How to Implement Agile IT Setups:
A Taxonomy of Design Options

by

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Research paper

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Abstract

The digital transformation requires organizations to rethink how they interact with customers, define value propositions, leverage data, and organize internal operations. Evolving into an indispensable part of value creation, IT organizations are required to not only plan, build, and run IT services in the safe and steady mode, but also to enable organizations seizing digital opportunities in an agile and adaptive mode. Despite mature knowledge on IT organizations, ambidextrous IT, and agile methods, there is high uncertainty on how to implement bimodal IT organizations. To address this gap, we propose a taxonomy of design options for the agile mode. Our taxonomy includes seven dimensions (i.e., scope, institution-alization, accountability, governance, location, staffing, and technical integration) that address relevant questions regarding the design of agile IT setups. While creating our taxonomy, we built on extant literature and involved experts from various organizations (e.g., Chief Information Officers, Digital Transformation Officers, and Managing Directors of IT departments). These experts did not only validate our taxonomy regarding real-world fidelity and understandability, but also applied it to classify the agile IT setups of their organizations. Thus, our study contributes to descriptive knowledge and delivers practically relevant insights into existing agile IT setups.

Keywords: IT organization, bimodal IT, dual IT structure, IT ambidexterity, taxonomy.

1 Introduction

Digital transformation leads to new requirements for IT departments. Besides refining and operating IT systems, which are major tasks of an organization's traditional IT function, there is a rising need to develop and support the innovative capability due to digital disruptions (Châlons and Dufft, 2017). Organizations are confronted with new technologies, the need for increased business orientation, requests for a faster time-to-market as well as customer-centric and iterative development (Bharadwaj et al., 2013; Horlach et al., 2016). Agile IT setups are discussed as a potential measure to cope with these challenges and to address the quest for more agility and speed (Châlons and Dufft, 2017). We use the term agile IT setup to describe the part of a dual or bimodal IT organization dedicated to innovative capability (Horlach et al., 2016). Thereby, organizations face the challenge of simultaneously running traditional IT, which is geared toward safe and steady operations, and agile IT, which strives for innovation and flexibility (Horlach et al., 2016). Consequently, the implementation of agile IT setups is

highly relevant for today's organizations. This has been corroborated by a Gartner survey, showing that 45% of the responding CIOs have already started to implement agile IT setups (Sondergaard, 2014). Not surprisingly, there are many consulting-driven initiatives, describing approaches to simultaneously run traditional and agile IT setups (Horlach et al., 2016). Moreover, several contributions describe the concept of three- and multimodal IT organizations or even an entirely agile IT setup (Bayley and Shacklady, 2015; Gartner, 2014; Hinchcliffe, 2015). Nevertheless, these concepts emphasize the general need for contextual, adaptive, and faster IT organizations. Although the proposed approaches largely differ and are controversially discussed, they agree on the important role of agile IT in light of digital transformation. However, none of these approaches defines relevant design options, outlining how an organization can implement an agile IT setup. Although we think the decision whether or not to implement an agile IT setup is an important field for future research, we refrain from this decision and focus on the organizational anchorage of an agile IT instead to provide an academic foundation.

Besides practical contributions, there are very few scientific works on agile IT setups. Yet, this current topic shows strong parallels to earlier research related to organizational agility as well as organizational and IT ambidexterity. The existing body of knowledge provides insights into the combination of exploitation, which is comparable to traditional IT, and exploration, which is comparable to agile IT, to sustain or increase organizations' innovative capability and agility (Lee et al., 2015). Thus, we embed the recent discussion of agile IT setups in the context of IT ambidexterity, framing agile IT as an explorative capability. So far, research cannot provide a comprehensive description on how to implement ambidextrous or agile IT setups. While there seems to be consensus that IT organizations must improve in terms of flexibility and agility, the literature lacks detailed guidance on how to implement agile IT setups. Yet, the implementation of agile IT setups is crucial for IT organizations to address current challenges and enable future-proof IT setups, capable of complying with competing requirements for stability and agility. Acting on the assumption that the traditional IT setup continues to be the prevalent IT mode in most organizations and that its design options are well-known, we focus on agile IT setups and their integration into the traditional IT organization. Thereby, well-established organizations are considered and we are confident to cover most existing IT organizations with this approach. We aim to differentiate agile IT setups according to their organizational structure and positioning. Hence, we pose the following research question: *What are the design options for agile IT setups?*

To answer our research question, we have chosen a taxonomy development approach. Thereby, we intend to add to the descriptive knowledge on agile IT setups and enhance transparency in this comparatively young field, which is low on theoretical insights (Gregor, 2006). Our taxonomy aims to compile relevant design dimensions and characteristics for agile IT setups. In the course of our research process, we collected empirical evidence on existing agile IT setups based on seven expert interviews, enhancing and validating our taxonomy. In the following, we first class the implementation of agile IT setups into the present academic discourse, discussing relevant scientific and practical literature in Section 2. In Section 3, we outline the research method we applied to develop our taxonomy. In Section 4, we introduce our taxonomy as well as the feedback we received in the conducted expert interviews. Using the expert interviews as foundation, we showcase five real-world cases of agile IT setups in Section 5, classifying them based on our taxonomy and highlighting cross-case insights. In Section 6, we summarize our key findings, discuss limitations, and provide an outlook on directions for further research.

