

An Extension of PlanDigital: Software Support for Collaborative Idea Management in SMEs

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Abstract. Two promising approaches for SMEs to encounter prevalent Digital Transformation challenges are (1) IT-based Idea Management support and (2) the integration of external supporters. This paper is an extension of a prototype, ultimately aiming to support Idea Management in SMEs through collaboration with external support units. The prototype addresses a practice-inspired problem by instantiating previously formulated design knowledge. Nine design-accompanying small-scale projects with SMEs, three focus groups, and three semi-structured interviews proved the prototype’s usefulness to facilitate Idea Management and, thereby, Digital Transformation in SMEs.

Keywords: Software Engineering · Digital Transformation · Idea Management · Small and Medium-sized Enterprise · Collaboration

1 Motivation

Driven by rapid technological developments, Digital Transformation (DT) is an omnipresent theme for organizations and a predictor of success in many facets [10]. DT as a process describes the continuous implementation of digital innovation ideas in organizations [8]. This process poses major challenges for companies, in particular though for small and medium-sized enterprises (SMEs). Among others, SMEs seem overwhelmed with selecting and implementing the ‘right’ ideas [4]. Two related themes that promise improvement of SMEs’ situation are Idea Management (IM) and external support. First, IM supports an effective identification of promising digital innovation ideas [2]. Second, so-called External Support Units (SUs) support IM in SMEs and help bridge prevalent limitations, such as potential competency gaps, to ultimately leverage DT success [1]. However, it turns out that SMEs often struggle with implementing IM properly and, thereby, miss out on the advantages that come along with IM [11]. Similarly, SMEs often miss the opportunity to collaborate with external support units, despite what their involvement seems to promise [9].

In the light of these problem areas, this paper presents *a prototype that aims to support IM for SMEs through collaboration with SUs*. The prototype integrates

dedicated features that allow SUs to provide effective IM support in collaborative settings with SMEs. This prototype is an extension of an earlier prototype known as *PlanDigital* by Hermann et al. [5].

2 Artifact Design

2.1 Version History and Implementation Choices

Throughout about two and a half years (from 10/2019 until 03/2022), three distinct versions of *PlanDigital*, i.e., *easily-document*, *pretty-UI*, and *better-collaborate*, have been implemented (see Figure 1). All versions have been implemented and evaluated in the context of the *Mittelstand 4.0 Kompetenzzentrum Lingen*, an initiative that qualifies as a publicly-funded SUs. In what follows, key differences between these three versions and important design decisions are outlined. The design of *easily-document* was initiated with the objective to support documentation activities in on-site workshops with SMEs. In those workshops, the documentation of an SME’s DT goals, business model, or environmental aspects has commonly preceded core IM activities. To that end, *easily-document*’s purpose was to prepare IM in SMEs by documenting these aspects digitally. The decisions for technical implementation details were mainly aimed at the rapid delivery of a usable prototype to support documentation in ongoing projects. More specifically, the *Python* web framework *Django* has been chosen, which is known to be especially helpful for rapid prototyping. To further speed up development time, *easily-document* relies on the template-system that *Django* provides by default. More details are depicted in [5]. In summary, *easily-document* can be considered a first working alpha-version of *PlanDigital* with an apparent focus on preparatory IM- and SME-related features.

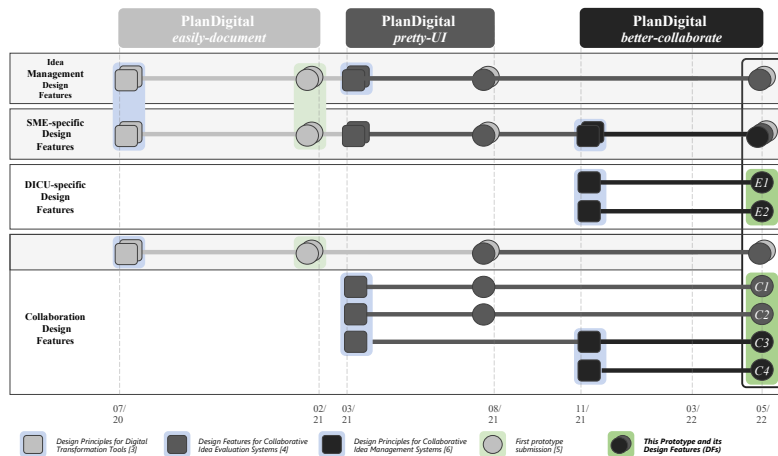


Fig. 1. Version History of *PlanDigital*.

