A BUSINESS COMPETENCY FRAMEWORK WITHIN DIGITAL TRANSFORMATION - AN EMPIRICAL STUDY

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Research Paper

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Abstract

The goal of the present research is to develop a comprehensive Digital Transformation Competency Framework that considers the requirements of different hierarchical levels within companies in the Digital Transformation (DT). Therefore, it is necessary to identify and structure cognitive aspects as well as the affective competencies required for a successful DT. Special attention was paid to the empirical approach and transferability into practice. A comprehensive literature review, which included sources from both science and industry, identified a total of 32 competencies in six categories. A survey of n=46 experts from science and industry confirmed the relevance of the competencies and helped to define the competencies more precisely. Finally, the applicability of the developed framework was tested and validated in an application case. Thus, the framework provides a valid basis for further research and represents a valuable contribution to the Information System discipline on several levels. In addition to a precise definition of the individual validated competencies, the framework enables the development of requirement profiles in different contexts within the digital transformation.

Keywords: Digitalization, Competency Framework, Digital Competency, Digital Transformation, Requirement Profiles.

1 Introduction

Digital transformation (DT) plays a key role for companies to maintain their competitiveness and to adapt the company to changing conditions (Charias et al., 2019). Comprehensive changes in business processes and strategies are often necessary to keep pace (Ravichandran, 2018). For example, Bharadwaj et al. (2013) also recommends a complete rethink in the development of information technology strategies to holistic digital business strategies. The four key topics identified underline the central character that digital technologies assume in the business context and lead to changed competency requirements (Bharadwaj et al., 2013).

The current Covid-19 pandemic has also proven to be a complementary driver for digitalization, forcing even traditional companies to rethink within a very short time and putting existing business models to the test (Benbunan-Fich et al., 2020). During this rapid change, shortcomings in the competencies needed to implement the DT became particularly apparent and revealed the need for a structured framework of these competencies. The fact that competency is a decisive factor for the success or failure of digitalization has already been extensively proven (Ferrari, 2013, 2012). Since many problems in the process of digitalizing companies are not only of a technological and infrastructural nature (Majchrzak et al., 2016), special attention should also be paid to the human component, which supports the entrepreneurial innovation process (Matt et al., 2015; Shahlaei et al., 2017; Murawski and Bick, 2017). Therefore, this framework should take into account both, the frequently examined cognitive aspects as
well as the affective competencies. Chakravarty et al. (Chakravarty et al., 2013) suggest a connection between individual and corporate performance, arguing that IT competencies are moderated by a multitude of factors resulting from the environment and context. Further, it has already been found that there are organizational and management characteristics that support the DT (Matt et al., 2015; Hess et al., 2016), so that a consideration on several levels is necessary. The goal of the present research is to develop a comprehensive Digital Transformation Competency Framework that takes into account the requirements of different hierarchical levels within companies in the DT.

2 Research Context

The terms “digital transformation” or “digitalization” are defined very differently depending on their context and perspective (Bouza, 2018; Irriger, 2017; Schallmo, 2019; Westerman et al., 2011; Bloem et al., 2014; Petry, 2016; Matt et al., 2015; Mertens et al., 2017; Solis et al., 2014), but one of the most widely used definitions in the Information Systems (IS) literature is that of Vial (Vial, 2019), which defines DT as “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies”. This definition is based on a comprehensive literature search of 2019, which will also be used as basis for the following. The consulting industry in particular pays great attention to these reports and studies on the benefits and potential pitfalls, focusing on the managerial perspective and the required competencies (Matt et al., 2015; Hess et al., 2016; Gimpel et al., 2018; Back and Berghaus, 2016). For this reason, in addition to the scientific literature, we also intend to incorporate findings from practical experience into the framework modeling process. Especially in practice, however, terms are not always precisely differentiated, which is the reason why they must be considered in advance. There are different definitions of the term "digital competence" and "competence" in general. Thus, the boundaries of "competence" and "competency" are difficult to grasp (Moore et al., 2002; Hayton and Kelley, 2006; Spencer and Spencer, 1993; Dubois et al., 2000). Often competence is understood as an area of work or responsibility, whereas competency means the attributes and skills that contribute to performing this area of work (Moore et al., 2002). In this research we focus on the attribute and skill perspective and therefore follow the more general definition of competencies as “a collection of skills, abilities, and attitudes to solve a problem in a given context” (Pawrowski and Holtkamp, 2012) to ensure that all relevant attributes – cognitive as well as affective - of actors at different hierarchical levels are considered.

Existing competency models usually focus on students (Ferrari, 2012; Alexander, 2017) or are limited to a specific industry (Hess et al., 2016) and do not focus on digital transformation competency (DTC) and are therefore not widely accepted models. At this point there is still a white spot in the IS literature, especially since the focus of existing publications is mostly limited to the management level (Bhatt and Grover, 2014). DTC of the workforce have often been overlooked in personnel management but recently, there seems to be a paradigmatic shift: Hess (Hess et al., 2016) asks for the skill–development of existing workers and as well as skills required for future workers forming the digital workforce (Colbert et al., 2016; Watson, 2017). Identifying these skills and abilities is a challenge that goes beyond the field of human resources (Karimi and Walter, 2015; Singh and Hess, 2020) and can serve as a link to other disciplines. This is where IS research can make a significant contribution to the multidisciplinary knowledge base. This paper thus forces the following research question:

RQ: Which cognitive and affective competencies are relevant in companies in the ongoing process of digital transformation?