2 Research Foundations

While several practical contributions describe the latest developments towards innovative and agile IT setups, discussions about different focal areas in organizations already date back to the 1970's (Duncan, 1976; Abernathy and Utterback, 1978). More precisely, literature on organizational agility and (IT) ambidexterity serves as a starting point and theoretical grounding for the design options of agile IT setups in the digital age. While the technological trends driving digital transformation might imply additional challenges for organizations (Châlons and Dufft, 2017), the underlying dichotomy of innovation and

efficiency is comparable. Emerging from these trends is the necessity to anticipate and adapt quickly to market dynamics, which constitutes organizational agility (Sambamurthy et al., 2007).

Therefore, an increasingly dynamic and competitive environment is symptomatic for digital transformation, which induces organizations to build up ambidextrous capabilities (Jansen et al., 2006). Ambidexterity refers to an organization's ability to simultaneously combine exploitation, i.e., striving for efficiency, and exploration, i.e., enabling innovation (Lee et al., 2015). On the one hand, exploitation aims to increase the productivity of existing operations, focusing on control and reduction of uncertainty. On the other, exploration facilitates the adoption of novel technologies or processes through experimentation and discovery, increasing organizational flexibility and agility (March, 1991). Although an exclusive focus on either exploitation or exploration is considered as insufficient or even detrimental (Sarkees and Hulland, 2009), reasonable combinations of both concepts are known to enhance the organizational agility (Lee et al., 2015). Thus, the literature argues that organizations should strive for exploration and exploitation (Turner et al., 2013). As exploitation and exploration are two opposing activities, they require different organizational strategies and structures (Raisch and Birkinshaw, 2008). Furthermore, organizations must consider that both activities potentially draw on the same resources, leading to a trade-off (Gibson and Birkinshaw, 2004; He and Wong, 2004). However, previous research provides different approaches to balance exploitation and exploration. First, organizations could choose a sequential implementation (Duncan, 1976), thereby shifting between both modes and sequentially realigning structure and processes (O'Reilly and Tushman, 2013). Second, organizations could opt for a structural separation of exploitation and exploration in different departments (Tushman and O'Reilly, 1996). This approach requires suitable integration mechanisms (Fang et al., 2010). The third option is a contextual approach, addressing ambidexterity on a behavioral level, i.e., the staff is aligning or adapting to the organizational context (Gibson and Birkinshaw, 2004). In contrast to these static approaches, organizations may consider ambidexterity as a dynamic capability (Kranz et al., 2016). Thus, a continuous change between exploitation and exploration at any given point of time is possible, which is especially valuable for disruptive environments (Luger et al., 2013). Last but not least, organizations can apply mixed forms of the aforementioned approaches (Cao et al., 2009; Kauppila, 2010), thus extending the possibilities for agile IT setups. Up to now, the literature in this field lacks detailed guidelines for the implementation of ambidextrous organizations, especially considering their strategic prioritization (O'Reilly and Tushman, 2013). Nevertheless, we can draw on this research domain as it helps to substantiate the benefits of ambidextrous approaches in general and explorative capabilities in particular, which can be transferred to agile IT setups. Thereby, we frame agile IT setups as the explorative part of ambidexterity, fostering organizations' innovative capability.

Besides the existing scientific literature, which we analyzed above, there are several practical contributions (e.g., proposed by consulting companies) that outline possibilities to face the challenges of the digital transformation. One of the most prominent examples is Gartner, who disseminated the term bimodal IT in their '2014 CIO Agenda' (Gartner, 2013). They defined this capability as "[…] the practice of managing two separate but coherent styles of work: one focused on predictability; the other on exploration" (Gartner, 2014). Although Gartner initially differentiated the two modes, namely mode 1 (traditional IT) and mode 2 (agile IT), only in terms of speed, they later added customer orientation and the overarching goal of both modes as two further very important distinguishing criteria. Besides the general encouragement for a stronger customer orientation, faster innovations, and iterative development processes, the concept of bimodal IT is not without criticism. Remarks and suggestions for improvement range from multimodal approaches, such as trimodal IT (Cohen, 2016; INFINIT Consulting, 2016), to more radical approaches, i.e. the IT organization should be an agile IT as a whole (Forrester Research, 2016; White et al., 2016). Although these commercial approaches sometimes differ substantially, they agree that agile IT setups help organizations master digital transformation. However, these approaches only superficially describe specific design options relevant for implementing agile IT setups. As one of the first initiatives to examine this practical stream from a scientific perspective, Horlach et al. (2016) conducted a review of the literature, describing the concept and important characteristics of

bimodal IT. Furthermore, they discussed the implications for business IT alignment and governance, caused by such IT organizations. Thereby, their work serves as a basis for the identification of relevant design options for agile IT setups.

