined by the ITSM team: Service Request, Incident, Non-Standard De-

mand, and Request for Change. For each ticket type there is a dedicated ticketing process and all of the processes are implemented in a ticketing application. Basically, all users are affected by these ticketing processes in order to request IT services. Users from the business side are only requesting services being the starting point of the ticketing processes. Users of the IT departments are executing the processes in order to fulfill the requested services. Although the ticketing processes are completely specified by the ITSM team and there exists a tool to support the execution of the ticketing processes, there are open issues. The ITSM team reports a lack of users' understanding of the ticketing processes and difficulties in the execution of these processes. Thus, we agreed to develop a PGS to support these ticketing processes.

In a first workshop with the ITSM team, the first author presented the process guidance concept, the three design principles and the existing PGS prototype realized in cycle one and two. The ITSM team presented their ticketing processes and the ticketing tool. The four ticketing processes are specified in detail by the case company including all mandatory and optional process steps. There are two different clients available for the ticketing tool, a rich client and a web client. The rich client is primarily used in the European sites of the case company and the web client is currently rolled out in the US sites of the case company. In future, all sites should use the web client of the tool.

After the clarification of the context, we developed specifications for the implementation of the PGS by discussing each design principle. In order to implement **DP1**, we decided to add a button into the ticketing tool which opens the PGS and passes the current users' process context. The current process context is determined by the type of ticket and the current state of the ticket. These information are then used to visualize the process guidance to the user (**DP2**). In order to keep the process guidance lean and precise for the given complex ticketing processes, we decided to provide only the next process steps for the current process state to the user. Each process state includes various mandatory and optional steps. For all the steps, the PGS provides detailed information in the form of explanations on how to execute the particular process step (**DP3**). The explanations can be expanded and collapsed in order to prevent information overload of the users. Within the explanations, the ITSM team can describe how to execute the specific process action and also provide links to other applications or websites. Considering the two different client versions, we decided to implement the PGS as a web-based application. This application can be opened in both versions of the client in the form of a browser window which is included in the users' work environment (**DP2**).

After implementing the first version, we presented and discussed the PGS in a second workshop with the ITSM team. **Fig. 2** depicts a screenshot of the resulting PGS (foreground) with the rich client of the ticketing tool (background). Based on the discussion within the workshop, we added a simplified and aggregated process model diagram to the PGS. Furthermore, we improved the layout and look and feel of the developed system. We named the resulting application ITSM ProcessGuide. In addition to the process guidance features of the ITSM ProcessGuide, we also added functionalities required for the evaluation of the system. Each time the ITSM ProcessGuide is used, it logs the following information: anonymized user name, current

ticket type and state, expanding of the process steps, and if the user is clicking on one of the provided links. We also added a feedback functionality for the user. Randomly, the tool invites the user to provide feedback (highlighted as "Evaluation" in **Fig. 2**). If the user clicks on the link, the user is asked to answer questions addressing the three design principles.

For the maintenance of ITSM ProcessGuide, we developed a web-based backend to the PGS. In this backend, the ITSM team can maintain the process states, steps and explanations. Another use case of ITSM ProcessGuide is the easy and quick possibility to communicate changes of the ticketing processes. The ITSM team can easily change the explanations of the process steps in the backend and announce the changes to the employees. Then the users can see the changes when using the ITSM ProcessGuide.