This paper thus makes a decisive contribution to a more comprehensive understanding of DT at four points: It summarizes existing insights and frameworks into a comprehensive framework, taking into account both individual and corporate requirements (1). In addition, these results are validated and weighted with the help of empirical studies (2), thus ensuring their relevance. In addition, a precise definition (3) of the identified relevant competencies will be carried out with the help of experts, which will provide a valid starting point for further investigations. Finally, on the basis of the knowledge gained, application cases are tested (4) in order to identify different requirement profiles and validate
the transferability to other research setups. A holistic framework that takes into account the different perspectives represents a significant added value for the IS-literature and forms a solid basis for more in-depth evaluation instruments and training concepts.

3 Building a Competency Framework for Digital Transformation

The goal of the present research is to develop a comprehensive Digital Transformation Competency Framework that takes into account the requirements of different hierarchical levels within companies in the DT and enables the identification of role profiles.

3.1 Method

A multi-level methodological approach was chosen to model the desired framework. Based on a comprehensive literature review, potentially relevant competencies were to be identified and then examined by experts with regard to their relevance. By additional expert comments, the framework should be extended in the form of definitions of the individual competencies before the framework is tested for its applicability and completeness in a specific scenario.

To generate a comprehensive and up-to-date overview of identified competencies and competencies in the context of digital transformation, taking into account both the manager and the worker perspective a structured literature review was conducted. Therefore, we followed the established recommendations for a concept-based literature search (Webster and Watson, 2002) to find existing Digital Competency Frameworks respectively additional specific digital competencies. Additionally, we integrate the findings from Vom Brocke et al. (Vom Brocke et al., 2009) regarding the procedure within a literature review and follow the taxonomy proposed by Cooper (Cooper, 1988).

We operationalized the general review approach by using an iterative process of definition, clarification and refinement within our research team to identify the main keywords and search terms for our strategic search (Higgins and Green, 2012). The following search terms were used in the initial search: Digital Literacy, Digital Competence, Digital Competency, Digital Self-Assessment Tools, Digital Competency Model, Digital Skill, Digital Ability, Digital Competence Framework, DC-Model. The literature search is therefore not limited to certain journals and conferences of Information Systems (Lowry et al., 2013), but considers interdisciplinary databases AIS Library, IEEE Explorer, Springer Link, ScienceDirect, EBSCO Information Services and Elsevier Science. In addition to purely scientific publications, studies realized within the context of nationally and internationally influential companies were also taken into account due to their great practical relevance. To expand our search, we also went forward and backward from our initial results (Webster and Watson, 2002). The research considered sources in English and German language. Only sources that meet the following criteria has been defined as relevant:

- Published in the past 15 years (2005-2020)
- Contains defined digital competencies
- Relevant for a general company context
- Based on a scientific/solid foundation

These criteria made it possible to reduce the initially 194 identified publications to 29 sources, which form the basis for the subsequent concept matrix (Webster and Watson, 2002). The sources were analyzed with regard to the business competencies specified as relevant for a successful digital transformation. To create the concept matrix, we used the approach proposed by Salipante (Salipante et al., 1982), starting with the most comprehensive sources and successively adding the other publications. In doing so, a constant degree of abstraction of the individual competencies was ensured and similar competencies were combined in order to obtain a manageable framework that nevertheless takes into account and depicts the multi-layered dimensions of the competencies necessary for a successful digital transformation. Within this step, 32 competencies were identified, which according to the literature from science and practice are relevant for a successful realization of digital transformation within companies. In addition, a categorization was synthesized from the literature, which makes the framework clearer and thus facilitates its transfer into practice. The six categories ("Learning", "Understanding", "..."
"Analyzing", "Creating", "Communicating", and "Managing") also reflect the different requirement levels of the included competencies (Carretero et al., 2017; Ferrari, 2012). Within the development of the concept matrix, a first preliminary definition of the individual competencies was derived based on the summarized literature, which will later be supplemented and refined by experts. See the findings in the next chapter.

The completeness and relevance were validated by an online survey of experts (n=46), who were asked to rate the relevance of the mentioned competencies in the context of a successful digital transformation using a Likert scale and to provide additional feedback regarding comprehensibility.

The evaluation of the collected data contains a quantitative as well as a qualitative part. By coding the relevance, quantitative evaluations can be made, whereas the free text comments were evaluated qualitatively in order to make the definitions more precise and to take into account all perspectives addressed. The procedure of the qualitative analysis is based on the recommendations and quality criteria according to Mayring (2014) and leads to precise definitions of the identified competencies, which covers all mentioned perspectives of the experts. The quantitative evaluation of the average relevance of the individual competencies was used to establish a ranking of the competencies and to ensure the fundamental relevance of all identified competencies.

