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DESIGN AND EVALUATING A TOOL FOR CONTINUOUSLY ASSESSING AND IMPROVING AGILE PRACTICES FOR INCREASED ORGANIZATIONAL AGILITY

Full Research Paper

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Abstract

Many organizations struggle to measure, control, and manage agility in a manner of continuous improvement. Therefore, we draw on Design Science Research to develop and test a tool for Continuously Assessing and Improving Agile Practices (CAIAP). CAIAP helps agile practitioners to monitor the alignment of "as is" agile practices on individual, team levels with the overall agile strategy of the organization. To develop CAIAP, we first empirically gather requirements, draw on the ICAP framework to base the tool development on a solid conceptual and theoretical basis. CAIAP helps agile practitioners to constantly monitor their agile practices on individual and team levels and to identify areas for improvement to gain greater organizational agility. To researchers, CAIAP helps to make the unit of analysis of agile work explainable, predictable and helps researchers to guide their own empirical research as well as serve as a basis for designing further tool support.

Keywords: Agile Practice Improvement, Design Science Research, Agility, ICAP Framework, Organizational Agility

1 Introduction

Today, organizations operate in a turbulent business environment, in which time is a crucial resource (Hart 1995; Lee and Xia 2010) and globalized competition is constantly increasing (Breu et al. 2002). Simultaneously, novel digital technologies (Kumar and Stylianou 2014) with ubiquitous data, unlimited connectivity, and massive processing power pose both an opportunity and threat to existing businesses as on the one hand they offer the possibility to solve customer problems in new ways through novel (potentially disruptive) business models, which on the other hand pressurizes organizations to respond even more agile to environmental change (Cappelli and Tavis 2018; Roberts and Grover 2012). Thus, achieving agility has become a factor that determines the success and failure of companies (Overby et al. 2006). Although eight out of ten companies state that they are using agile methods, many organizations fail to reap to full potential of agile practices (Denning 2019).

Against the backdrop of these developments, companies face the necessity to constantly monitor, measure, and control their level of agility to either keep it stable in a sustainable manner of business continuity or to (continuously) improve it. In recent years, this has led to several tools for measuring agility, including the ability to compare oneself to competitors and understand their agility (Adalı et al. 2016). However, this was mainly driven by practice such as consulting companies. Although, several authors have been calling for more research in this vein (Overby et al. 2006; Tallon et al. 2019), in literature, little attention has been paid to the development of tool support that helps to master the phenomenon organizational agility (Adalı et al. 2016). Up to date there are no empirical grounded findings in the form of rigorously derived and instantiated design knowledge (Hamad and Yozgat 2017; Heeager and Nielsen 2017; Kakar 2017), on how to design tool support for helping teams in

continuously assessing and improving their agile practices. Existing frameworks and tools for organizing the shift towards improved agile performance, fall short in providing support on a longitudinal and continuous basis (Rigby et al. 2018). Also, the extant practice-related methods and tools focus only on statically evaluating the status quo rather than dynamically showing the differences in the development across teams over time. Furthermore, these solutions usually focus on a specific domains and agile method with underlying rigid frameworks. In reality, however, agile methods are adapted by teams to the respective work contexts and to the time-dependent externalities. Selecting several agile practices out of different agile methods. Therefore, we argue that extant solutions originating from practice and science are only restrictively applicable to obtain a dynamic and holistic picture of the ongoing and required organizational change towards the agile organization. Hence, we aim to answer the following research question (RQ):

RQ: How does a tool for supporting the continuous assessment and improvement of agile practices need to be designed and instantiated to assist the overall organizational agility?

To answer this RQ, we draw on an organizational learning perspective driven by the ICAP framework (Chi and Wylie 2014)) that views teams more than a collection of individuals. More specifically, team learning is achieved by individual learning, which eventually leads to a common understanding within teams, which is further institutionalized through organizational artifacts within the organization (Crossan et al. 1999; Fiol and Lyles 1985; Shrivastava 1983). However, such an artifact would support agile practitioners to identify enhancement areas and take appropriate actions to continuously improve their agile practices. Thus, in this paper, we are trying to close this gap by developing a tool (called CAIAP = Continuously Assessing and Improving Agile Practices) that enables individual team member to (a) assess their current state of organizational agility, (b) based on these findings develop agile competencies on a aggregated team level and (c) internalize these agile competencies throughout the team. For developing CAIAP, we follow the Design Science Research (DSR) paradigm Hevner (2007. We derive meta-requirements deductively from the agile, learning and educational literature and inductively from expert interviews to allow for both rigorous and relevant design of CAIAP. The instantiation of CAIAP is evaluated through exploratory focus group interviews. CAIAP shall help agile practitioners to constantly monitor their agile practices on the team level and to identify areas for improvement as well as benchmarking opportunities. To researchers, CAIAP and its underlying assessment logic such as the identified assessment factors shall help to make the unit of analysis of agile work systems more explainable and predictable and shall help researchers to guide their own empirical research as well as serve as a basis for designing further tool support. This shall ultimately pave the way for increasing the success of agile practices in organizations.