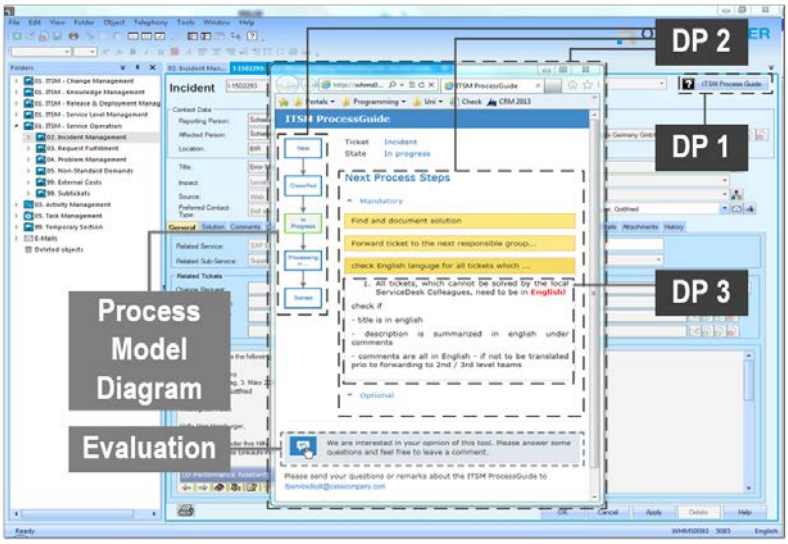


Fig. 2. ITSM ProcessGuide with highlighted Design Principles

4 Evaluation Methodology

Due to the complexity of the processes and the real-world environment, it is not feasible to measure the execution of each process instance of every user. Such an evaluation requires a controlled environment such as in a laboratory experiment. We already evaluated the effects of PGS in a controlled laboratory experiment. In order to evaluate the effects of the ITSM ProcessGuide in a real-world setting, we therefore decided to follow a multi-method approach.

First, adapting the framework on explanation use by Dhaliwal and Benbasat [5] we developed a survey. In a longitudinal study we intend to invite approximately 300 IT users of the case company to complete the survey at two points of time: immediately before and three months after the ITSM ProcessGuide introduction. In order to introduce the ITSM ProcessGuide to the case company's IT users the ITSM team

distributed descriptions and a video explaining how to use the ITSM ProcessGuide. At the moment, the first survey is running. We decided to conduct a longitudinal survey approach to evaluate the validity and sustainability of our design principles. Moreover, we assess the effects of process guidance on users' process model understanding, perceptions, process execution effectiveness as well as efficiency, and their process compliance performance. As a side effect, we also evaluate the proposed model by Dhaliwal and Benbasat [5] for the process guidance context in a real-world environment.

Second, in addition to the survey-based evaluation we collect direct user feedback about the usefulness of our design principles for PGS. We translated the design principle descriptions into questions about their usefulness and the user is asked to rate them on a 7-point Likert scale. As previously explained, the possibility to provide feedback is provided automatically and randomly by the system and all users can provide their feedback multiple times. In doing so, we intend to extract the users' perceptions about the usefulness of the design principles.

As the **third** evaluation approach we decided to conduct focus group workshops with the IT users of the case company. Within these workshops we will discuss and evaluate the ITSM ProcessGuide based on the feedback from the workshop participant. We have decided to add this qualitative approach in order to increase the validity of the overall evaluation and to get more detailed feedback.

For all the evaluations the data are stored anonymously. Due to the system is logging the usage data we have the possibility to not only gather self-reported data, but also real usage data. In doing so, we are able to increase the validity and reliability of our first and second evaluation approach. Moreover, since nearly half of the IT users are novices with respect to the ticketing processes (employees of the US sites) and the other half are already familiar with the ticketing processes (employees of the European sites), we also will have the possibility of a within group analysis. This will enable us to evaluate the effects of process guidance on novice and expert users.

5 Conclusion

This paper reports on our ongoing DSR research project on process guidance and introduces the overall research project and our case company. We already evaluated our design principles in a laboratory experiment with high internal validity. Following the call by Peffers et al. [3], the focus of this paper is the presentation of the planned evaluation of the design principles in a real-world environment. Building on theory-grounded design principles we implemented a PGS named ITSM ProcessGuide for the case company's ticketing process. Using the ITSM ProcessGuide we will evaluate the process guidance concept in a longitudinal field study by applying a multi-method approach. In doing so, we contribute to research and practice. First, we apply the existing framework by Dhaliwal and Benbasat [5] in a real-world environment in the context of process guidance and demonstrate its validity. Second, as we intend to develop a design theory for PGS, we need to evaluate our design principles. Thus, this real-world evaluation will increase the external validity of the design theory. Conse-

quently, our design principles will result in a new design theory for PGS. Third, our research can serve as an example for other researchers on how to apply the DSR methodology in cooperation with an industry partner. The ITSM ProcessGuide is also implemented in order to solve the case company's challenges regarding the ticketing processes. Fourth, the ITSM ProcessGuide can inspire other companies to develop their own PGS to support their users in executing processes. We are aware that our research has some limitations. First of all, the real-world evaluation itself comes with several possible issues. The complex environment cannot not be fully controlled by the researcher. Another possible limitation is the selected context of the ticketing process. We decided for this context due to the complexity of the processes and the involvement of multiple users within the processes instances. However, future research should apply the concept of process guidance in different contexts in order to show the intended effects. As next steps, we will complete respectively execute the first and second survey and conduct the focus group workshops in order to evaluate our design principles of PGS and assess the effects of PGS on user's process compliance performance. Subsequently, we plan to summarize the findings of all DSR cycles in a first version of a design theory for PGS.

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