The insights gained in this first empirical study were used to further improve the competency framework with regard to its definitions and structure and to close blind spots. In a first complementary study, the competency framework was finally tested for its transferability into practice. First, the roles of managers and employees were differentiated based on an online survey of experts. Here, too, the experts were able to contribute to the optimization of the competency framework by providing additional comments. In a second study, the competency framework was used in a specific context to differentiate between three roles within the company and to derive competency profiles. The most important methodological steps are summarized in Table 1 below.

<table>
<thead>
<tr>
<th>Methodical Step</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1 <strong>Structured Literature Review</strong></td>
<td>Concept-based literature search (Webster and Watson, 2002)&lt;br&gt;Iterative process of definition, clarification and refinement to define search terms (Higgins and Green, 2012): Digital Literacy, Digital Competence, Digital Competency, Digital Self-Assessment Tools, Digital Competency Model, Digital Skill, Digital Ability, Digital Competence Framework, DC-Model, Identification of 32 competencies based on IS Literature (Lowry et al., 2013) and interdisciplinary databases: AIS Library, IEEE Explorer, Springer Link, ScienceDirect, EBSCO Information Services and Elsevier Science&lt;br&gt;Consideration of practical studies from international companies&lt;br&gt;Additional forward and backward research (Webster and Watson, 2002)</td>
</tr>
<tr>
<td>2 <strong>Synthesis / Reduction</strong></td>
<td>Defining inclusion criteria: Published in the past 15 years; Contains defined digital transformation competencies; Relevant for a general company context; Based on a scientific/solid foundation&lt;br&gt;Reducing the 194 identified sources to 29 relevant publications&lt;br&gt;Developing concept matrix (Webster and Watson, 2002; Salipante et al., 1982)</td>
</tr>
<tr>
<td>3 <strong>Categorization</strong></td>
<td>Using existing categories to structure identified competencies to develop framework (Carretero et al., 2017; Ferrari, 2012)&lt;br&gt;Learning, Understanding, Analyzing, Creating, Communication, Managing</td>
</tr>
</tbody>
</table>
| 4 **Empirical study** | Using expert online surveys for result validation (n=46)<br>Expert = Employee or Manager with experience in DT or scientists in DT<br>Query the relevance of the competencies with the help of a Likert scale<br>0 = unimportant, 1 = less important, 2 = neutral, 3 = important, 4 = very important & "I can not judge"
Possibility of additional comments |
Competency Model Improvement
Using expert comments for precise competency definition
Ranking of competencies regarding their relevance

Application scenarios – evaluating usage
1) General role differentiation: Employee – Manager
2) Specific role differentiation in workshops for people with disabilities:
   Manager – Employee – People with disability

<table>
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<tr>
<th>Table 1. Methodological Research Steps</th>
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### 3.2 Synthesized DTC Framework

To get a better overview of the identified competencies and to facilitate the identification of focus areas, a categorization should be introduced. In the area of competency research, there are various approaches to categorization, such as Bloom (Bloom, 1956), Krathwohl (Krathwohl, 2002), Bartram (Bartram, 2005) and Salgado (Salgado, 2002). However, these taxonomies are limited in their consideration of competencies to specific perspectives, so that they could not be adopted exactly. In order to map the combination of technological and administrative competencies with individual competencies, we developed the following categories based on existing literature (Ferrari, 2012; Carretero et al., 2017): I Learning (L), II Understanding (U), III Analyzing (A), IV Creating (CR), V Communicating (CO), VI Managing (M). We believe that this categorization also takes into account the different levels of competency (Krathwohl, 2002) and at the same time allows for easy transfer into practice through precise wording. The Competency Framework for DT is illustrated in figure 1 below.

![Competency Framework for Digital Transformation](image-url)

**Figure 1. Competency Framework for Digital Transformation**

From the 29 sources identified as relevant, 32 cognitive and affective competencies could be determined using the methods described in the methodological part, which the literature regards as the basis for a successful DT. These competencies take into account not only purely technological skills, but also personal characteristics and attitudes. In the following, these categories as well as the underlying categorization should be proven in further empirical studies. A final definition is only possible after integration of the expert feedback in the next step. Additional competency description is attached in the appendix.

### 4 Empirical Testing and Refinement

For the validation of the competency framework, an empirical approach was chosen, which takes up the experience of experts in the field of digital transformation. Experts are defined as persons who work as employees or managers in a company that is already in an advanced stage of digital transformation or scientific actors who theoretically deal with the competency requirements within a digitalized working...
environment. A total of 46 experts were recruited for a more detailed survey based on the previous literature review. Of the 46 respondents, 10 were female and 36 male, and 24 participants in the study could be assigned to the expert group from industry and 22 to science.