3 Research Method

Taxonomies enable researchers and practitioners to understand, analyze, and structure the knowledge within a specific field (Nickerson et al., 2013). Often used interchangeably with terms such as 'typology' or 'framework', taxonomies are classification schemes of dimensions and characteristics that describe empirically or conceptually derived systems of grouping (Nickerson et al., 2013). Developing a taxonomy of design options for agile IT setups is reasonable as this field is comparatively young and low on theoretical insights (Gregor, 2006). In fact, current discussions on the implementation of agile IT setups is dominated by commercial and consulting literature (Horlach et al., 2016). In this study, we applied the taxonomy development method proposed by Nickerson et al. (2013). When applying this method, it is essential to define a meta-characteristic, reflecting the taxonomy's purpose, as well as to specify objective and subjective ending conditions. Based on the meta-characteristic and the ending conditions, Nickerson et al. (2013) suggest to iteratively combine conceptual-to-empirical and empirical-to-conceptual approaches. The first step in the conceptual-to-empirical approach is to conceptualize the taxonomy's design dimensions and corresponding characteristics. The second step is to map real-world objects to the dimensions and characteristics, resulting in an initial or revised taxonomy. In the empirical-to-conceptual approach, real-world objects are identified first. These objects are then grouped into dimensions and characteristics, leading again to an initial or a revised taxonomy. Nickerson et al. (2013) recommend applying both approaches iteratively until the ending conditions are met.

In our taxonomy development process, we defined the following meta-characteristic in line with our research question: *Characteristics of design options for agile IT setups.* Furthermore, our taxonomy development process is based on the following objective ending conditions as proposed by Nickerson et al. (2013): (1) each characteristic is unique within its dimension, (2) each dimension is unique within the taxonomy, and (3) at least one real-world object must have been identified per characteristic and dimension. Nickerson et al. (2013) propose another ending condition that requires characteristics to be mutually exclusive. In line with other recently proposed taxonomies, we allow for non-exclusive characteristics per dimension (Püschel et al., 2016). This ending condition could be easily met by including relevant combinations of characteristics into our taxonomy. However, our examination of real-world agile IT setups showed that this ending condition would lead to significantly more characteristics, resulting in a non-parsimonious taxonomy. Since this would contradict our objective of improving transparency about agile IT setups, we agreed on a subjective ending condition instead. This ending condition holds if the taxonomy reaches conceptual saturation, i.e., the taxonomy development process ends as soon as an iteration does not imply further modifications of the taxonomy. To foster the understandability of our taxonomy, we ordered the dimensions from business to technical topics.

With little data about real-world agile IT setups being available, we decided to start our taxonomy development process with a conceptual-to-empirical iteration (Nickerson et al., 2013). In this iteration, we identified essential dimensions of agile IT setups, studying relevant literature related to (bimodal) IT organizations and IT ambidexterity. To revise the initial taxonomy, we then chose an empirical-to-conceptual iteration. As the existing literature – be it academic or commercial – does not provide sufficiently detailed information about agile IT setups and as classifying real-world agile IT setups requires substantial in-depth knowledge about the organization in focus, we decided to conduct semi-structured expert interviews. The expert interviews not only yielded relevant practical insights, but also resulted in various modifications that clarified and enhanced our initial taxonomy. As the revised taxonomy did not meet the subjective ending condition of conceptual saturation, we conducted a third iteration, adopting the empirical-to-conceptual approach again. For this purpose, we created a classification profile of the agile IT setups of the organizations involved in the second iteration based on our interpretation of the

coded interviews. We then sent these classification profiles to the interviewees along with the revised taxonomy, asking for feedback on both the taxonomy and the proposed classifications. In this iteration, the interviewees did not request any changes to the taxonomy and proposed only marginal re-classifications of their organizations' agile IT setups. Accordingly, we were confident to have met the subjective ending condition of conceptual saturation. Since all objective ending conditions were met as well, we decided to refrain from another iteration with additional interviews.

In the second iteration, we conducted semi-structured interviews to receive expert feedback on our initial taxonomy as well as rich insights into their organizations' agile IT setups (Table 1). Qualitative interviews are well-suited for explorative and complex studies because they enable accounting for the respondents' specific context (Schultze and Avital, 2011). Our interviews included closed- and open-ended questions to ensure in-depth results. We identified the interviewees by expert sampling (Bhattacherjee, 2012), i.e., all interviewees were part of our industry network and selected because we knew that they were currently heavily involved in implementing an agile IT setup in their organizations, irrespective of their individual role or contextual setting. We also took care that the experts stemmed from various industries to offset potential biases. In total, we conducted seven interviews from July to August 2016, capturing insights from five different organizations as cases of agile IT implementations. Thereof, two interviewees provided information on the same organization (case 3). Moreover, one interviewee was a freelance consultant and could therefore not be associated with a specific organization. We introduced our research project via email, asking for the experts' support in the form of telephone interviews. The interviews lasted between 45 and 75 minutes and at least two of the authors were present in each of the interviews. The interviews were recorded and systematically analyzed, involving all four authors.

Interview	Role of the interviewee	Case	Industry	Employees (2015)	Revenue (2015)
1	Managing Director	1	Energy	>1,750	1.4 bn. €
2	Chief Information Officer	2	Banking	>6,000	2.9 bn. €
3	Project Management Digital Transformation	3	Optics	>24,750	4.5 bn. €
4	Digital Transformation Officer				
5	Commercial Manager / Consultant	4	Information & Communication	>45,750	8.6 bn. €
6	Managing Director	5	Tourism	>150	-
7	Freelancer	-	Consulting	-	-

Table 1.   Descriptive details on the seven semi-structured expert interviews

Following a semi-structured interview guide (Myers and Newman, 2007), we addressed three major topics: The first part of the interview consisted of a short mutual introduction and information on our research topic. The second part focused on the interviewees' experiences with agile IT setups. In the third part, we discussed our taxonomy structured along the dimensions we identified in the first iteration. Thus, the exploratory section at the beginning helped us get a general understanding of the concept of agile IT, before we compared the interviewees' perspectives with our taxonomy (Schultze and Avital, 2011). We recorded the interviews and used open coding to interpret the interviews because it does not restrict the analysis. Open coding facilitates the integration of insights resulting from our explorative approach with the theoretical taxonomy initially derived from the literature (Saldaña, 2009).

