Journaling the Design Science Research Process. Transparency About the Making of Design Knowledge

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Abstract. Design Science Research (DSR) is a highly context-dependent and iterative process. Design processes in DSR projects represent the actual strategy and execution of design knowledge inquiry and are typically unique. However, details of the actual design process are often lost as there is a lack of transparency in published DSR projects. In this research in progress paper, we present the idea of "journaling" the DSR process. We introduce the concept, showcase it with a conceptual framework, present practical applications, discuss implications and outline future research.

Keywords: Design Science Research · Process Journal · Open Science

1 Introduction

Design Science Research (DSR) is an established field for developing innovative solutions to real-world problems [2]. In recent years, many methodological contributions have increased the maturity of the DSR paradigm, including guidelines on how to conduct DSR [10], templates on how to plan and document DSR projects [4], as well as the conceptualization of the design process, such as the process suggested by Peffers et al. [18].

One major leap in the development of DSR methodology is the understanding that DSR is a highly context-dependent and iterative process [2]. While phased models provide important guidance on what kind of activities comprise a DSR project and how they would relate to one another, it is well understood today that every single DSR project follows its own process on the instance level, and it actually should do, taking into account both specific opportunity and constraints of design. Extant research has emphasized the evolutionary nature of DSR [14]. In an iterative manner DSR seeks to understand and conceptualize the problem space, analyze the solution space and, over the course of multiple iterations, would gradually develop an understanding of both problem and solution space, while also developing and evaluating design knowledge [22]. Contributions to the evaluation of DSR have developed the idea of concurrent evaluation [20] as well

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as design and evaluation sprints [21]. Vom Brocke, Winter, Hevner, and Maedche have used the analogy of DSR as a "journey through space and time" in order to emphasize and further conceptualize the importance of knowledge accumulation and evolution in DSR [2].

When publishing DSR, it is difficult to account for the evolutionary and accumulative nature of design research. One very obvious reason is the lack of space to report on the process in detail. Often, the "making of" a DSR project and the "making of" the design knowledge presented in a paper gets rather lost in a brief account of the research methodology of the peer. This is problematic, as the design process is the actual strategy of inquiry used to arrive at the design knowledge presented in a paper, so – according to the goal of rigor – this process should be transparent to fellow researchers [13].

Also the discourse on research transparency calls for openness regarding the research process [7]. Open Science practices stress the importance of making the research process and its results more transparent and verifiable. For example, the recently proposed Transparency and Openness Promotion (TOP) guidelines are being increasingly adopted by journals and organizations [16]. A recent editorial in Management Information Systems Quarterly [5] discusses research transparency in IS and calls for contributions taking into account the nature of respective IS sub-communities. In fact, the extent to which a study establishes transparency about the specific design process is also described as an important quality criterion for DSR [2].

In this research in progress paper, we present the idea of keeping a journal of the DSR project to increase transparency and on this basis enable a fruitful discourse in DSR. In other disciplines methods of journaling or keeping a diary are well established [11], however DSR, today, lacks standards and guidelines on how to keep and present a journal of this kind. We conceptualize journaling the DSR process, showcase forms such journals may take, and discuss avenues for further research.

2 Related Work

The processes of conducting DSR have been studied extensively in the DSR literature, such as Nunamaker et al., Walls et al., Hevner, Kuechler & Vaishnavi, and Peffers et al. [10, 12, 17, 18, 23]. Furthermore, there exists tool support for researchers to document and structure such DSR processes, for example, developed in the collaborative DSR research project MyDesignProcess.com [3].

More recently, the discussion on the DSR process has very much focused on the evolutionary and accumulative nature of DSR and more iterative way of designing and evaluating design artifacts. Sonnenberg and vom Brocke [20], for instance, have introduced the idea of concurrent evaluation and design of intermediate artifacts; Abraham et al. argue in favor of failing "early and often" [1]. Winter and Albani, building on Hevner's "three-cycle view of DSR" [9] and referring to ADR [19], develop a one-cycle view of DSR, where every single iteration of the cycle allows for reshaping the DSR knowledge base. Vom Brocke et al. have used the metaphor of DSR as a journey through space and time, and discussed various specific directions this journey can take.

Drawing from the current discourse, we know that DSR does not follow strictly a standardized reference process, instead the activities taken need to be individually

decided upon. Hence, we believe it is important to document the entire research process in order to make it accessible for fellow researchers. Indeed, we value the transparency of the research process as a key quality criterion in DSR, and put forward the concept of journaling the DSR process to support such transparency.

3 A Conceptual Framework for Journaling the Design Science Research Process

We use the term "research process" to refer in general to the set of activities conducted in order to fulfill a research objective. Thus, journaling the research process means taking notes concurrently to describe the performed research process. The key characteristic of journaling is the concurrency with which the process is documented. Unlike ex post descriptions, journaling the research process specifically means taking notes on the process as it unfolds, like keeping a log file or a personal diary.

Keeping a journal can relate to different aspects of the DSR process, and we outline such aspects in Fig. 1. DSR has been differentiated on two layers, comprising design processing and design theorizing [4], so that beyond documenting the activities conducted in the design process, a journal could also take notes reflecting on ideas for potential theoretical contributions along this process [11]. Obviously, in the design processing layer, the journal can relate to the phases identified for DSR processes, such as proposed by [18]. Researchers have also suggested one-page representation for DSR, such as [6] and [4], so—before going into details of documenting single DSR activities—a research journal might also include notes on such consideration referring to the overall research design. Hevner and Gregor have presented guidelines on how to publish DSR research [8], so that in preparation for publishing a DSR study specific aspects (such as appropriate ways to structure the presentation of the project) may be supported by the journal.