All 46 experts took part in an online survey, which can essentially be divided into two parts. In the first part, demographic data was asked for, such as age, professional position, and work experience. These data were used to ensure the robustness of the empirical data (Döring and Bortz, 2016). In the second part, the participants were first asked to assess the relevance for a successful digital transformation within a company on a Likert scale of 0-4 for each previously identified competency. Here 0 = unimportant, 1 = less important, 2 = neutral, 3 = important, 4 = very important. In addition, the selection “I cannot judge” could be chosen. In the final step, the participants could make additional comments regarding the completeness of the competencies and the definition.

The query of the relevance of the identified competencies can be read in the following figure 2 with the help of mean values, which could be generated with the help of the coding. A value of two stands for a neutral assessment whereas a value of three confirms a relevance. All values are clearly above the neutral assessment and a large part even above the clear relevance. With a Cronbach's alpha value of .839, it is well above the generally accepted value of .70, which means that the internal consistency of the data is within the resilient range (Nunnally, 1978).

![Figure 2. Mean values of Competency Relevance](image)

It is noticeable that the competencies which make the creation of one's own digital content (16 & 14) tend to be regarded as less relevant. In contrast, learning competencies 4 & 1 are considered most relevant and address the ability to use the digital environment as an independent continuing education option. It is also noticeable that attitudes and soft skills such as (1) Willingnes to learn, (30) Decision Making and (11) Critical Thinking, which have so far been neglected in the literature, are rated particularly highly in terms of their relevance. This shows that competencies are also of very high relevance in digital transformation that are not directly linked to novel technologies or digital tools. It seems less important for a successful digital transformation to produce one's own digital content than to adapt to this development in a reflective manner.

Overall, all identified competencies are considered sufficiently relevant to be considered for further model building. Furthermore, no additional skills requiring a new competency were mentioned in the supplementary free texts. All references could be clearly assigned to a competency and were included in the definition (see appendix) in order to document those aspects of a competency that may not be obvious.
4.1 Competency Refinement and Definition

On the basis of the complementary feedback from the experts, the identified competencies in the individual categories are defined in the appendix. A total of 68 comments on the 32 competencies were added by the experts. These mostly reflected the individual perspective of the commenting expert on a competency and helped to define it more clearly and to draw distinctions from other competencies. This made it possible to specify unclear wording from the literature and to implement a uniform level of abstraction. The derived definitions allow a clearer classification in the context of DT and a differentiation between the individual competencies. Thus, a sound basis has been created to transfer the results into practice. Single competencies have been named according to their key activities in order to facilitate differentiation and to improve readability within the paper. The descriptions of the individual categories considered are summarized below. The definitions of the competencies included are given in the table in the appendix.

**Learning.** The category "Learning" comprises all competencies that are related to the acquisition of knowledge within the DT. It includes both the perspective of the learner and the teacher. Individual competencies do not have a direct digital character (Willingness to Learn), but nevertheless form a relevant basis for a successful DT. (Spitzer et al., 2015; Hofert, 2018; Murawski and Bick, 2017; Graumann et al., 2016; Fiegel, 2006; Calvani et al., 2010; Schumacher et al., 2016; Eshtet, 2004; Becker, 2015; Manders, 2014; Hoch, 2007; Grabmeier, 2015; Celi, 2015; Crummenerl and Kemmer, 2015; Sekretariat der Kultusministerkonferenz, 2016; Gençer and Samur, 2016; Ferrari, 2013, 2012; Shahlaei et al., 2017).

**Understanding.** The category "Understanding" comprises all competencies that enable an employee of a company to understand the scope of the individual aspects that accompany the DT and to understand both the opportunities and risks. Also included here are competencies that are not only necessary for a successful DT, but also have a high degree of importance in other contexts. (Lautenbach and Müller, 2017; Spitzer et al., 2015; Shahlaei et al., 2017; Lichtblau et al., 2015; Murawski and Bick, 2017; Ferrari, 2012, 2013; Calvani et al., 2010; Sekretariat der Kultusministerkonferenz, 2016; Carretero et al., 2017; Graumann et al., 2016)

**Analyzing.** The third category of our framework "Analyzing" includes all competencies that have the main focus on the evaluation of information and is therefore on a higher level than "Understanding". Especially due to the almost unlimited availability of information via digital channels, the ability to put it into the right context and to evaluate it becomes more and more important. (Ferrari, 2012, 2013; Lichtblau et al., 2015; Berman, 2012; Sekretariat der Kultusministerkonferenz, 2016; Katz, 2007; Shahlaei et al., 2017; Spitzer et al., 2015; Binninger et al., 2017; Graumann et al., 2016; Grabmeier, 2015; Hofert, 2018).

**Creating.** The "Creating" category comprises all competencies that deal with the own design and development of content or solutions in the digital context and partly presuppose the competencies of the previous categories. Here the employee changes the role from consumer to producer. (Carretero et al., 2017; Katz, 2007; Murawski and Bick, 2017; Sekretariat der Kultusministerkonferenz, 2016; Ferrari, 2013; Spitzer et al., 2015; Hess et al., 2016; Berman, 2012; Binninger et al., 2017; Manders, 2014; Shahlaei et al., 2017).