2 Theoretical Background

2.1 Agility and agile methods in organizational teams

Agility describes the ability for fast and flexible organizational change and adaptability (Wendler and Stahlke 2013). Influenced by the software industry, different methods have emerged to guide teams towards an agile way of working (Lindvall et al. 2002), e.g., Scrum, Extreme Programming (XP) and Kanban (Anand and Dinakaran 2016). In general, project cycles are shortened within these methods, after which tangible deliverables (e.g., a working algorithm or software) are delivered to customers, allowing team flexibility and early feedback from customers during the development (Nerur and Balijepally 2007).

However, against this background, teams within organizations do not capture the same level of benefits of agile methods. This is due to the fact, that agile methodologies need to be tailored to the specific working context of the team (Cao et al. 2009; Qumer and Henderson-Sellers 2008; Rasnacis and Berzisa 2017). Thus, depending on the work context, individual agile practices from different agile methodologies are applied at the team environment. A phenomenon observed in various organizational contexts is that agile methods are generally understood as a kind of toolbox from which different agile practices are taken and combined with existing work or other agile practices (Buchalcevova 2018). This

results in individualized and different agile methods depending on the work context of the respective team. One could say that agile practices more often can be compared to patchworks rather than an evenly distributed pattern aligned with the overall agile strategy. This composition of heterogeneous and individual agile practices, which arise against the background of different work contexts, leads to a complex interweaving of many different agile approaches within one organization. Managing and aligning these complexities within teams and in between teams of an organization is a complex endeavour, which requires a collaborative exchange between the individual team members (Lalsing et al. 2012). However, a collaborative social process between team members within an organization who value mutual trust and feedback is critical to the success of deploying agile practices for competitive advantage (Nerur et al. 2005). For employees to participate in an agile work environment, feedback on their agile behaviour is a key factor in the learning and improvement of a team's agile performance (Vázquez-Bustelo et al. 2007). Here, CAIAP shall help to operationalize and facilitate this agile feedback and learning mechanism for continuously improving agile practices in organizations.

2.2 The Importance of Feedback in the Context of Agile Learning & Organizational Agility

Learning can be described as the process that changes the state of knowledge (Koskinen 2011). In accordance with the contingency theory, the learning processes in teams are viewed as adoption processes. This perspective indicates that teams are skilled at creating or acquiring knowledge, then transferring it and modifying their team behaviour to reflect the newly gained knowledge (Garwin 1993). Prior research has argued that establishing feedback processes is an indispensable element in agile learning to continuously learn and adapt to changing situations (Ahonen et al. 2011; Tidd and Bessant 2018). And, when it manifests itself into the organizational structures it leads ultimately to a higher order of organizational agility. However, to define the term feedback, we use the definition proposed by Hattie and Timperley (2007), who have stated that feedback is conceptualized as information provided by an agent, for example an agile coach or more experienced team member, providing guidance to a team member. Hence, feedback is provided based on the work performance or in general about behaviour and outcomes. Based on Carless (2016), feedback needs to be seen as a process and not as a task that has to be fulfilled at the end of a business process. To ensure that providing feedback is a daily business practice, prior research has considered feedback loops (Crossan and Berdrow 2003; Crossan et al. 1999). Apart from that, feedback has to contain learning information (e.g. Duijnhouwer et al. 2010) and should include the uptake by its receivers (e.g. Boud and Molloy 2013).

According to Hattie and Timperley (2007) feedback must answer three major questions. In the context of agile practices, the first question addresses the working goals needed to be achieved by agile practices (as well as the organizational strategy). The judgement concerning the achievement of a working goal may occur on many dimensions, such as directly "rate of speed" or "completing of project requirements" (Shute 2008). The second question involves providing information in relation to a task or performance goal. Usually, this is related to prior performance and/or to success or failure in a particular task using agile practices. Feedback is effective when it consists of information regarding the progress and/or on how to proceed with a certain problem space (Black and Wiliam 2009). The last question helps guiding agile team members by providing advice for improving agile practices. This could involve more self-regulation in the adaptation process, greater fluency and automaticity, deeper understanding, more strategies and processes regarding the work, and more information about what is and what is not understood (Hattie and Timperley 2007). Feedback, as also stated by Rietsche et al. (2018), is based on a preceding self-assessment and peer-group feedback, which judges an agile team-member's performance compared to other peers in the team (Thelwall 2000).

Thus, a number of advantages for agile learning and the overall organizational agility result from research on feedback. Firstly, on an individual level, it allows members to inform and evaluate the actions of their group and organization as well as their actions (DiBella and Nevis 1998). Secondly, individuals can identify gaps resulting from their actions (Argyris 1996). On an organizational level, it is important for continuous improvement and refinement of business processes as well as alignments

with organizational goals (Strand and Söderström 2002). Therefore, taking over a feedback-oriented lens combined with the notion of agile learning is particularly helpful for positioning the design of CAIAP for increased organizational agility.

2.3 Agile Learning through team action guiding status quo assessment

Agile learning requires teams to identify its current situation and status quo. Usually, this also includes a comparison with the teams' goals, external requirements such as customer needs, laws or regulations or benchmarks. However, it is often complicated to reach an objective assessment of a team's status quo. Therefore, methods or tools for the status quo assessment, the derivation and prioritization of improvement opportunities and the subsequent control of the measures and improvements are indispensable. Maturity models are one example and suitable method for initiating internal benchmarking and are used extensively within IS research and represent a concept for addressing the challenges mentioned above (Becker et al. 2009).