4   A Taxonomy of Design Options for Agile IT Setups

In the following, we present our resulting taxonomy which we achieved after conducting one conceptual-to-empirical and two empirical-to-conceptual iterations of the taxonomy development method (Table 2). For this, we explain the practical relevance of each dimension and characteristic and outline whether it has been derived from literature or identified in one of the conducted interviews.

Dimension	Characteristics			
Scope	Innovate	Develop	Operate	Market
Institutionalization	Temporary		Permanent	
Accountability	IT Department	Business Department	Separate Department	Separate Legal Entity
Governance	Corporate		Proprietary	
Location	Onsite IT Department	Onsite Business Department	Onshore	Offshore
Staffing	IT Department	Business Department	External Provider	New Hiring
Technical Integration	Not Integrated		Partially Integrated	Fully Integrated

Table 2.   Taxonomy of design options for agile IT setups

Scope

As agile IT setups commonly coexist with traditional IT departments, the tasks assigned to agile IT can vary greatly between different setups (Horlach et al., 2016; White et al., 2016). Based on the consolidated input derived from interviewees and literature, we defined the characteristics ***innovate***, ***develop***, ***operate***, and ***market*** as the four major tasks of agile IT setups. None of these characteristics, however, restricts the scope of the traditional IT, which may perform the same tasks as well. By innovate, we understand all activities that relate to the ideation and innovation of new use cases, products, or services. Develop subsumes all activities required for the implementation of new use cases, products, or services. The third characteristic operate comprises all activities necessary for running the products and services. The fourth characteristic market applies when the agile IT setup has direct or indirect access to internal or external clients and is responsible for the distribution of products or services. Almost all interviewees agreed that the first two characteristics, namely innovate and develop, are the most relevant tasks for agile IT setups. One of the seven interviewees emphasized that the operate task has a high demand for reliability. In accordance with the focus areas of agile and traditional IT setups (see Section 2), this is the reason why that interviewee favors traditional IT setups to operate products and services. Therefore, the decision regarding the scope of agile IT setups strongly depends on the criticality of the IT infrastructure or information systems concerned. For instance, if an agile IT setup deals with systems that are required to ensure the availability of core business activities, the operate task should not be part of the agile IT setup. However, there are also approaches that explicitly intent to combine the tasks develop and operate, e.g., DevOps (Callanan and Spillane, 2016). As agile IT setups can perform more than one of the tasks described by the characteristics, this dimension is non-exclusive.

Institutionalization

The next relevant dimension for characterizing agile IT setups is institutionalization, defining how persistently agile IT is anchored in the organization. A possible approach is to set up agile IT for individual projects only, i.e., as a temporary organization (Turner and Müller, 2003). This implies a limited time frame, which influences the resource allocation policy of the agile IT setup, its work content, and even its acceptance in the organization. Thus, we included this dimension in our taxonomy and defined ***temporary*** and ***permanent*** as characteristics. Temporary means that the team and/or resources (e.g., budget, hard- and software) are assigned to the agile IT setup for a limited time frame and distinct purposes only. Permanent means that an agile IT setup features a dedicated core team and resources. This dimension is exclusive, meaning that an agile IT setup can be either temporary or permanent at the same time. Most interviewees agreed that a temporary organizational structure could be advantageous during the initial period of an agile IT setup, providing more flexibility and being easier to implement. Furthermore, our interviews have shown that, in many cases, a gradual transition from a temporary to a permanent setup

offers numerous benefits. Examples for these benefits are the easier creation and dissemination of know-how and the better consolidation of lessons learned.

Accountability

Furthermore, we found accountability to be an important dimension for describing agile IT setups (Horlach et al., 2016). Accountability refers to the department that legitimizes the agile IT setup and is authorized to issue directives. The characteristics associated with this dimension are ***IT department***, ***business department(s)***, ***separate department***, and ***separate legal entity***. The first two characteristics imply that the IT department or one or more business departments have the decisional power over the agile IT setup and are the main recipients of reports. The characteristic separate department applies whenever the agile IT setup is consolidated in a separate department, reporting directly to the management board. The fourth characteristic applies if an agile IT setup is organized in terms of a separate legal entity. In this case, the original organization typically issues directions indirectly by taking strategic positions in the top management or supervisory board. Especially for the definition of the last two characteristics, we substantially benefited from the interviewees' practical experience, as interviewees described settings that already show these characteristics. Although there are impossible combinations of the characteristics (e.g., IT department and separate legal entity), the dimension is not exclusive. An example for an admissible combination of this dimension's characteristics would be an agile IT setup that is simultaneously legitimized by the IT department and one or more business departments.