**Communicating.** The DT will create a dynamic, international and interdisciplinary working environment in which communication will play a crucial role, especially since it will also take place via digital channels. The competencies necessary for successful communication in a digitalized world are summarized in the category "Communicating". (Carretero et al., 2017; Shahlaei et al., 2017; Sekretariat der Kultusministerkonferenz., 2016; Lichtblau et al., 2015; Berman, 2012; Binninger et al., 2017; Murawski and Bick, 2017; Bolten, 2007; Bein, 2015; Ferrari, 2012).

**Managing.** The category “Managing” comprises all competencies related to the organization and administration within a company, which also change and become more complex due to the DT. (Crummenerl and Kemmer, 2015; Binninger et al., 2017; Celi, 2015; Gençer and Samur, 2016; Harting et al., 2015; Hoch, 2007; Walchshofer and Riedl, 2017; Hofert, 2018; Manders, 2014; Hamann and
Empirical Investigation: Role Differentiation

On the basis of the generic DTC, an initial role differentiation was also made within the survey of experts (n=46). Such differentiation is only a first step and requires further investigation to develop prioritized and supplemented DTC into a role or job specific model. However, the findings can be used to compare them with other studies (Walchshofer and Riedl, 2017) and check their plausibility. The experts were asked to assess the individual competencies with regard to their special relevance for two hierarchical levels. Initially, only a distinction should be made between "manager" and "employee". Alternatively, the experts had the option of specifying "Others" and defining them in more detail. Multiple answers were allowed. Table 2 below shows the relative values of the assignment of competencies to the roles of Manager and Employees by the experts. In addition, the differences are also listed to make it easier to identify deviations within individual competencies.

The evaluation in Table 2 shows that the relevant competencies differ from each other in two categories in particular, depending on the role. The values correspond to the relative experts who consider the individual competency for the respective employee role to be associated with it. For example, 95.5% of the surveyed experts assign the competency (22) Change Management to the role of managers and only 27.3% consider it relevant for employees. The difference indicates the difference between the roles within a competency and thus reveals particularly striking characteristics in the mapping. In the category Managing, the competencies are assigned to the role Manager by almost all experts. With a maximum of 48.8% agreement from the experts, Conflict Management is still the most necessary management competency that employees should have. And only 12.5% of the experts assess (25) Budget & Resource Management as relevant for the role of employee. The competencies in the category Creating are considered by the experts to be more relevant for the employees. The competency (15) Digital Innovating alone is considered more relevant for managers with 83.3% compared to 66.7% for employees. In the other categories there are no similarly striking differences, which allows the conclusion that the requirements for learning, understanding, analyzing and communicating are very similar for managers and employees in the DT in general. There are, however, individual competencies in which clear differences between managers and employees have been identified. For example, (3) Digital Coaching is assigned to the role of manager by 90.2% of the experts, whereas only 61% consider this competency relevant for employees. The difference is even more significant in the understanding competency (5) Agile Awareness which is assigned to managers by 95.3% of the experts compared to 65.1% of the employees. Even though these competencies are assigned to managers by significantly more experts, the nevertheless high values of more than 60% in the assignment to employees, as well as the experts' supplementary free-text answers underline the tendency that employees in a digitized working environment must also cover an increasingly broad range of tasks and work more independently.

This assessment is also reflected in the free text comments on individual components. Even if the context of the interviewed experts was very different, with the help of the developed framework clear tendencies can be identified, which also seem plausible. The fact that the competencies in the category Managing are more likely to be assigned to managers, while the competencies in the category Creating are considered more relevant for employees, is in line with the findings of other literature (Murawski and Bick, 2017; Westerman et al., 2011; Petry, 2016; Colbert et al., 2016; Singh and Hess, 2020; Manders, 2014).
This first examination shows that the developed Competency Framework is suitable for differentiating roles within a company and thus allows to derive role profiles. Despite the heterogeneity of the experts surveyed, the profiles of managers and employees can be clearly distinguished from one another. Even more precise profiles can be expected for more homogeneous groups of respondents, such as representatives of a single company. The supplementary definitions of the individual competencies form a solid basis on which a requirements analysis can be conducted in different contexts. The free text comments added during the survey confirm the objectivity and validity of the underlying Competency Framework.

### 5 Application Case: Digital Transformation Competencies for People with Disabilities

In order to also test the transferability of the framework into practice, an application case was chosen where, on the one hand, a high level of differentiation between individual roles could be expected and, on the other hand, good accessibility to experts was given. Through an underlying research project dealing with the potentials of digitization for people with disabilities (PwD), it was possible to win a group of ten experts for a workshop to derive requirement profiles of different roles within workshops for people with disabilities based on the framework. These workshops for people with disabilities are
governmental supported institutions for people with mental and physical disabilities, who are given the opportunity to fill a job with support. The activities are mostly assembly and packaging tasks. The group of experts consisted of employees of different hierarchical levels of the workshops for people with disabilities and scientists with several years of experience in the field of cooperation with workshops for people with disabilities.