Furthermore, in combination with benchmarking, a status quo assessment can be used firstly to put one's own maturity result in relation to a selected comparison group in order to uncover one's own performance deficits. Secondly, it can be used to direct oneself towards striving for excellence and to define realistic target values in order to plan and implement concrete measures for improving one's own status quo and master successful team change and development (Otto and Österle 2016; Overby et al. 2006). Usually, status quo assessment models are composed of several levels of maturity and a number of dimensions operationalized through respective assessment factors. Thus, different levels can be achieved in different dimensions, and either qualitative descriptions or quantitative measurements can be used to communicated the assessment results, e.g., to senior management (Lahrmann et al. 2010; Mettler et al. 2010). Hence, such models pose a possibility to initiate an assessment process within teams to evaluate the status quo in a given area (in our case agility) but fail to provide additional guidance in regard to the derivation of measures for organizational intervention in a manner of dynamically combining feedback cycles and agile learning over time. Consequently, such models do not dynamically foster agile learning within teams directly but need to be enhanced with concrete action guiding elements to steer and facilitate agile learning and continuous improvement of agile practices over time.

2.4 ICAP Framework as a Kernel Theory to Interactively Engage Agile Team Members in Learning to increase Organizational Agility

One advantage of using a status-quo measurement compared to traditional approach of periodically taking measures with agile coaches is the increasing engagement of agile team members due to the continuous interaction and feedback of employees with the status-quo of their agile performance and that of the team as well as the whole organization. According to Chi and Wylie's (2014) ICAP (Interactive, Constructive, Active and Passive framework), learner (agile team member) engagement with the learning material (agile practices) "can range from passive to active to constructive to interactive" (Chi and Wylie 2014) and lead to an improved learning outcome (in our case, individual agile performance). While team members in passive engagement just use or reciprocate agile principles (e.g., participate in daily Scrum meetings), team members in active engagement actively alter the presentation of material (e.g., by communicating personal successes or failures in the project). Team members deepen their interaction in the two most engaged modes of interaction, according to Chi and Wylie (2014), by comparing agile practices to their prior knowledge (constructive engagement), debating or asking and answering questions with other teams or team members, and elaborating and proposing improvement suggestions (interactive engagement). Here, each mode of the ICAP framework corresponds to different types of behaviours and knowledge change processes that determine different agile performance levels (Chi and Wylie 2014). According to the framework's premise, status-quo measures and peer-group comparisons can boost agile team member engagement by allowing the new component to show each team member's unique agile performance to their own agile teams as well as other teams. Unlike traditional maturity tools, action guided status-quo metrics may show agile team members other teams in the same working context, allowing them to better discover improvement

opportunities - exactly like human agile coaches. The application of the ICAP framework to interactively involve learners in learning problem-solving abilities (Winkler et al. 2019) or programming skills has previously been effectively shown (Hobert 2019). Therefore, we believe that a user-centered and literature-based design of an action-guiding status-quo tool, to provide individualized agile mentoring for agile practitioners by providing team-members with individualized feedback, would engage them interactively in the spirit of the ICAP framework. Therefore, we draw on the ICAP framework as our Kernel theory guiding the design of CAIAP.

3 Methodology

We employed the three-cycle DSR technique to fulfil our study aim (Hevner 2007). We took this approach because we wanted to a) use a scientific method to solve a set of practical problems that researchers and practitioners face in their daily work, and b) contribute to the existing body of knowledge by designing and evaluating a new research artifact and documenting the design knowledge as DPs in accordance with the structure proposed by (Gregor et al. 2020).