Governance

Based on their practical experience, three interviewees proposed to include the dimension governance in our taxonomy, describing which internal regulatory framework applies to the agile IT setup. The relevance of this dimension is based on the fact that the governance of agile IT setups may substantially differ from the governance of traditional IT to mitigate organizational barriers and leverage the innovative capability and velocity of agile IT setups (Tiwana and Konsynski, 2010). Accordingly, our taxonomy includes the dimension governance for which we define the characteristics ***corporate*** and ***proprietary***. Corporate applies if all decisions made in the context of the agile IT setup must comply with the internal regulatory framework that also applies to traditional IT. Proprietary is used if the internal regulatory framework of the agile IT setup differs in part or entirely from the internal regulatory framework of traditional IT. As these characteristics are mutually exclusive, the governance dimension is exclusive.

Location

Two interviewees suggested to include the dimension location, capturing where the employees of agile IT setups are physically located. On the one hand, IT organizations are frequently relocated to low-wage countries (Lacity et al., 2009). On the other hand, agile approaches make the case for colocation of team members as well as for close collaboration with end users (Boehm and Turner, 2005). Accordingly, the choice of the location plays an important role when implementing agile IT setups. Thus, we included this exclusive dimension in our taxonomy and defined the characteristics ***onsite IT department***, ***onsite business department***, ***onshore***, and ***offshore***. Onsite IT department and onsite business department refer to agile IT setups where employees are located in or next to the traditional IT or business department, respectively. If the employees of an agile IT setup are located in another office building within the same country as the organization headquarter, the characteristic onshore applies. The last characteristic offshore describes settings where agile IT employees are located in another country.

Staffing

Besides the already presented dimensions, we included the staffing dimension in our taxonomy. This dimension captures from which sources the staff involved in agile IT setups is acquired. This dimension is relevant as the stronger functional involvement of business departments compared to traditional IT setups requires a stronger collaboration among employees of different departments with diverse capabilities (Fink and Neumann, 2007). The involvement of internal and external specialists acquired from different departments and organizations allows for combining various capabilities. Consequently, we considered the characteristics ***IT department***, ***business department***, ***external provider***, and ***new hiring***.

The first two characteristics describe that staff requirements of agile IT setups are met by existing internal departments, providing IT or business people, respectively. The third characteristic indicates that agile IT employees are acquired from one or more external providers (e.g., consulting companies), while the fourth characteristic implies agile IT employees to be acquired from the free labor market. As agile IT setups could acquire the staff simultaneously from multiple sources, this dimension is non-exclusive. What is notable are the controversial views of our interviewees on this dimension. One interviewee deliberately avoided collaborating with external providers when implementing an agile IT setup in his organization. The reason was the potential drain of internal knowledge and the resulting dependence on external providers. Accordingly, this interviewee largely relied on internal employees and new hiring. Another interviewee emphasized the need of external knowledge in terms of new hiring and external providers to build up a sufficient knowledge base to facilitate the scaling of agile IT. A third interviewee underlined the larger demand of external providers and new hiring at least during the ramp-up phase of implementing agile IT setups. That is, the longer agile IT setups exist in organizations, the more sufficient the internal knowledge and the lower the need for external employees.

Technical Integration
Finally, we included a dimension that describes the extent to which agile IT setups are interrelated with extant internal IT resources. Considering the strong interrelation between innovations and their technical implementation, organizations should ensure the technical feasibility and compatibility with existing IT infrastructure (Horlach et al., 2016). However, according to our interviewees, a strong technical integration between agile and traditional IT could also restrict the organization's innovation capacity. This is because a closely technically integrated agile IT setup is very likely to be subject to the same regulatory framework as the traditional IT, which is typically geared toward a safe and steady operating mode. For this dimension, we defined the three mutually exclusive characteristics *not integrated*, *partially integrated*, and *fully integrated*. The characteristic not integrated applies if an agile IT setup has no access to data, hardware, or software of traditional IT. Thereby, the access of agile IT to core business systems, confidential records, and the productive system is restricted. The characteristic partially integrated describes a setting where the agile IT setup has limited access to selected data, hardware, and software. The characteristic fully integrated defines agile IT setups as integral parts of traditional IT with full access to data, hardware, and software. According to our interviewees, the characteristics not integrated and partially integrated are useful, if the organization's regulatory framework restricts its innovation capacity. Thus, a partly or not technically integrated agile IT setup would (partly) get rid of paralyzing regulations. In contrast, a fully technically integrated agile IT setup allows for a seamless transition of products and services from development to operations.

5 Application of the Taxonomy on Five Cases of Agile IT Setups

Based on the interviews we conducted in the second iteration of the taxonomy development process, we collected insights into agile IT setups implemented in different organizations. Beyond enhancing and validating our taxonomy, the interviewees provided us with rich insights into their organizations' agile IT setups and classified their setups according to our taxonomy. Below, we present the application of the developed taxonomy on five cases including the rationale behind the respective design decisions. After that, we perform a cross-case analysis to compare the different agile IT setups. As described in Section 3, the information about the five classifications of agile IT setups was consolidated from six interviews, while the cross-case analysis includes information from all seven interviewees. The cases are summarized in Figure 1.