The motivation for *pretty-UI* was to create a stable version that can be used in field environments [7]. Building upon *easily-document*, the objective was to rework its frontend and add features that yet remained in the backlog. To get to a modern and responsive frontend, the *Javascript* library *React* extends the technology stack of *PlanDigital*. *React* enables the decoupling of the core *Django* application from its frontend and allows to design state-of-the-art User Interfaces. Characterizing for *pretty-UI* is a new frontend and an emergent focus on collaboration support for SMEs and SUs. Inspired by feedback from evaluation activities, *better-collaborate* was born. The focus of *better-collaborate* has been to equip *PlanDigital* with a comprehensive library of collaboration features. Attention has also been paid to “supporting the supporters” themselves, i.e., to also improve the daily work of SUs. In addition, the technology stack was slightly adjusted. The database is implemented using *PostgreSQL*, and the backend is still implemented with *Django*. The communication between the database and the backend is enabled through the *Django REST framework*. The frontend is served via *React* and *NextJS*. The web server for handling and routing user requests is *Nginx*. Currently, *better-collaborate* is hosted at a commercial cloud service provider to allow for rapid scaling of computing resources on demand. The chosen technology stack accounts for the potential need to integrate the prototype into existing IT landscapes. So, the implementation of *better-collaborate* can be augmented with suitable APIs to adjacent systems of SMEs.

2.2 Features for External Support Units and Collaboration

The versions *easily-document* and *pretty-UI* have had a stronger focus on IM-related and SME-specific features (see Figure 1). In turn, features that address the needs of SU staff and their collaboration with SME remained underrepresented. Hence, *better-collaborate*, the latest version of *PlanDigital*, aims to close the gaps that exist in *easily-document* and *pretty-UI*. In what follows, four newly added collaboration and two SU-related Design Features (DFs) are presented.

SUs often are a consortium of multiple institutions that may differ regarding, e.g., their focus area or service portfolio. To model this structure and present this information to SMEs, *better-collaborate* implements a *Support Unit Management* (DF_{E1}) component. This feature allows representatives of a SU to manage the following meta-information: staff information, competency areas, focused sectors, and offered services. SUs standard work mode is to collaborate on-site with SMEs in the context of IM activities. For those, *PlanDigital* provides the users with selected tools [5]. However, only providing those tools disregards the observed need of SU staff to take notes beyond the tool’s application, e.g., for administrative purposes. Against this backdrop, *better-collaborate* integrates a *Personalized Workspace* with basic text processing features for staff of SUs (DF_{E2}).

On-site collaborations usually involve the application of various tools, e.g., the business model canvas, in a predefined order. To transfer this idea to (virtual) collaboration settings that are carried out with *better-collaborate*, a so-called IM *Wizard Mode* (DF_{C1}) has been implemented (see Figure 2). The wizard is configurable, i.e., the user is prompted to define a desired selection and order of

tools that are available in *better-collaborate*, such as the *Business Model Canvas* or the *Technology Documentation Space* (see also [5]). Afterward, the mode directs its users through the tools' applications as configured. If desired, the tools of *better-collaborate* can also be applied in a *Canvas Mode* mode. That default mode arranges available tools on a dashboard at a glance. In addition to those planned on-site and virtual interventions of SUs, *better-collaborate* is supposed to be used in a self-directed manner by SME staff. At times, though, SMEs might deem it necessary to reach out to external supporters [4]. Thus, *better-collaborate* features a built-in *Support Request* component (DF_{C3}). That is, the system allows for SMEs to post support requests. The support request will appear as a notification and be sent via e-mail to associated SU staff.