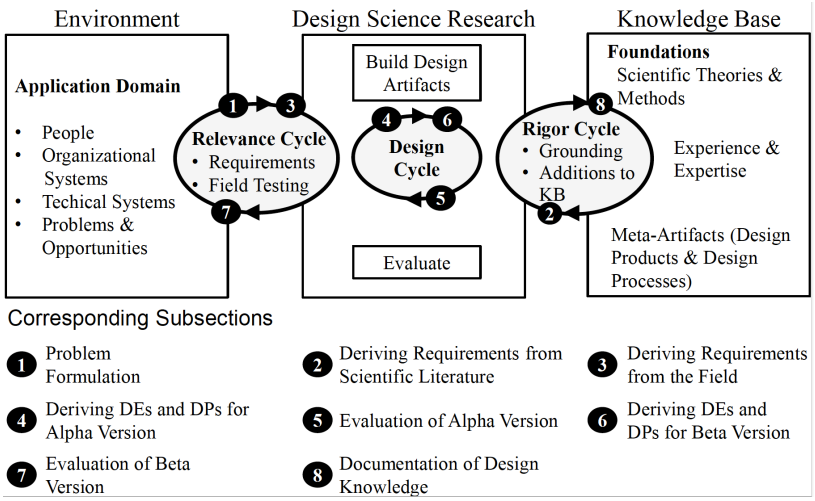

Figure 1: Design Science Process according to Hevner (2007

Moreover, to ensure that the CAIAP addressed all important aspects to increase agile performance, we followed a theory driven design approach by grounding our research on the ICAP framework by Chi and Wylie (2014 theory. In the following section, we will present the details of all phases advocated by (Hevner 2007) for the development of CAIAP. The formulation of the problem is the first stage. The problem's practical driven motive was explored in detail in the introduction section. In the second and third steps, we developed requirements for the design of the CAIAP from a) scientific literature and b) a total of 12 semi-structured ToolCorp interviews in two iterations, based on the problem definition. The interviews ranged in duration from 30 to 90 minutes. The first round of interviews (eight interviews) concentrated on deriving requirements from expert interviews, while the second round (four interviews) focused on evaluating the alpha version. Table 1 provides a summary of the interviewers and iterations. With over 300,000 people, ToolCorp (disguised name) functioned as an implementation partner. ToolCorp has its headquarters in Germany and is an international leader in manufacturing and technology. Following that, the interviews were transcribed and analyzed using Kuckartz's technique of category construction (2014).

Iteration	Number of Interviews	Function & Role	Average Duration
1	2	Scrum Master & Agile Coach	32 min
	2	Executive	45 min
	2	Project Member	35 min
	2	Team Member	41 min

2	1	Executive	50 min
	2	Scrum Master & Agile Coach	45 min
	1	Team Member	43 min

Table 1: Number and Iteration of Interviews

In the fourth phase, we developed and implemented design features based on the requirements for the alpha version. The examination of the alpha version was completed in the fifth phase. In order to analyse the alpha version, we performed four further interviews inside the same firms described above. The design aspects of step four were updated in the sixth phase based on the assessment findings of step five. The beta version was the result of this process. The beta version was examined in a focus group setting in the seventh phase. The DPs are documented in the eighth phase using the anatomy of DPs proposed by (Gregor et al. 2020).

Steps seven and eight are discussed in separate sections to ease readability. As a result, step seven "beta version evaluation" has its own section, and step eight "design knowledge documentation" is presented in the Discussion. We built an instance called CAIAP to evaluate the six DPs. We used the evaluation approach suggested by (Venable et al. 2016). This paradigm has the benefit of describing a methodical way to analysing each phase of the artifact design process. We conducted an artificial ex ante evaluation of the alpha version's design features and a naturalistic ex post evaluation of the beta version's design elements.

4 Designing and Evaluating the Data-driven Agility Management Method

This section shows how we created and assessed CAIAP in eight successive phases after DSR, based on the issue formulation (step one) in the Introduction Section. Figure 2 summarizes all of the findings from our qualitative research.

4.1 Step 2 & 3: Deriving Requirements from Scientific Literature and User Interviews

The first set of requirements are derived from a structured literature review following vom Brocke et al. (2015. (1) We defined the review scope, and primarily focused our research on studies that demonstrate the successful implementation of agile learning practices and benchmarking systems.(2) We conceptualized the topic and identified three main areas for deriving the requirements: Agility, Educational Technology and Human-Computer Interaction. (3) Conducting the literature search,[1] search on Google Scholar and Web of Science to identify relevant literature. (4) We selected 65 papers for an intensive analysis. We have summarized similar topics of these contributions as *literature issues (LI)* and formed four clusters from them (LI1 (Soloway et al. 1996), LI2 (Hattie and Timperley 2007), LI3 (Chi and Wylie 2014), LI3 (Festinger 1954)). Based on these LIs, we derived *meta-requirements* (MR) for the design of a CAIAP (see Figure 2). After the defined meta requirements, we derived requirements from the eight interviews during the first iteration on employees and manager (Gläser and Laudel 2009). The interview guideline included 25 questions, and the interviews ranged in length from 32 to 50 minutes. The interviewers were all ToolCorp employees who are all prospective CAIAP users. We analyzed the interviews after transcribing and classifying them according to the recommendations of Gioia et al. (2013). The analysis is divided into two sections that are carried out sequentially. The first step consists of an inductive first-order analysis using interviewee-centric terminology and ideas. The purpose is to find and collect user stories that are important to the development of the CAIAP. As a

[1] We used the following Keywords: „agile learning“, „organizational feedback“, „team-based learning“, „learning theory“, „organizational benchmarking“, „performance measurment“

second stage, we looked for similarities and relationships between the user stories by assigning relevant concepts and identifying user requirements (UR). Figure 2 depicts the final results.

4.2 Step 4: Deriving Design Principles and Features for the Alpha Version

The DPs described in this section were created using a condensed collection of LIs, USs, and formulated MRs and URs. Because the DPs are written in the manner provided by Gregor et al. (2020), we believe they are self-explanatory. Figure 2 illustrates the DPs. We constructed a first prototype of CAIAP at ToolCorp with design features (DF) as instantiation of our DPs to instantiate and evaluate the DPs. In the earliest alpha version of CAIAP, we produced a ClickDummy of CAIAP in order to collect early input on the project. The ClickDummy depicted an individual assessment of an agile team member as well as advice for first actions toward improvements. In Step 6, the completely working software artifact was implemented. It comprises of a user-centered front-end based on simple actions that guide evaluation of the agile state of the team member and assistance in future improvement and support activities by comparing peer groups and their historical development and executed measures.