Scope	Innovate	Develop	Operate	Market
Institutionalization	**Temporary**		Permanent	
Accountability	**IT Department**	Business Department	Separate Department	Separate Legal Entity
Governance	**Corporate**		Proprietary	
Location	**Onsite IT Department**	Onsite Business Department	Onshore	Offshore
Staffing	**IT Department**	**Business Department**	**External Provider**	New Hiring
Technical Integration	Not Integrated	Partially Integrated	**Fully Integrated**	

Case 1 – Energy

Scope	Innovate	Develop	Operate	Market
Institutionalization	Temporary		**Permanent**	
Accountability	**IT Department**	Business Department	Separate Department	Separate Legal Entity
Governance	Corporate		**Proprietary**	
Location	**Onsite IT Department**	Onsite Business Department	Onshore	Offshore
Staffing	**IT Department**	**Business Department**	External Provider	**New Hiring**
Technical Integration	**Not Integrated**	Partially Integrated	Fully Integrated	

Case 2 – Banking

Scope	Innovate	Develop	Operate	Market
Institutionalization	Temporary		**Permanent**	
Accountability	IT Department	Business Department	**Separate Department**	Separate Legal Entity
Governance	Corporate		**Proprietary**	
Location	Onsite IT Department	Onsite Business Department	**Onshore**	Offshore
Staffing	**IT Department**	**Business Department**	**External Provider**	**New Hiring**
Technical Integration	Not Integrated	**Partially Integrated**	Fully Integrated	

Case 3 – Optics

Scope	Innovate	Develop	Operate	**Market**
Institutionalization	Temporary		**Permanent**	
Accountability	IT Department	Business Department	**Separate Department**	Separate Legal Entity
Governance	**Corporate**		Proprietary	
Location	**Onsite IT Department**	**Onsite Business Department**	Onshore	Offshore
Staffing	**IT Department**	**Business Department**	External Provider	New Hiring
Technical Integration	Not Integrated	Partially Integrated	**Fully Integrated**	

Case 4 - Information & Communication

Scope	Innovate	Develop	**Operate**	**Market**
Institutionalization	Temporary		**Permanent**	
Accountability	IT Department	Business Department	Separate Department	**Separate Legal Entity**
Governance	Corporate		**Proprietary**	
Location	Onsite IT Department	Onsite Business Department	**Onshore**	Offshore
Staffing	IT Department	Business Department	**External Provider**	**New Hiring**
Technical Integration	Not Integrated	**Partially Integrated**	Fully Integrated	

Case 5 – Tourism

Figure 1.   Taxonomy classification

Case 1 – Energy

The organization in case 1 attributed great importance to the digital transformation of the energy industry. Especially, the teams working on portal and web development are facing new challenges due to increasing requirements resulting from rapidly changing customer demand, innovative specifications, and shorter development cycles. To tackle these challenges, the organization developed a new IT strategy that includes the setup of an agile IT. In this strategy, the organization decided not to split the organization's IT into agile and traditional IT, but to set up agile teams whenever reasonable. Thus, the agile IT setup of this organization comprises agile teams collaborating for a limited timeframe to innovate and develop new products and services related to customer portals and web development. Consequently, the respective interviewee classified the scope of his organization's agile IT as innovate and develop and the institutionalization as temporary. The accountability for agile IT is assigned to the IT department, and the agile teams are subject to the corporate governance. Further, the teams are situated next to the IT department and are staffed by employees of the traditional IT, business departments, and external providers. The agile teams are also fully technically integrated, which allows the organization's IT department to decide for every project, whether it should be conducted by agile or traditional IT.

Case 2 – Banking

According to interviewee 2, one of the major challenges the banking industry currently faces is to be compliant with various regulatory guidelines. As for the organization's IT, this results in exceptionally high standards inhibiting the innovation capacity. Thus, the organization implemented a permanent agile IT setup largely exempted from regulatory guidelines. This setup serves as a think tank and experimental laboratory within the bank. This experimental laboratory mainly innovates new products and services and develops initial prototypes. As, in this organization, knowledge about agile methods is mainly located in the IT department, this department accountable for the agile IT setup. Moreover, the organization decided to locate its agile IT next to the IT department for close cooperation. To allow the agile IT setup not to be subject to the regulatory frameworks applying in the banking industry, agile IT is not technically integrated and subject to a proprietary governance. To ensure the separation of agile and traditional IT, the organization operates a separate infrastructure. There are currently no employees exclusively dedicated to the experimental laboratory, as it is at a very early developmental stage. It rather offers the employees of IT and business departments the opportunity to exchange creative and innovative ideas and to cooperatively work on prototypes on a voluntary basis. In the future, the agile IT setup will be staffed with dedicated employees of the IT and business department as well as with new hiring. According to interviewee 2, the use of external providers should preferably be avoided, since this could probably entail the risk of transferring knowledge to competitors. Moreover, he is convinced that changing the bank must be driven from within the bank.

Case 3 – Optics

In case 3, the organization's motivation for implementing an agile IT setup is similar to that of case 2. According to interviewees 3 and 4, the overall objectives of the organization's agile IT are to identify emerging markets and new business models as well as to create disruptive solutions matching the requirements of these markets and business models. Consequently, the agile IT setup was intended to serve as an experimental laboratory, increasing the organization's innovation capacity and contributing to the organization's digital transformation. For this, the organization implemented its agile IT setup as a permanent and separate department directly reporting to the executive board. The agile IT setup focuses on both the innovation of new products and services and their development. There is a hand-over to the traditional IT department as soon as a first running prototype of a new product or service exists. To enable the transition to the traditional IT with minimum effort, the agile IT setup is partially technically integrated. The rationale behind this choice is that a full integration would have resulted in a stricter governance framework, most probably reducing the innovative capability. To combine as much relevant knowledge as possible, the agile IT setup acquires employees from internal and external sources. These employees are located onshore in a building next to one of the organization's locations in Germany.