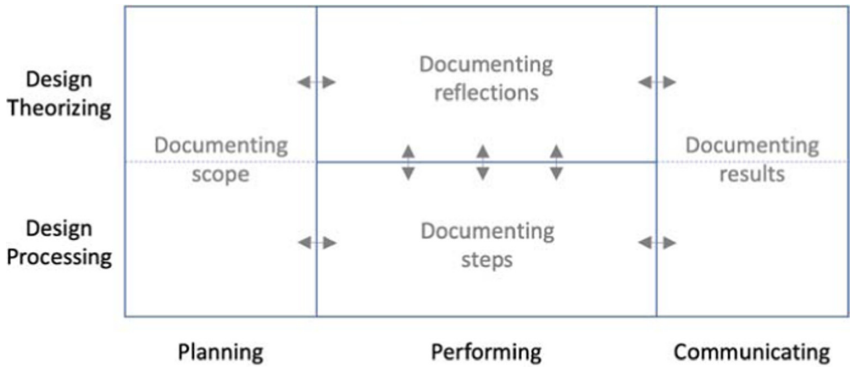

Fig. 1. DSR journaling conceptual framework

The framework presented in Fig. 1 structures potential aspects of a DSR journal according to two dimensions: the progression of a DSR project—planning, performing,

and communicating—and the level it refers to, the processing or theorizing level. When planning a DSR project, journaling such items as problem space and solution spaces plays an important role, for example with regard to considerations on the overall process, key concepts, as well as input knowledge and output knowledge. When performing the process, more detailed notes on design activities, such as interviews or sketches of potential solution artifacts, may be noted. To support theorizing, memos could be taken that conceptualize, group, and link up observations. Communicating results, checking for completeness, making supplementary remarks, and providing evidence and reasoning for design decisions are some examples of features that would be of interest for the journal.

4 Practical Examples of Journaling the Design Science Research Process

To illustrate the idea of journaling a DSR process further, we refer to practical example of journals from exemplary DSR projects. In very simple terms, a journal could be kept using a researcher's conventional office environment, so comprising hand-written notes as well as notes using diverse office products. While the flexibility of using such tools is positive, it is also a challenge organizing and structuring the various forms of notes. Such shortcomings are addressed by distinct tools that have been designed for the purpose of documenting the research process, such as the tool MyDesignProess.com [3]. In order to demonstrate the idea of journaling the design process, we used the tool MyDesignProcess.com and reconstructed a journal for a DSR project that has already been published [15]. Figure 2 illustrates the researcher view of a DSR project journal, and the full journal can be accessed via a publicly available link[1].

In the planning phase, an overview of the DSR project is captured in the Design Canvas, available in the project navigation, and mainly filled to organize and structure the project. The performing aspect of the project is expressed through the different activities executed and captured during the project. Such activities can also contain sub-activities in order to structure and organize the process of a DSR project [3]. The complete journal of a DSR project, or only parts of it, can be made publicly accessible and communicated to the community.

[1] https://mydesignprocess.com/public/191/ Further journals of projects can be accessed here https://mydesignprocess.com/#projects-section.

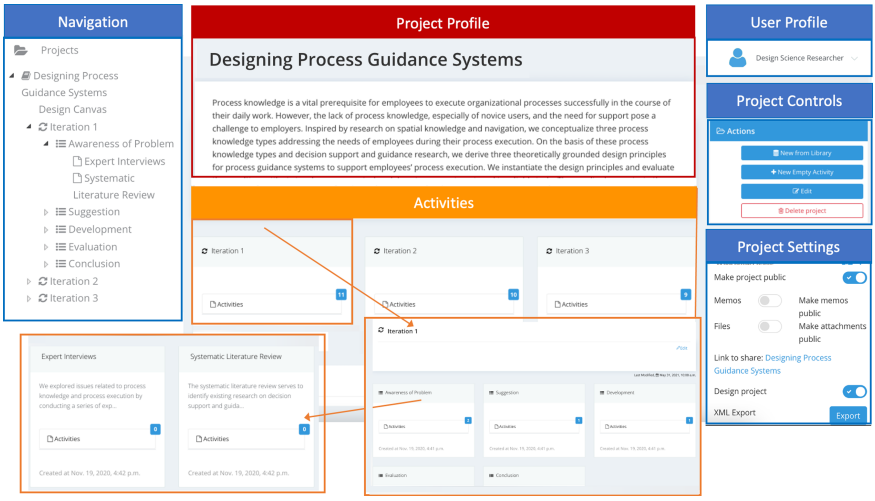

Fig. 2. Example of a DSR journal

5 Implications and Future Research

Journaling the research process makes important contributions to DSR. First, it supports DSR researchers in better planning, communicating, and reflecting upon their research activities. Second, journaling allows for more rigor in DSR, as the research process is highly situational, and all design knowledge derived is only the result of a specific design process. So, disclosing the specific DSR process should be a key quality criterion in DSR. Third, journaling the DSR process makes an important contribution to the discourse of open science and research transparency in DSR [5, 16]. Such transparency will allow for more re-use of design knowledge and increased discourse on design processes in DSR.

Future research will advance our understanding of journaling DSR processes. We intend to undertake further iterations in refining our problem understanding and solution design, while also advancing our knowledge of how journaling of this kind can be applied to support DSR researchers in their practice.

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