CAIAP was designed using just minimal design components based on **DP1** and **DP2** (DF1). The logic for this concept is that users play an important role as co-creators of value and hence should have as few barriers to involvement as feasible (Sanders and Stappers 2008). CAIAP was implemented in our situation through an MS-Teams plug-in (DF1). We built CAIAP as a responsive web-based application that can be used on all kinds of devices to instantiate **DP2**. In order to provide flexibility to implement it in the corporate infrastructure of ToolCorp (US3). However, we believe that this DP may fluctuate based on business conditions and culture and, as a result, is easily modifiable. CAIAP's front end was created utilizing cutting-edge web technologies such as HTML 5, Cascading Style Sheets (CSS), and JavaScript (JS). We construct CAIAP with an adjustable feedback mode on the individual assessment profile to instantiate **DP3** and **DP4**. The agile profile is defined by six key dimensions (reflecting ToolCorp's definition of agile), which the users can submit via slider-input (DF2) and, if they choose with detailed questions and explanations. The data from the agile assessment can either by viewed as individual assessment, as an aggregation on a team level (to view the team performance) or in comparison to other teams from the same working context (DF8) and visualised as a polar diagram (DF7). In the report centre for agile coaches, we added the possibility to observe the frequency distribution for each answered detail question (DF6), which they then could use as basis for feedback and discussion with the team-members, teams or within the whole organization. For ideas to be shared over team boundaries, we added an organisation-wide idea marketplace named "Agile Council" (DF3). To provide concentrated feedback to the ideas posted in this idea marketplace, the Facebook reaction system as described by Tian et al. (2017) was adapted (DF4) to the four positively formulated responses "Good idea", "I'll help", "Thanks" and "I don't think so". Ideas submitted to the idea marketplace can be shown anonymously if desired (DF9). Users can access a form at the bottom of the page to send a support request to the agile coaches'team, which helps to decrease the barriers to asking for help (DF10). To match organizational fit, we made it essential for users to select one of four pre-defined roles for the agile coach when submitting a support request (Expert & Trainer for Agile Practices; Improvement Coach; Moderator & Facilitator; Change Agent) (DF5).

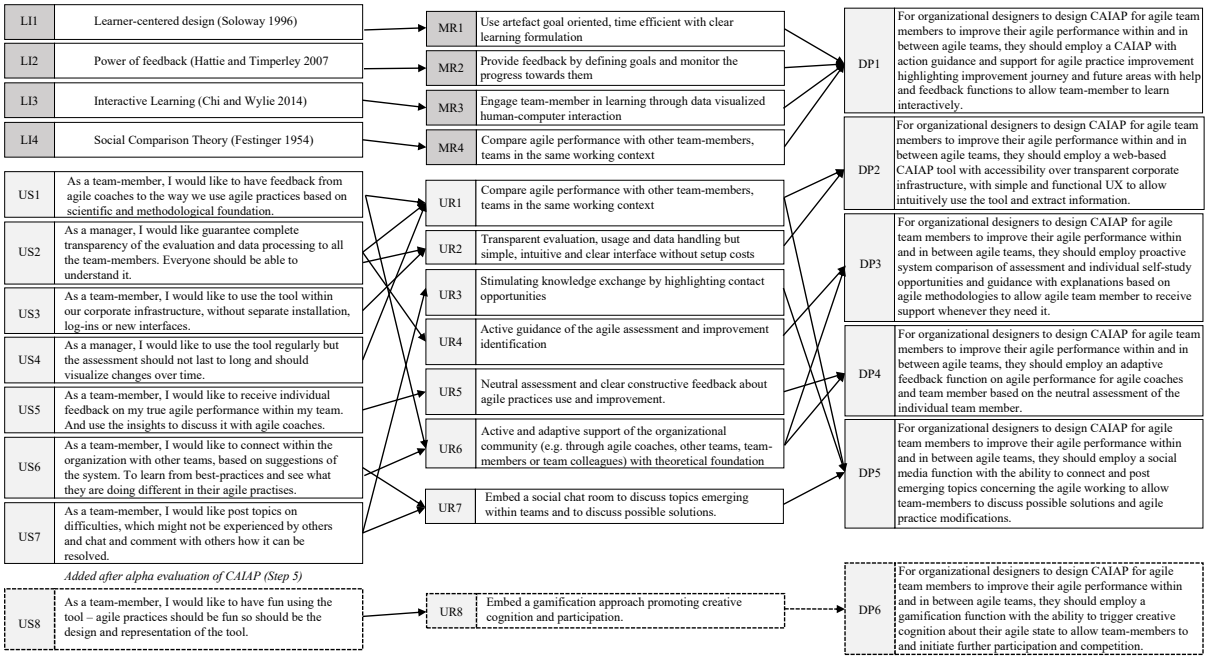

Figure 2: Overview of the derived design principles according to Gregor et al. (2020)