In two expert groups, each consisting of five experts from both practice and academia, discussions were held to assess the relevance of the 32 identified competencies for three different roles. One is the management level, which is responsible for the strategic direction of such workshops. Then the role of the employees who support and instruct people with disabilities. And the third role was defined as the role of the people with disabilities who carry out various tasks in such workshops under guidance. The experts were asked to discuss the individual competencies in their small groups and assess the relevance of the competencies for each role from 0 = irrelevant to 5 = highly relevant. In addition, they had the opportunity to make comments on the individual assessments, which should allow for later reconstruction and additional insights. The expert groups were independent of each other and made their decision based on their professional experience and the supplementary definitions of the competencies that were provided to you. Meanwhile, the workshop leader was available for formal questions and ensured that the time frame was adhered to.

Figure 3. Relevance of DTC in Workshops for PwD.

In figure 3 the evaluation of the averages of the two expert groups clearly shows the different profiles that result from the respective roles within the institution. A value of 5 means a very high relevance for the respective role, while 0 means irrelevant. For some competencies, hardly any differentiation of roles is made, such as (1) Willingness to Learn. The willingness to learn is therefore considered by the experts to be very important for all roles to fill the respective job. However, the experts have made some very clear distinctions, particularly in the case of management skills. For example, (21) Digital Presenting is classified as completely irrelevant for PwD, whereas it is considered relevant for employees and very relevant for managers. The (22) change management competency alone was also rated as very important for PwD, whereby the free texts show that this assessment is not so much about actively shaping these change processes, but rather that this competency was interpreted as openness to change processes at the working environment. In the additional comments of the discussion groups it became clear that even with similar relevance in individual domains of competency there are different levels of requirements. For example, (2) Digital Learning is considered very relevant for all three defined roles, but the experts
distinguish between different levels. This needs to be examined more closely in further studies in order to derive even more precise requirement profiles.

Basically, this initial study shows that the competency framework can support the identification of different employee profiles and can be transferred into practice. An additional recording of the requirement level could also contribute to sharpening the profile. The competency framework also offers a solid basis for this.

6 Discussion

The Competency Framework developed in this paper has the potential to contribute to IS knowledge at various points. In contrast to many existing frameworks, this one does not only consider the managerial level (Manders, 2014; Grabmeier, 2015; Hoch, 2007; Celi, 2015; Crummenér and Kemmer, 2015), but also respects the other relevant hierarchical levels. For example, it also takes into account affective competencies such as "Willingness to Learn" or "Critical Thinking", which, in addition to cognitive competencies, are of greater relevance for employees who are not actively involved in shaping the digital transformation, but who must support it for successful implementation. In this way, it is possible to gain a more differentiated insight into various roles within the digital transformation and the associated requirements, as implemented in the initial employee-manager differentiation of the framework refinement.

Furthermore, the framework does not limit itself to digital competencies (Sekretariat der Kultusministerkonferenz, 2016; Ferrari, 2012, 2013; Carretero et al., 2017; Shahlaei et al., 2017), but also takes into account additional factors such as the underlying mindset. There was still a gap in existing frameworks, as the focus was mostly on technological competencies (Carretero et al., 2017; Hess et al., 2016; Lichtblau et al., 2015). The first investigation of the relevance of the identified competencies even suggests that creating one's own digital content is less relevant for a successful digital transformation than a reflective examination of the new world of work and the willingness to adapt to it. Our framework takes into account both the frequently examined cognitive aspects and affective competencies and is considered complete by relevant experts (chapter 4).

The precise definition of competencies, which facilitates linking in practice, can be mentioned as a further contribution, even if these must certainly be further specified in an adapted manner depending on the area of application. In existing frameworks and models, these usually remained imprecise or on a purely theoretical level, which made it difficult to transfer them into practice (Spitzer et al., 2015; Carretero et al., 2017; Schumacher et al., 2016; Berman, 2012). The supplementary categorization supports this transferability. The definitions are based on empirical findings from experts, which provide a solid foundation for further research, although they still need to confirm their comprehensibility in further research approaches. The initial empirical validation and specification go one step further than previous research (Sekretariat der Kultusministerkonferenz, 2016; Graumann et al., 2016; Eshet, 2004; Crummenér and Kemmer, 2015).

In addition, the developed framework has already proven its validity and applicability in practice in two use scenarios. In these scenarios with different levels of abstraction, it was possible to generate not only additional insights for the framework, but also initial findings regarding different requirement profiles within DT. Existing models are mostly limited to pure modelling and miss the opportunity to prove the application in concrete cases (Sekretariat der Kultusministerkonferenz, 2016; Ferrari, 2012; Carretero et al., 2017; Shahlaei et al., 2017).

The first scenarios also allowed to identify the limits of the developed framework. Thus the framework forms a solid basis and takes into account both cognitive and affective competencies, but requires further adaptation in specific application cases. For example, in the presented application case, it became clear that not only the relevance but also the level varies and that additional competencies therefore have an impact.

