

# **A Framework of Factors Enabling Digital Transformation**

*Completed Research*

**Manuel Muehlburger**  
Johannes Kepler University Linz  
manuel.muehlburger@jku.at

**David Rueckel**  
Johannes Kepler University Linz  
david.rueckel@jku.at

**Stefan Koch**  
Johannes Kepler University Linz  
stefan.koch@jku.at

## **Abstract**

This paper provides a framework of factors which positively influence a company's ability to successfully initialize digital transformation. It was motivated by empirical data and cases which describe the phenomenon that, although a majority of organizations is aware of the necessity of engaging in digital transformation, only a small fraction can successfully initialize associated initiatives. Following a design science approach, a framework describing four categories and nine underlying factors was developed through a structured literature review, and then evaluated for its practical applicability and relevance in semi structured expert interviews. Whilst empirical data indicates that the categories defined within the initial version of the framework allow a holistic categorization of all enabling factors, the set of enabling factors deducted from literature was shown to be relevant, but not holistic.

## **Keywords**

Digital Transformation, Enabling Factors, Digital Business, Initiation, Framework

## **Introduction**

Developments in information technology (IT) have demonstrated the ability to fundamentally change the world in which modern organizations operate (Sandberg 2014). These fundamental changes are not limited to certain sectors or parts of organizations but have the potential to transform organizations and their environment as a whole, significantly (Merali et al. 2012). To harness all possibilities of these technologically initiated changes and stay competitive organizations need the ability of co-evolving with new technologies. By utilizing IT to significantly change internal structures and business models, they can create advantages in their competitive environment (D'Aveni et al. 2010). This increasing necessity for organizations to transform their value creation by means of technology stands at the core of the now omnipresent call for the digital transformation (DT) of organizations. Results of field studies from trade journals indicate that successful DT still poses a great challenge to organizations. Eastman and Sissons (2016) show that a majority of organizations is fully aware of the potentials of new technologies as well as their need of adapting to them. Yet this evidence at the same time indicates a majority of companies being stuck in traditional business models and ways of thinking. These companies lack the capability of successfully transforming their companies' structure and business models based on technological trends. As argued by Kahre et al. (2017) based on the results of two qualitative field studies (Eastman and Sisson 2016; ITWeb 2014): "78 percent of US CEOs are concerned about the rapid pace of technological change while 48 percent of CIOs still spend most of their time aligning IT operations with overall corporate objectives" (Kahre et al. 2017, p. 4706). In contrast to this phenomenon of companies which show a low impact from new technologies on their actual business's structures, empirical studies (Berghaus and Back 2016; Hess et al. 2016) also indicate a significant proportion of companies who are able to utilize technological trends. These companies can reshape their business models or their entire organizations through technology. Whilst the sizes of the different groups of companies are somewhat different between

studies, the data indicates an underlying phenomenon. Some companies make fast progress towards a strong impact from technology on their internal structures and business models. Yet, most companies are not able to take advantage of DT and stay stuck in traditional business models and structures. Empirical studies (El Sawy et al. 2016; Hansen and Siew Kien Sia 2015; Rothmann and Koch 2014) as well as theoretical work (Bharadwaj et al. 2013; Martins and Terblanche 2003; Matt et al. 2015) give fragmented insights on which factors allow a company to successfully initialize DT. These studies indicate that knowledge about these factors that allow companies to successfully start their DT is already available in the literature. Yet this knowledge is not structured and organized holistically.

To support future research on the topic of DT this paper therefore develops a framework of enabling factors for the initialization of DT initiatives within an organization based on an extensive literature review and empirical data gathered through expert interviews. The paper is structured as follows: we discuss (1) the phenomenon and research field of DT; (2) the design science methodology applied to the framework artefact; (3) the resulting artifact (enabling factors framework); (4) the artifact evaluation; and (5) sum up with a discussion section that finishes in opportunities for future research.