Case 4 – Information & Communication

A specific characteristic of case 4 compared to the previously presented organizations is that its business model is based on providing cloud services. As a consequence, the business departments of this organization can be equated with IT departments of other organizations. Accordingly, the focus on IT is considerably higher than in many organizations of other industries. Over the past years, the organization aligned its IT and the corresponding processes with the demand of large customers, requiring large long-term cloud computing capacities. However, customer needs changed in the last few years. Besides the large and long-term capacity demand, customers also request small short-term capacities and especially the fast provision of new and customer-specific solutions. Correspondingly, the organization built up a permanent agile IT as a separate department, innovating, developing, and marketing new products and services to meet new customer needs. The operation of these products, however, is carried out by the traditional IT department, as this task does not essentially differ for the products of agile and traditional IT. Furthermore, the accountability of the agile IT setup is assigned to a separate department, provisioning these small short-term cloud computing capacities. The agile IT employees are located next to the IT and the business departments to facilitate continuous exchange. These employees are primarily acquired from the IT and the business departments, as they already have relevant knowledge about the products and the organization itself. Accordingly, the organization does not depend on external providers. To allow for a seamless transition from the development performed by agile IT to the operations performed by the traditional IT, the infrastructures are fully technically integrated.

Case 5 – Tourism

In recent years, the tourism industry has undergone substantial changes. Two of the major changes are the increasing importance of digital sales channels and the resulting opportunity for services providers (e.g., hotel operators) to sell their services directly to travelers without travel agencies as intermediaries. These changes have decreased the market entry barriers for new players. Thus, travel agencies are under pressure to offer innovative and attractive products to differentiate from competitors. The organization in case 5 decided more than two years ago to build up a separate legal entity to concentrate its efforts in online sales. The core of this separate legal entity is a permanent agile IT setup, which is highly involved in the entire value chain including the innovation, development, operation, and even marketing of new products and services. This broad scope requires an end-to-end responsibility of the agile IT setup for all IT value creation processes resulting in the reduction of coordination effort. Although the agile IT setup is generally subject to corporate governance, it is occasionally developing its own standards and guidelines that facilitate agile innovation and realization of new products and services. Thus, agile IT is subject to a proprietary governance. During its ramp-up phase, the agile IT setup acquired its staff mainly from external providers and the free labor market, since the required skills were hardly available in the organization. The agile IT employees are situated close to other departments of the organization and both, agile and traditional IT, are partially integrated to facilitate the exchange.

Cross-case Analysis

A comparison of our five cases reveals that there are different possibilities to implement agile IT setups (Figure 1). For example, the analyzed agile IT setups differ in scope. Case 2 represents a setup where the scope of agile IT only covers the innovation and development of initial prototypes. Case 5, in contrast, showcases a setting where agile IT innovates, develops, markets, and even operates own products and services. Regarding the institutionalization, we experienced an agile IT setup consisting of small temporarily composed teams assembled for individual projects (case 1). In contrast, there was another setup describing agile IT implemented as a permanently existing separate legal entity (case 5). Accordingly, even though individual agile IT setups seem to perfectly assist the respective organizations in achieving their objectives, they fundamentally differ. Thus, there is no one-size-fits-all agile IT setup. Consequently, there are internal and external contextual factors determining which agile IT setup is most appropriate. Below, we elaborate on potential contextual factors. With our work focusing on the development of a taxonomy, please note that we can only hypothesize about contextual factors, as we did not investigate sufficiently many cases to make empirically valid statements.

An essential factor affecting agile IT setups is the objective for which the organization strives by implementing agile IT. In cases 2 and 3, for instance, the organizations' major motivation was to enhance their innovative capability. Thus, both organizations implemented experimental laboratories. However, even though both organizations gave agile IT certain degrees of freedom by defining a proprietary governance, the implementation of the agile IT setup slightly differed. As an example, case organization 2 fully detaches and case organization 3 partly detaches its agile IT setup from internal IT resources. This discrepancy is caused by different external regulatory frameworks. The regulatory framework applying to financial service providers is much more restrictive if there is any connection to core systems. Thus, in case 3, the products and services developed by agile IT could be applied with less effort due to the less restrictive framework. As a result, the agile IT setup of case 3 focuses more on the development of own products and services than the setup in case 2 which is part of the banking industry. In contrast to the cases 2 and 3, the major motivation of the organizations in cases 1, 4, and 5 was a faster reaction to customer needs. Thus, all three organizations implemented a setup that combines innovation and development. In cases 4 and 5, the agile IT setup also markets own products and services, whereas in case 5 agile IT even operates them. Although, in case 5, standards and guidelines occasionally arise from the agile IT setup, all three cases of agile IT are subject to the organizations' corporate governance, which facilitates the operation and/or marketing of products.