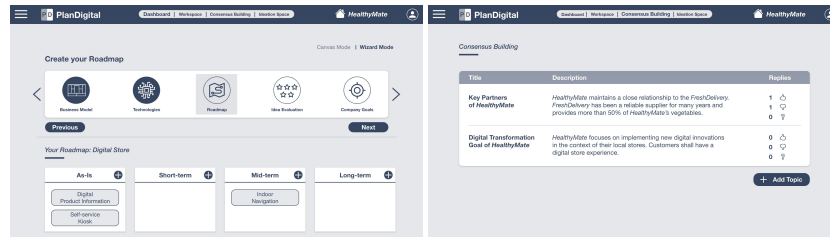


Fig. 2. Wizard Mode (DF_{C1}) and Consensus Building (DF_{C4}) of PlanDigital.¹

Associated SU staff is intended to reach out to the requesting SME proactively [4]. To minimize media disruptions and have the parties collaborate in the system environment of *better-collaborate*, functionality to provide *Virtual Assistance* (DF_{C2}) has been integrated. The virtual assistant manifests as an asynchronous chat. Thereby, SU staff is equipped with a feature to provide IM support for SMEs in a virtual setting, which has become more important with the onset of the COVID-19 pandemic. Having *better-collaborate* integrate communication features, the general possibility for SMEs and SUs to collaborate virtually is facilitated. Their virtual collaboration, however, is characterized by organization-spanning boundaries from the outset. These may manifest in SMEs distrusting SUs or doubting the general advantage of outsider support [9]. Indeed, SUs are required to truly understand an SME's business in order to provide good quality support [1]. To that end, *better-collaborate* implements a *Consensus Building* feature (DF_{C4}) that is meant for SU to prove and improve their understanding of SMEs (see Figure 2). In particular, SU staff would post presumption, e.g., about the SME's business model, which can be responded to and evaluated by SME staff until a consensus has been reached.

¹ Further visual interfaces are available here: <https://go.wwu.de/8zjb5>.

3 Significance to Practice & Research

IM and the integration of SUs are meaningful means for supporting SMEs in their DT. Yet, practice lacks IT tools that facilitate externally supported IM activities. *PlanDigital* provides a theoretically grounded solution for a practice-inspired problem. The proposed prototype offers a digital IM environment for SMEs and SUs that facilitates collaborations between these actors. Its feature set (see Section 2.2 and [5]) enables more efficient IM in SMEs, supports SU in their daily work, and allows governmental authorities to implement more effective DT initiatives for SMEs. The IT tool mirrors real-world workshop settings in on-site and virtual scenarios, which proved equally important throughout projects in the COVID-19 pandemic. Thus, the tool offers different pathways (e.g., wizard vs. canvas) and accounts for critical success factors of external support (e.g., Consensus Building). Last but not least, the prototype is supposed to inform and inspire software vendors to pay attention to the presented features.

Although DT in SMEs is a vivid research realm, there are only a few propositions with respect to IT support for externally supported IM. Such IT support requires a plethora of concepts from adjacent research realms to be integrated and harmonized into one system. The final version of *PlanDigital*, i.e., *better-collaborate*, marks the end of a complex design science research journey, resulting in different kinds of design knowledge that has been evaluated, among others, with the different versions of *PlanDigital* (see Section 2.1). The implemented IT tool is the instantiation of this prior formulated knowledge. Scholars may use the prototype to gain further knowledge about IM as well as DT in SMEs. Also, data that is collected in real-world applications of the prototype enables future research efforts. For instance, scholars could explore the frequency of certain ideas and digital technology usage within an industry [5,3]. The version history can be considered a blueprint of how a real-world business problem can be broken down into individual sub-problems. These sub-problems are each tackled successively, providing respective solution designs, which are then instantiated as prototypes.

4 Evaluation

Several design-accompanied evaluations have been performed along the version history (see Figure 1). In this respect, ten externally supported digital innovation projects with SMEs have provided the context for the prototype development. These projects continuously informed the alignment of the software design with the practical needs of SMEs and SUs. The first prototype (*easily-document*) was presented at the *DESRIST 2021* and evaluated based on an initial focus group discussion and (laboratory) testing sessions (cf. [5]). While this was primarily done to confirm *easily-document* as a proof-of-concept, later evaluations aimed at refining the prototype's User Experience and its feature set. *pretty-UI* was mainly informed by two focus group discussions with scholars and practitioners. These focus groups, for instance, helped to refine the two working modes, i.e., canvas view and IM wizard. The second prototype was additionally tested

by the focal research team to document bugs and test former conceptualized features. Due to technical issues and the research team’s aspiration for a more lean software tool, the prototype was relaunched as *better-collaborate* (see Section 2.1). To evaluate *better-collaborate*, three semi-structured interviews, each with two staff members of another SU, have been conducted. The interviewees helped to refine and finalize the feature set, which now also comprises dedicated features to support SUs and their intended collaboration with SMEs. In future workshops, the prototype is planned to be tested with the complete feature set, including IM, SME, SU, and collaboration features. Also, we consider integrating user feedback forms into the prototype. Based on collected feedback, further design knowledge can be aggregated from the field environment. By disseminating the prototype to universities and other research institutes that commonly support SMEs in their DT, we enable other research teams to derive additional design knowledge. Ultimately, the refined prototype supports DT in SMEs by facilitating collaborative IM through the involvement of SU.

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