4.3 Step 5: Evaluation of Alpha Version

The alpha version was evaluated ex ante using an artificial evaluation setting (Venable et al. 2016). The purpose of the first round of eight interviews was to generate CAIAP requirements from expert interviews. The alpha version was evaluated in the second iteration, which included four interviews. As a result, the goal of this study was to assess the completeness of the DPs and DFs. To accomplish this, we conducted four interviews inside ToolCorp across various teams and hierarchies. The qualitative interviews that followed a web-based survey that mimicked the CAIAP and its objectives were intended to analyse and reflect on the model and its characteristics in practice. The extent to which the dimensions, levels, and objects are clear and consistent, if gaps exist, and whether the model is valuable for the firms were all discussed throughout the conversations. Furthermore, the goal was to determine which stakeholders such a survey should ideally be completed by and to whom it should be delivered. The primary goal of filling out the survey was to give the interviewees a sense of the CAIAP by going through and understanding the functions, dimensions, and objects with their respective characteristics. Following that, the interviews were utilized to determine where CAIAP has flaws and where modifications to the model's features and structure are needed. Essentially, the survey and subsequent conversations aimed to validate the different components of CAIAP, including improving the language of explanations or assessment questions, as well as consistency and completeness. Furthermore, the relevance and effectiveness of metrics produced from a comparison of agile processes as part of an internal study were highlighted. The findings of the first iteration were given to the interviewees in the form of a network diagram, which on the one hand led to the objectives indicated in step two but on the other hand already created data insights. The purpose of this step was to evaluate the underlying DPs and DFs of the CAIAP. Hence, the evaluation led to inputs in regard to the structure (features) of CAIAP. The evaluation revealed issues in the area of user-centred questioning, which was already addressed in the first interview round. As already mentioned above, in the alpha version, the results of the first round of eight interviews was presented in the form of a network diagram. All of the interviewees appreciated the visual display of gaps and differences along the various dimensions of the agile assessment. Additionally, it was pointed out that a clear management commitment is needed and employees need to understand the overarching goal and benefit of the agility assessment. In this context it was highlighted to provide some features to promote participation and some kind of competition between teams. In the following section, the DFs derived for the beta version are explained in more detail.

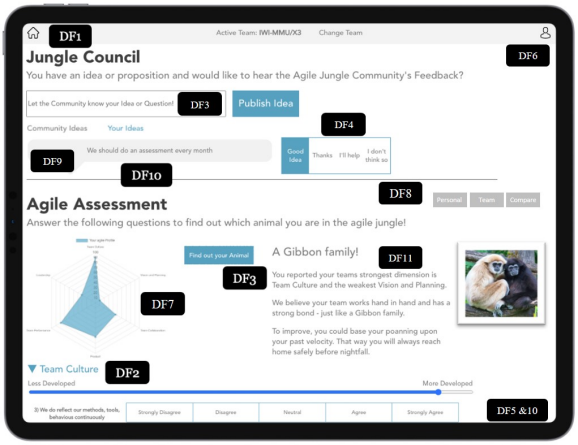

Figure 3: Expository Instantiation of CAIAP

4.4 Step 6: Deriving Design Principle and Features for the Beta Version

Following the evaluation of our alpha version of CAIAP, we created a new DP (see Figure 2) that included a gamification approach to stimulate creative cognition with agile assessment by team members and to increase engagement. This DP is also backed with recent literature where gamification have been successfully implemented (e.g. Majuri et al. 2018; Orji et al. 2017). CAIAP's final version has two interaction modes: (1) an agile assessment and learning mode that assists team members and teams in improving their agile processes, and (2) a gamified experience that rewards users for involvement after estimating all six aspects (DF12). The image of a jungle was deliberately chosen because negative mental images attributed to change processes such as chaos and uncertainty (Dent and Goldberg 1999; Kotter 2007) could be picked up and framed positively. To reduce hurdles for users to input data into the agile assessment The goal was to set a positive stimulus for participation via little quiz and personalised results (Majuri et al. 2018; Orji et al. 2017). As a result, we changed minor features in practically all instantiated DF, such as changing the name of the idea marketplace DF4 from "Agile Council" to "Jungle Council." Our goal was to create and construct a completely working software artifact based on the amended version. To begin, we used the design feature DF12 to instantiate DP6. CAIAP includes a gamification algorithm for this reason, which not only identifies an animal based on the information in the assessment, but also incorporates opposing animal traits in a challenge to cope with their shortcomings and strengths. This enhances DP5 by distributing deficits and strengths across the community structure. After both sides have voted on measures, they are awarded points and rated in the Jungle ranking list.

5 Evaluation of Beta Version

In this section, the naturalistic ex post evaluation of the beta version in a controlled environment is presented (Venable et al. 2016) (Table 2). We follow the argumentation of Venable et al. (2016 and evaluate through our design artifact (CAIAP) simultaneously the usefulness and the achievement of our purpose and the approach of the pursued design theory. We followed the research methodology proposed by Tremblay et al. (2010) of exploratory focus groups, which specifically serve the evaluation purpose of the artifact improvement in an environment where quantitative evaluations are not feasible (as in our case, where the works council of ToolCorp prohibits any quantitative survey and analysis for third parties). A focus group is a discussion facilitated by a moderator in groups of several persons about a certain topic (Stewart and Shamdasani 2014). The usefulness, or the extent to which the CAIAP thoroughly fulfills its aim of promoting an improvement in agile performance respectively organizational agility, is the assessment criterion (see table 2). Both tool efficiency and learning performance can be used to determine success. The utility of the CAIAP is appraised qualitatively as a first stage of a field evaluation. The evaluation objects are the DF and its CAIAP instantiation. In the

following, the procedure for conducting the focus group interview and the analysis of the results (Tremblay et al. 2010) is described. Using a sample framework, we selected teams for focus groups based on two criteria (see Table 2): First and foremost, the team had to employ agile principles. Second, diverse agile practices from various agile approaches are investigated and deployed in the team on a regular basis.