Another important factor affecting agile IT setups is its temporal development. The setups illustrated in Figure 1 are snapshots of various agile IT setups in different developmental phases. In case 2, for example, the organization recently founded an agile IT, which is still in the initial ramp-up phase. Currently, it is legitimized by the IT department and located next to traditional IT to optimally use the IT employees' agile competences in this early period. However, interviewee 2 emphasized that their agile IT setup has not reached a final state. The plans include that the IT department should not solely legitimize agile IT, but the influence of the business departments should gradually increase. Thereby, the involvement of the business departments should enhance, probably resulting in an even higher innovative capability. Also in case 3, the agile IT setup was still in the ramp-up phase. The organization in case 3 has already gained experiences with agile approaches as there have been small agile teams, each consisting of two or three employees. These teams represent the first stage of the organization's agile IT. Currently, the agile IT setup is consolidated in a separate department and the plan is to increase the number of employees to more than 70. Compared to cases 2 and 3, the cases 1, 4, and 5 depict agile IT setups that were initiated some time ago. Since the organization in case 1 decided to define an agile IT setup that comprises temporarily composed teams, it could build its agile IT setup with little effort and in a short time. Thus, this setup allowed for skipping a time-consuming ramp-up phase. Since the setup perfectly matches the organization's requirements, the interviewee currently sees no need to further develop the agile IT setup in the near future. Nevertheless, according to the interviewee, the long-term transition from a temporary to a permanent agile IT could be reasonable. The organization in case 4 implemented its agile IT setup as a permanent and separate department from scratch. Accordingly, the initial ramp-up phase required a lot of preparatory effort, for instance due to the coordination of several stakeholders. Moreover, the agile IT employees are almost exclusively acquired from internal sources as this organization, being active in the IT industry, already had many necessary competences in its IT and business departments. The agile IT setup of case 5 started in 2014 as a permanent separate legal entity with about 20 employees. As the organization could not provide the necessary competences, the organization primarily used new hiring and external providers to get required staff. Since then, the agile IT setup grew up to over 150 employees, but the organizational setup as a whole has not substantially changed. In cases 4 and 5, the respective organizations currently do not see a need to significantly change their agile IT setups, as they appropriately contribute to the organizations' objectives.

In sum, comparing the five cases illustrates that individual agile IT setups differ greatly, as they depend on various external and internal contextual factors. Examples for such contextual factors are the regulatory framework, the innovative pressure within the respective industry, the competences available in the

organization when initiating the agile IT setup as well as the motivation for and the temporal development of the agile IT setup.

6 Conclusion and Outlook

Considering the increasing importance of agile IT for digital transformation, we analyzed design options for agile IT setups. To do so, we developed a taxonomy of design options for agile IT setups following Nickerson et al.'s (2013) taxonomy development method. Our taxonomy comprises seven dimensions that help to answer relevant questions when setting up agile IT. These dimensions are scope (Which tasks does agile IT perform?), institutionalization (How persistently is agile IT anchored in the organization?), accountability (Which department legitimizes agile IT and is authorized to issue directives?), governance (Which governance framework applies to agile IT?), location (Where are the employees of agile IT physically located?), staffing (From which sources does agile IT acquire employees?), and technical integration (How strongly is agile IT integrated with existing IT resources?). In line with the iterative nature of the taxonomy development method, our taxonomy builds on extant knowledge on IT ambidexterity and IT organizations as well as on the insights of industry experts. We involved experts (e.g., Chief Information Officers, Digital Transformation Officers, and Managing Directors of IT departments) from various industries (i.e., banking, consulting, energy, information and communication, optics, and tourism) not only to validate our taxonomy for real-world fidelity and understandability, but also to apply the taxonomy for classifying their agile IT setups. On the one hand, our study adds to the descriptive knowledge on IT organizations and agile IT, increasing our understanding of agile IT setups and establishing a foundation for higher-order theories (Gregor, 2006). On the other hand, our study delivers practical insights into the agile IT setups of five different organizations, delineating the essential design options for IT decision-makers confronted with the task to build up agile IT. In a cross-case analysis, we already found that organizations have different motivations and approaches for implementing agile IT setups, depending on internal and external contextual factors (e.g., environmental dynamism, existing innovation capabilities, and knowledge on agile methods). In fact, there is no one-size-fits-all agile IT setup, which is why IT decision-makers must carefully assess their organizations' context when determining an appropriate agile IT setup.

Our taxonomy is beset with limitations that stimulate further research. First, agile IT is a dynamically evolving field that offers many design options, contingent to organizations' contexts. Although our taxonomy considers extant literature as well as empirical insights and although it was not subject to changes in the last iteration of the taxonomy development process, we cannot guarantee to have covered all possible dimensions and characteristics. Future research should involve more organizations in further empirical-to-conceptual iterations, increasing our initial sample size of seven expert interviews. Second, we treated the dimensions included in the taxonomy as independent. However, not all characteristics can be freely combined, e.g., an agile IT setup that operates own products and services cannot be institutionalized temporarily. Future research should explore dependencies both within and across dimensions. Third, in our opinion, the most worthwhile direction for future research is the identification of archetypes for agile IT setups based on more classified cases. Such archetypes may be identified via a cluster analysis and, in a second step, be correlated with a structured set of internal and external contextual factors. Such a multi-method research design could compensate for the subjective nature of the expert interviews in our study. Archetypes would also allow for taking a longitudinal perspective on the evolution of agile IT setups in organizations. All these results planned for future research would not only add to the descriptive, but also to the prescriptive knowledge on agile IT, which would provide practitioners with guidance on how to choose among alternative agile IT setups.

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