The results of this paper thus make both theoretical and practical contributions to IS research. The developed framework considers cognitive as well as affective competencies and thus extends existing
literature by important components. This theoretical basis is a valid starting point for further research. In addition, the empirical investigation generated first practical insights by identifying individual roles within the DT on different levels of abstraction, which have different requirement profiles. In order to confirm the actual implementation of the competency framework, however, further validations in the context of application cases in industrial companies are required, to the extent that the results obtained from the requirement profiles could also be validated.

7 Conclusion

In this paper, a comprehensive literature review identified a total of 32 competencies that are important for a successful DT. These are not limited to skills required for the use of digital technologies, but also take into account knowledge, abilities, and attitudes that play a key role in a digitized world. These skills can be divided into six categories: "Learning", "Understanding", "Analyzing", "Creating", "Communicating", and "Managing", which allows a better overview and transfer into practice.

In an expert survey with a total of 46 participants from business and science, the relevance of all identified competencies was demonstrated. In addition, the previously vague definitions from the literature were made more precise by supplementary expert comments. The paper thus provides a comprehensive competency framework for DT with precise definitions that can be applied in various contexts and in practice. The applicability and plausibility of the framework was tested in an empirical investigation and an application case. For this purpose, the 46 experts first differentiated the requirements between employees and managers in a very generalist approach. The results showed clear differences in individual competency categories regarding the requirements, which corresponded with the comments of the experts.

In an initial very specific application example, the framework was used as a basis for requirements mapping of different roles within workshops for people with disabilities. Again, the framework was used to identify crucial differences. Even though the additional comments of the ten experts called for an additional adaptation of the framework to the specific application case, it was generally considered a suitable basis.

As it was also noted in the application case, the framework must not be understood as a universal tool for all areas of application. Rather, it should provide a solid basis for further research and specific adaptations for special application areas. As a very generalist framework, it offers a variety of starting points for further research. Thus, for individual industries, additional competencies that have not yet been recorded can play a central role in shaping a successful DT and allow even more precise statements to be made. The main focus of the framework is to determine requirement profiles for different contexts and thus to generate a valuable knowledge gain. The uniform underlying competency framework will then also enable a comparison of the results with each other, which will contribute to a broader understanding. However, this applicability across sectors must first be examined in supplementary studies with larger samples.

The framework can also be used to assess the impact of interventions. Due to the uniform framework, a comparison of different interventions is also possible here. Finally, the framework allows a flexible application in practice through its supplementary precise definition of competencies and can, for example, support personnel and competency planning.

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Willingness to Learn means that a person with a high degree of self-motivation takes in new information from a wide range of topics, participates in the active exchange of experiences with others and is open to new ideas (Ghaffari et al., 2017; Becker, 2015; Calvati et al., 2015; Celi, 2015; Grammen and Kriener, 2015; Ebert, 2004; Pagel, 2006).

Digital Learning means the acquisition of knowledge with the help of digital technologies both on the hardware side, such as the use of tablets and laptops, and on the software side, such as online training courses or learning through video conferences (Geyer and Samu, 2016; Grabmeier, 2015; Grammen et al., 2015).

Digital Coaching means the ability to pass on knowledge with the help of digital tools and, for example, to use online forums and wikis in a goal-oriented manner and to use digital teaching material for collaborative digital collaboration (Hoch, 2007; Hofert, 2018; Manders, 2014; Schumacher et al., 2016).

Digital Information Seeking describes the ability to use digital technologies and tools to identify helpful sources of information and obtain the required information in digital environments (Ferrari, 2013; Ferrati, 2012; Murawski and Bick, 2017; Sekretariat der Kultusministerkonferenz, 2016; Schumacher et al., 2016).

Agile Awareness describes the ability to understand the change from traditional development methods to agile methods (Schum, Kamerl., Design Thinking, etc.) and to participate in these methods with their flexible and iterative elements (Murawski and Bick, 2017; Becker, 2015; Lautenbach and Müller, 2017).

Security Awareness enables an employee to know the risks involved in handling sensitive data in the digital environment and to take appropriate precautions to secure this data and to prevent danger, both in terms of hardware and software (Ferrati, 2013; Ferrati, 2012; Shahlaei et al., 2017; Celi, 2015; Becker, 2015; Eitel, 2014; Sekretariat der Kultusministerkonferenz, 2016; Lichtblau et al., 2015).

Customer Competent Mindset enables an employee to recognize the value of the customer in his relationship and to know how this potential can also be used in the development of his own products and services to enable the best possible human technology interaction (Becker, 2015).

Understanding Digital Transformation means the competence of an employee to be able to assess the effects of the individual components of the digital transformation in relation to his own work area and to have an understanding of digital processes and infrastructures (Calvati, 2015; Sekretariat der Kultusministerkonferenz, 2016).