## **Digital Transformation**

We define DT based on Matt et al., (2015) as a process of significant changes within a company's value creation chain or a company's internal structure that are either triggered by or are a precondition for the usage of technology. Scientific research on the topic of DT has intensely dealt with new strategic concepts in times of DT, especially Digital Business Strategy (DBS) (Bharadwaj et al. 2013) and Digital Transformation Strategy (DTS) (Matt et al. 2015). Furthermore, research not focused on strategic concepts has been done under a variety of homonymous labels including digitization, digitalization and simply DT.

The term DT strategy is based on a paper published in 2015 (Matt et al. 2015). Within the initial paper, the authors defined three main research opportunities: firstly "elements and success patterns of DT strategies", secondly "procedural aspects and responsibilities connected to DTS", and finally "integrating DT strategies into firms" (Matt et al. 2015, p. 342). Other studies identify the progress attained in each of these topics (Berghaus and Back 2016; Chantias and Hess 2016; Hess et al. 2016). The question for procedural aspects and responsibilities is currently a focal area, mainly related to the necessity and the possible responsibilities for the role of a chief digital officer (CDO) (Horlacher and Hess 2016). The second term, which is clearly defined and pertains to the area of how companies can take full advantage of technological developments, is digital business strategy (DBS). DBS is an early field which broke with the paradigm of business-IT alignment (Bharadwaj et al. 2013). The main idea of a DBS is to understand IT as a prerequisite for innovation and competitiveness. Therefore, this idea intends to integrate it at the highest level of an organization's strategy instead of subordinating it to lower strategic levels (Kahre et al. 2017). A variety of publications focusing on the internal and external contexts as well as the contents of a DBS were identified in a recent review by Kahre et al. (2017). This review identified core knowledge gaps when it came to questions of how a DBS can be implemented within companies (Kahre et al. 2017). Research under the label of DT contains the most heterogenic research contributions. This is mainly caused by the variety of scientific communities contributing research under this label. Aside from management literature (Kane et al. 2015) relevant publications can also be found in journals of the Management Information Systems (Kohli and Johnson 2011) or System Sciences (Horlacher and Hess 2016) community. Whilst papers within this field often focus on the outcome or the potential of DT they also provide insights on factors positively influencing an organizations ability for initializing DT initiatives. In this paper we understand such factors as enabling factors for DT.

## **Methodology**

The framework development was based on design science research (DSR) as mainly characterized by the works of Hevner et al. (2004), Gregor and Hevner (2013), and Peffers et al. (2007). Figure 1 shows the DSR process applied, with specific application and information sources.