Team	Working Context	Team Size	Number of Interviewees and Roles of the Team
A	Sales	• 30	2 Agile Coaches; 4 Product Manager; 6 Team Member
B	Finance	• 25	1 Agile Coach; 1 Product Owner; 5 Team Member
C	IT	• 18	1 Chief Information Officer; 2 Product Owner; 3 Team Member

Table 2: Focus Groups and Interview partner

We developed a questioning route, which determines how to proceed in the evaluation. On that basis, we conducted face-to-face evaluation interviews with the interviewee groups, using a semi-structured, open-question questionnaire, which was open to all interviewees during the evaluation.

In doing so, we presented and explained all elements and components of the IT artifact and process. Moreover, we created three separate groups, one for each team, to simulate the entire process with all participants using a randomly selected example. After each step (evaluation, analysis, exchange) post-its were handed out, and the participants were asked answer questions regarding the utility, advantages, and disadvantages of design choices and of concrete artifact features. We also asked the interviewees for possible improvements for the CAIAP in order to address potential aspects and features, so far disregarded in the design. The discussion led to some adjustments regarding the results, upcoming new aspects were integrated, themes were reorganized, and answers reassigned throughout the discussion until a final consensus was achieved over all interviewees regarding each design principle and feature.

Three types of findings are reached. First, if a CAIAP feature is deemed helpful by experts, it is inferred that the underlying CAIAP design concept is sound. Second, if CAIAP needs to be modified to match the unique application environment of the interviews, principles of the underlying approach may be retained or modified, depending on the severity of the alterations. Third, if interviewers believe aspects to be redundant or even counterproductive, CAIAP elements must be adjusted or eliminated. The final findings and discussion of the focus group interviews are shown in Table 3.

Design Principle	Design Feature	Rating	Conclusion
DP1: Action-guiding agile practice assessment	**DF1:** Action guiding design	*Useful*	• Retain features in the design principle and refine with modifiable working context
	DF2: Building assessment around agile dimensions defined by organizational goals and backed by agile methodology	*Useful*	
	DF7: Visual representation of assessment	*Useful*	
DP2: Organizational infrastructure embedded simple, functional UX	**DF 1:** Embedding CAIAP in organizational infrastructure	*Useful*	• Retain feature and provide documentation on the corporate intranet
DP3: Proactive system comparison and individual self-study opportunity with explanations based on agile methodologies	**DF2:** Assessment of individual agile practices according to agile dimensions	*Useful*	• Add tree structures and content maps • Store results in a central repository and provide links to aggregated and compare results
	DF8: Aggregation and comparison function of assessment	*Useful*	
DP4: Support and feedback request	**DF10:** Support and request function for help	*Neutral*	• Include agile industry expert not agile experts following a fixed framework
	DF6: Report Centre for Agile Coaches	*Useful*	

function for agile coaches	**DF5:** Role and expertise request function for agile coach	*Useful*	
DP5: Solution oriented social community with idea exchange and rating	**DF3:** Idea marketplace	*neutral*	• Add further communication applications
	DF 4: Rating and discussion	*Useful*	
	DF9: Anonymous posting	*Useful*	
DP6: Gamification function to trigger internal challenges and creative cognition	**DF11:** Creative cognition elements and competition feature	*Useful*	• Elements of the jungle should be maintained and rewards of challenges should be highlighted.

Table 3: Final Results of Evaluation of Beta Version

6 Documenting the Evaluated Design Knowledge

We document design knowledge according to the anatomy of design principles in order to present the theoretical contribution and capture the outcomes of our DSR project (Gregor and Jones 2007). The goal of a design theory is to provide clear prescriptions for the production of artifacts, in our case CAIAP. As a result of our carefully performed design process, we encapsulate our theoretical contributions in the form of a "design and action" theory (Gregor and Jones 2007). The theory's goal is to establish principles in form and function for building artifacts, in this instance CAIAP.

1) Purpose and scope	The purpose of CAIAP is to support agile team-member to learn to improve their agile practices by providing individual or team support, guidance and reference based on individual status-quo agile assessments.
2) Constructs	**DF1-DF2, DF7-8:** Agile status-quo Assessment and Comparison, **DF3-DF4, DF9**: idea marketplace with rating functions, **DF5-DF6; DF10** support of agile coaches; **DF11** creative cognition elements and competition feature (e.g. agile jungle and animal theme)
3) Principles of form and functions	**DP1:** assessment with action-guidance and support for agile practice improvement; **DP2**: responsive web-based design with functional and simple UX; **DP3** Proactive system comparison and individual self-study opportunity with explanations based on agile methodologies **DP4** support and feedback through agile coaches based on individual assessment; **DP5** solution oriented social community with idea exchange and rating; **DP6** gamification function to trigger internal challenges and creative cognition
4) Artifact mutability	Core assessment dimensions, e.g. product, leadership, mindset etc. might be changed to other based on organizational preferences. Design elements of the CAIAP need to be adapted to fit into organizational infrastructure
5) Testable propositions	(1) Using CAIAP increases the agile team-members agile practice performance. (2) Using CAIAP improves the provision of agile practice guidance and support (3) Using CAIAP reduces the uncertainty of applying agile practices and amount of agile coaching.
6) Justificatory knowledge	ICAP Framework (Chi and Wylie 2014)