Data Analysis describes the ability to analyze, organize and structure data (digital data) and to use appropriate digital tools and methods to derive the relevant conclusions (Ferrati, 2013; Ferrati, 2012; Murawski and Bick, 2017; Becker, 2015; Sekretariat der Kultusministerkonferenz, 2016; Lichtblau et al., 2015; Berman, 2015; Binninger et al., 2017; Katz, 2007).

Customer Analysis describes the ability to identify and evaluate the needs and problems of a customer, also via digital channels, and to handle the data appropriately in order to derive relevant conclusions for the company (Becker, 2015; Hoch, 2018; Berman, 2015).

Critical Thinking means the ability to critically question information and to evaluate the information actually and purposefully (Ferrati, 2013; Murawski and Bick, 2017; Calvati, 2015; Sekretariat der Kultusministerkonferenz, 2016; Binninger et al., 2017).

Media Analytics includes the ability to analyze media in digital environments using appropriate methods and tools, to weigh their significance and independence and to identify possible motives and effects of the creators (Murawski and Bick, 2017; Sekretariat der Kultusministerkonferenz, 2016).

Digital Problem Solving describes the ability of an employee to select the right approach to a specific challenge from a wide range of options to solve a digital problem or design a digital solution (Ferrati, 2013; Shahlaei et al., 2017; Celi, 2015; Celi, 2016; Celi, 2015; Celi, 2015; Berman, 2015; Binninger et al., 2017).

Digital Innovating means the ability to use digital technologies and tools to develop new products, services and business models that promise sustainable success (Hess et al., 2016; Ferrati, 2013; Ferrati, 2012; Celi, 2015; Grammen et al., 2016; Berman, 2015; Binninger et al., 2017).

Content Creation means the competence of an employee to independently generate content with the help of digital tools in order to develop digital platforms and environments and to orient them to the respective specific requirements (Manders, 2014; Binninger et al., 2017; Becker, 2015; Sekretariat der Kultusministerkonferenz, 2016).

Social Media Interaction means the ability to select suitable communication channels and tools from a wide range of possibilities in a digital environment to exchange information in a targeted manner and to be able to adapt to new channels (Manders, 2014; Binninger et al., 2017; Sekretariat der Kultusministerkonferenz, 2016; Lichtblau et al., 2015; Katz, 2007).

Digital Collaboration & Coordination describes the ability to use digital tools and methods to drive a development process together with other actors and to exchange the required data and resources (Manders, 2014; Binninger et al., 2017; Shahlaei et al., 2017; Calvati, 2015; Celi, 2015; Berman, 2015; Katz, 2007).

Netiquette means the ability to move purposefully in an unfamiliar culture and to participate efficiently in a process together with different cultural backgrounds (Sekretariat der Kultusministerkonferenz, 2016; Berlin, 2015; Bolton, 2017).

Digital Presenting means the ability to use appropriate digital methods and tools to deliver content to a specific audience and to present facts in an organized and understandable way (Ferrati, 2013; Sekretariat der Kultusministerkonferenz, 2016; Binninger et al., 2017).

Digital Problem Solving means the ability to pass on knowledge with the help of digital technologies and, for example, to use online forums and wikis in a goal-oriented manner and to use digital teaching material for collaborative digital collaboration (Hoch, 2007; Hofert, 2018; Manders, 2014; Schumacher et al., 2016; Hofert, 2015; Katz, 2007; Fusaaro, 2017).

Digital Governance means the competence to react to conflict situations both as a participant and as an outsider with appropriate professionalism and to bring about a joint solution in the interests of the company (Hoch, 2007; Hofert, 2018; Manders, 2014; Schumacher et al., 2016; Hoch, 2007; Fusaaro, 2017).

Digital & Resource Management means the ability of an employee to use and monitor the available budgets and resources in a targeted manner to progress the digital transformation (Harmel and Huber, 2015).

Conflict Management means the competence to react to a conflict situation both as a participant and as an outsider with appropriate professionalism and to bring about a joint solution in the interests of the company (Calvati, 2015; Grammen et al., 2016; Harting et al., 2015; Microsoft, 2017).

Digital Management means the ability to organize an agile and multidisciplinary team even with changing requirements and working environments and to make the necessary decisions quickly and flexibly (Manders, 2014; Binninger et al., 2017; Becker, 2015; Schumacher et al., 2016).

Digital Planning means the ability to develop long-term and strategic plans and goals and to link them with the existing strategies by making the necessary decisions (Murawski and Bick, 2017; Binninger et al., 2017; Schumacher et al., 2016; Katz, 2007).

Risk Management means the competence to identify and prevent potential risks at an early stage and to implement suitable security mechanisms (Manders, 2014; Walcher and Holzer, 2017).

Digital Mobility means the ability to move and work in different technological environments and to cooperate with different actors in a digital environment in the interest of the company (Ferrati, 2013; Becker, 2015).

Digital & Resource Management means the competence to react to a conflict situation both as a participant and as an outsider with appropriate professionalism and to bring about a joint solution in the interests of the company (Hoch, 2007; Hofert, 2018; Manders, 2014; Schumacher et al., 2016; Hofert, 2015; Katz, 2007; Fusaaro, 2017).
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