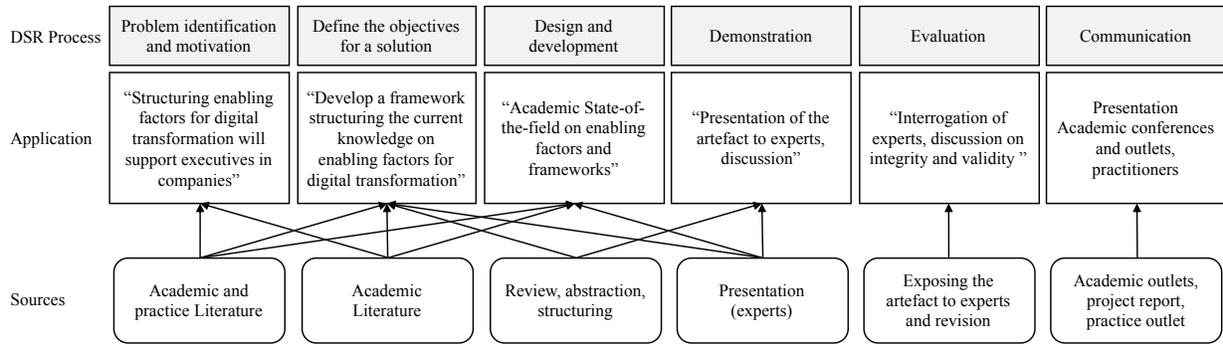


Figure 1. DSR Process

As basis for the creation of the framework, a review of the current literature on DT was performed to identify papers including information about enabling factors for the initialization of DT initiatives as well as existing frameworks structuring these factors. Based on the labels and discriminators presented in Table 1 a literature search was done using the online sources ScienceDirect, GoogleScholar, WebOfScience and SpringerLink. Results were screened for potentially relevant information on enabling factors for DT and included if such factors were explicitly mentioned within the paper. As a result, 36 papers were identified as containing relevant information for this work. Due to the heterogeneous body of literature, the enabling factors that were found varied immensely in their level of abstraction and their method of scientific validation. In a deductive process based on factor names and descriptions, the broad list of often very detailed factors was consolidated to nine combined factors. Existing structures found in the literature review were analyzed for their inclusiveness to all resulting factors. The structuration that showed the highest level of inclusiveness was then modified to allow the inclusion of all retrieved enabling factors.

Labels	Discriminators
Focus DBS	Focus DBS
IT Strategy	Digitalisation OR digitization OR digitalization OR digitalisation OR digital Transformation OR transformation
IS Strategy	Success factors OR successful
Digital Strategy	Framework OR path OR model OR roadmap OR (drivers driving factors) OR (enablers enabling factors)
Digital Business Strategy	Focus Digital Transformation
Focus Digital Transformation	businesses OR corporations OR organisations
Digitization	Success factors OR successful OR drivers OR drivers driving factors) OR (enablers enabling factors)
Digitisation	Framework OR model OR roadmap OR path
Digitalization	
Digitalisation	
Digital Transformation	

Table 1. Overview Factor Accommodation

The developed framework was evaluated through seven semi-structured expert interviews, with a focus on deriving possible modifications. Interviewees were required to have more than one year of management level or strategic consulting expertise in one or more DT programs. Table 3 provides an overview of the interviewed experts. Interviews were structured into four phases. The first phase was an information phase introducing the interviewee to the key definitions and the general process of the interview. The second phase acquired general information about the current role of the interviewee and the status of their respective DT programs. This was followed by asking the interviewee to detail a complete list of enabling factors for DT programs based on his or her opinion and experience. The list was noted by the interviewer and checked with the interviewee to ensure its completeness. To avoid bias it was ensured that the interviewee did not access the proposed framework before the completion of this phase. In the third phase, the proposed framework was presented and explained in detail to the interviewee. In the fourth

phase, each factor previously proposed by the interviewee was analysed for its integrability into the presented framework. To avoid false categorizations based on misunderstandings between the author and the interviewee, a factor was accommodated within the framework only if both parties agreed on the correctness of the proposed categorization. In the next step, the interviewee was asked to propose alterations of the framework (additional factors or additional categories) in order to allow the accommodation of previously uncategorizable factors. This final interview phase finished with the interviewee describing perceived differences in the importance of the categories presented within the framework.

### Artefact Description - Enabling Factor Framework

Table 2 presents the initial version of the framework. Changes to the framework due to the evaluation are presented in the evaluation section of this paper.