Table 4: Documentation of our design knowledge adapted from Gregor and Jones (2007)

7 Discussion and Conclusion

We pursued the objective of assisting firms in continually reviewing and enhancing their agile processes and overall organizational agility in this DSR project. Thus, using the ICAP framework as our Kernel theory, we created CAIAP iteratively based on conceptual and theoretical insights from research and empirical insights from experience. CAIAP assists agile practitioners in continuously monitoring their agile practices on an individual and team level, identifying areas for progress as well as benchmarking possibilities for the entire organization. CAIAP and its underlying assessment logic, such as the

identified assessment factors, will assist researchers in making the unit of analysis of agile work more explainable and predictable, as well as in guiding their own empirical research and serving as a foundation for designing additional tool support. This should potentially open up avenues for organizations to increase the success of agile methods and their organizational agility. In the context of agile learning, in the sense of increasing the agile performance and organizational agility usually is not a guided process, and many organizations experience problems capturing benefits of agile practices due to their lack of proper orientation and understanding. To fill this need, we explicitly articulated prescriptions for a class of design artifacts for continually analysing and refining agile methods — in our case, instantiated by our CAIAP tool. As shown by design features (DF) in this instance. Three meta-requirements were obtained from the scientific literature, and sixteen requirements were generated from expert interviews with employees and managers. Based on the derived requirements, we built ten DFs that characterize the CAIAP. The first relevant DFs are that companies initiate an agility assessment through a web-based survey among teams and departments with employees and managers. The assessment is developed using agile concepts along operational and strategic aspects, and the assessment questions are asked naturally while respecting the user's working context. The design theory is based on the ideas of form and function (Point 3, Table 2).When designing a socio-technical system (Mumford 2006), a main principle is user-centricity. To achieve this aim, we used the CAIAP and three DPs (DP 1, DP 2, DP 3) to improve usability and minimize cognitive effort. CAIAP is a web-based tool that asks evaluation questions about the user's specific working environment (DP1). Furthermore, the CAIAP assists managers, employees, and enterprises in interpreting assessment data by presenting them at several aggregate levels (DP3). Furthermore, the beta version assessment revealed that an action directing process (DP 2), i.e., the instantiation of a timetable and task description with specified method (DF 5) is supported by the practice partners in the focus groups. During the focus group, the experts concluded that DF 9 (agile expert) and DF 4 (development of knowledge sharing ecosystem) are not beneficial. This resulted in a change of the design concept of external insight. As a result, we advise that external insights be avoided while constructing CAIAP.

Regarding the final two design principles, the suggested design aspects of DP 5 were mostly rated as beneficial. Only DF 4 was determined to be of neutral use. As a result, the validity of DP 5 was reaffirmed during the beta version evaluation, emphasizing the relevance of interactive feedback loops in organizational learning and throughout an agile transformation process. Finally, anonymity during the whole transformation process was deemed extremely relevant, and DP 6 was considered legitimate as well. In sum, our results provide deeper insights into how to design tools for continuously assessing and improving agile practices for increased organizational learning and support researchers in applying the presented design principles for a) their construction of artifacts or b) further revision and extension. Our objective was to propose design concepts that must be taken into account while developing CAIAP in order to grasp agile transformations and increase organizational change. We utilized the DSR technique to design our artifact and produced a compact set of six design principles based on a review of scientific literature and a total of twelve semi-structured interviews with users. Furthermore, we provided an initial version of an instantiation (CAIAP) of these design principles and assessed our alpha and beta versions' design principles through interviews and exploratory focus groups. The results of our evaluations have shown that five out of six design principles and the respective design features as useful were classified as valid when designing CAIAP.

Several limitations must be considered with respect to our study. First the list of requirements is derived from a specific field of research and from specific interviews with experts (user and manager). There exists a chance that different requirements would have been derived, if we have used different interviews and a different theoretical perspective. However, we tried to select the most relevant research field and representative sample of experts. Further, the conducted evaluation of the beta version of the CAIAP has additional limitations: First, the results generated within the focus groups strongly depend on the way the method is presented and how the researchers guide the interviews (Tremblay et al. 2010). Second, exploratory focus groups provide little evidence on the actual utility of the CAIAP when applied in real life organizational settings since the method was only applied in an artificial setting. After implementing the design improvements in CAIAP , field evaluations within relevance cycles (Hevner

2007) have to be conducted, which was not the case in the presented research process. Additionally, there was no quantitative evaluation carried out on a broader basis as the implementation partner prohibited such an analysis of employee data.

In view of these constraints, we propose that future research evaluate the design principles in a larger environment and using a quantitative method to supplement the already created design information. Furthermore, a categorization of usefulness in the form of prioritizing between design principles will be investigated in greater depth.

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