	Enabling Factor	Referring Sources
Workforce Capabilities	Individual Creativity and Innovation Capabilities	An individual’s capability to think creatively, work creatively with others and implement innovations (Binkley et al. 2012); see also (El Sawy et al. 2016; Rothmann and Koch 2014).
	ICT Literacy	The individual’s capability of “using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate and create information in order to function in a knowledge society and at its highest level enable innovation, individual transformation, and societal change” (Educational Testing Service 2002); also (Brown et al. 2013; El Sawy et al. 2016; Kane et al. 2015).
Organizational Values	Innovative Organizational Culture	A company culture which fosters innovation, creativity and an entrepreneurial mindset of the employees by cultivating tolerance for mistakes, encouragement for the generation of new ideas, support for continuous learning, risk taking and experimenting, competitiveness, management support for change and finally tolerance and constructive handling of conflicts as central organizational values.(Martins and Terblanche 2003); also (Bärenfänger and Otto 2015; Hess and Barthel 2017; Kane et al. 2015; Karimi and Walter 2015; Khazanchi et al. 2007).
	Internal and External Collaboration	A value structure within a company which fosters collaboration between its employees, independent of their specific roles and departments while also fostering the inclusion of third parties within all steps of an innovation process following the paradigm of open innovation. Derived from (Chesbrough 2006; El Sawy et al. 2016; Hosseini et al. 2017; Hylving 2015; Islam et al. 2017; Leipzig et al. 2017).
Organizational Infrastructure	Digital Platform Infrastructures	Highly integrated infrastructures following investments into technology infrastructure, data, digitized business processes and electronic linkages to external parties (Quaadgras et al. 2014); also (Bärenfänger and Otto 2015; Westerman et al. 2011).
	IT-Agility	An IT–function’s capability to identify changes within a company’s environment and adapting to the changing business needs following these changes (Leonhard et al., 2017); also (Fowler and Highsmith 2001; Haffke et al. 2017; Westerman et al. 2011).
	Institutionalized Innovation Processes	A process imposing structural value profiles which encourage efficiency, productivity, stability and structure on the innovation environment that is generally based on flexibility value profiles such as creativity, individual empowerment and change (Khazanchi et al. 2007); also (Brown et al. 2013; Kohli and Melville 2009).

<b>Management Capabilities</b>	Strategic Embeddedness	An interwoven digital business strategy which effectively governs the necessary transformational processes within the organization. Derived from (Kahre et al. 2017; Kane et al. 2015; Matt et al. 2015; Mithas and Lucas 2010; Peppard et al. 2014).
	Digital Leadership	Management board that has reached a mutual understanding to view IT as an asset, recognize its' strategic or turnaround orientation; contains a member fulfilling the role of an IT Orchestrator (Hansen et al. 2011); also (El Sawy et al. 2016; Gerth and Peppard 2016; Hansen and Siew Kien Sia 2015; Horlacher and Hess 2016; Yin and Chen 2008).

**Table 2. Enabling Factor Framework**

Three holistic approaches of structuring enabling factors were identified within the literature. (1) Karimi and Walter (2015) structured a hierarchical framework of dynamic capabilities into resources, processes and values. (2) Bärenfänger and Otto (2015) structure dynamic capabilities necessary for digital business models. (3) Hess and Barthel (2017) describe three fields of action as well as corresponding tasks necessary for successful digital transformation. Whilst structure (1) was applicable to six of the nine defined factors, structure (2) was not applicable to the defined factors. Structure (3) accommodated eight of the nine defined enabling factors and was therefore used as a basis in the creation of the framework. The categories of workforce capabilities as well as organizational values were directly derived from Hess and Barthel’s task categories “prepare workforce” and “change company culture” (Hess and Barthel 2017). Workforce capabilities hereby contain factors that the initialization of digital transformation programs requires from individual employees of a company. Organizational values describe values and attitudes a company has to adopt to foster its possibilities to enable such programs. The category of Organizational Infrastructures was introduced as a combination of Hess and Barthel’s (2017) task categories “Prepare IT-Landscape” and “Build Innovation Fostering Structures”. By combining these two categories, the framework can be kept less complex and does not contain any categories with only a single factor. The new category organizational infrastructure contains three enabling factors. The final category was not derived from Hess and Barthel (2017), but introduced as a category based on the two remaining factors of strategic embeddedness and digital leadership. As both enabling factors exclusively refer to top management tasks and responsibilities.

## Evaluation

The following section provides the list of experts which participated in the semi structured interviews (Table 3), and provides the consolidated findings of the empirical evaluation phase. Table 4 provides data on how often the different factors in the proposed framework were referenced within the interviews without prior knowledge of the artefact. Table 5 summarizes data underlying several general findings regarding the proposed framework, whilst Table 6 presents data about the revisions to the framework.

	<b>Position and Relevant Experience</b>	<b>Current Internal Digital Transformation Tasks</b>
1	Member of digital transformation department within a multinational group, technology/manufacturing sector	Finding measurements to identify overall success of past initiatives
2	Head of digital transformation within a multinational group active in telecommunication, transport and ICT sector	Making strategic use of innovation capabilities
3	CEO of an IT-consulting group active in strategic IT consulting	Digitize value creation chain
4	Product manager for a highly digitized product line of an SME providing hygiene solutions	Stable “digitized” state of product line reached, ensure continuous transformational activities

5	CEO of a corporation active within telecommunications sector	Manage transformational activities in phases from conceptualization to pre-launch
6	CEO of a software business SME and former senior consultant managing digital transformation initiatives	Connecting IT-infrastructure with partners and foster integration and homogeneity of internal IT infrastructure
7	Recently hired CEO of an IT-consulting agency focusing on IT-acquisitions and former IT-strategy consultant	Rebuilding a “digital” agency after a recent restructuration process.

**Table 3. Expert Interview Partners**

	1	2	3	4	5	6	7
Individual Creativity and Innovation Capabilities	X	X	X	X		X	X
ICT Literacy	X	X	X	X	X	X	X
Innovative Organizational Culture		X	X	X	X	X	X
Internal and External Collaboration	X	X		X	X		X
Digital Platform Infrastructures	X	X	X		X	X	
IT-Agility			X	X			X
Institutionalized Innovation Processes			X	X			X
Strategic Embeddedness		X	X		X		X
Digital Leadership	X	X	X	X	X	X	X

**Table 4. Factor List from Interviews**

Three findings indicating the validity and integrity of the proposed framework can be retrieved from the results presented in Table 4. First, all factors derived from the literature are also perceived as relevant by at least some practitioners working within the field of digital transformation (F1). Second, no practitioner presented a list of factors that did not contain at least one factor of each category in the proposed framework. In other words, every practitioner referenced each category at least once within their unbiased list of factors (F2). Third, the experts referenced some factors more frequently than others (F3).

The following table gives an overview of relevant metadata obtained during the empirical research phase of this research project after the artefact has been presented to the interview partners. The second line describes the number of factors for each interview that could not be accommodated in the framework. The number of multiple relations describes how often a single factor listed by an expert was represented by more than one factor of the proposed framework.

	1	2	3	4	5	6	7
Number of Non- Accommodatable Factors	1	1	1	2	1	0	0
Number of Multiple Relations	3	0	4	4	1	1	1
Perceived Difference in Importance P = Priority 1=Management Capabilities 2=Workforce Capabilities 3=Organizational Values 4=Organizational Infrastructure	1>3,4>2	-	1>2>3,4	-	1>3>2>4	-	-

**Table 5. Evaluation Findings**

The results presented in Table 5 allow the deduction of three additional findings. Firstly, six out of seven interviewees described at least one factor that was not accommodatable within the proposed literature-based framework (F4). Secondly, six out of seven interviewees described factors that, while represented in the framework, were not represented within a single factor but within more than one of the literature-based enabling factors (F5). The third finding shows that only three interviewees understood the different presented categories of differing importance when it comes to their necessity for enabling digital transformation programs (F6).

Table 6 gives an overview of the changes to the framework artefact as proposed by the interviewed experts. As the experts demanded no additional categories, these proposed changes solely consist of additional factors that were deemed necessary. The first column shows the proposed new factors as well as the individual category. The reference of a factor within a certain interview is again indicated in the corresponding column.

	1	2	3	4	5	6	7
Management Capability/Forming Strategic Alliances	X					X	X
Management Capabilities/Strategic Customer Focus				X			
Organizational Infrastructure/Bimodal Organisation		X		X	X		
Organizational infrastructure/Organizational Agility			X				

**Table 6. Overview Framework Modification**

Two findings can be deduced from the results presented in Table 6. No alteration to the proposed categories structuring the presented enabling factors was proposed during the interviews (F7). The interviewed experts proposed only four alterations to the presented framework in the form of additional factors (F8).

## Discussion

Finding F1 clearly indicates that the factors derived from literature and described within the proposed framework are perceived by experts to show high relevancy for the initialization of digital transformation programs. F2 indicates all defined categories presented within the proposed framework as containing factors necessary for the initialization of digital transformation programs by practitioners, thus underscoring the validity of the categories. The implications of F3 can be interpreted in various ways. One possible explanation for the different level of attention for different factors could be a varying impact or influence on different transformation programs. Although this interpretation would contrast F6, this interpretation is still a valid assumption derived from the presented empirical data. Another possible interpretation would be a difference in scope within the defined enabling factors. Whilst a factor like IT-agility has a quite limited scope, factors like ICT literacy and digital leadership show a higher genericity in their definitions and therefore accumulate a more diverse set of underlying phenomena.

Although the reason for the different levels of attention for the different factors cannot be finally answered within this paper, the empirical data presented in table three clearly indicates the validity of the categories and enabling factors defined in the proposed framework.

F7 indicates the validity of the categories proposed within the presented framework, as all additionally proposed factors could be accommodated within the existing category structure. The implications of F8 are twofold. On the one hand, the newly proposed factors clearly implicate that the proposed framework in its first version was not inclusive to all enabling factors perceived by experts and can, therefore, be understood as incomplete. On the other hand, only four additional factors were proposed through empirical input. Previous findings of this paper already showed a strong validity for the factors and categories used within the framework. The combination of these two findings allows the interpretation of the weakness of the first version of the framework lying not in its general structure but into discriminative definitions of several factors, and a clear progression with the revised version.

The findings presented within this section clearly show that the proposed framework described the majority of enabling factors perceived by experts in the field. Yet it also shows that not all relevant factors were represented within the framework. The overall number of factors that were not represented within the framework as shown in F4 supports the previous findings indicating the frameworks first versions problem of integrating all factors perceived by practitioners. F5 shows a high number of multiple relations. This finding does not challenge the general validity of the defined factors but indicates different conceptualizations of enabling factors between the proposed framework and the experts the interviews were conducted with. The empirical findings concerning a difference in the importance of the described categories as presented in F5 can be considered inconclusive, as there is no clear pattern recognizable within the answers given by the experts.

## **Conclusion and Further Research**

The overall motivation for this research project was to foster insights on which underlying enabling factors for the initialization of digital transformation programs exist in organizations.

Following a design science approach, a framework structuring nine enabling factors for digital transformation into four categories was constructed based on the current scientific body of knowledge on digital transformation. In seven semi-structured expert interviews, the applicability of the framework on the enabling factors perceived by experts of the field was evaluated. The empirical data showed the validity of the enabling factors and categories described within the framework. Besides the general validity of the framework, empirical data also showed limitations of the developed framework, as not all enabling factors described by experts were represented. Although not all enabling factors perceived by experts were represented within the framework, the categories presented in the framework proved to be inclusive to all of these enabling factors, resulting in a framework artefact with 13 factors.

This work's contribution to practice and science is represented by a framework defining a holistic set of categories structuring a partially complete set of enabling factors for the initialization of digital transformation programs. This framework provides new insights into the necessary preconditions that organizations need to foster in order to successfully deal with the phenomenon of digital transformation. Through the defined categories, practitioners are enabled to plan and act based on a holistic structure, reducing the complexity of the digital transformation phenomenon. Besides the practical benefit provided by this framework, it also provides two benefits to the scientific community. The enabling factors described within the framework represent the literature's current state of knowledge on enabling factors for the initialization of digital transformation. Moreover, the categories described within the framework allow a more structured research approach for organizational characteristics fostering the ability for successful digital transformation.

Further research into possible relations or hierarchies between the presented categories and factors could explain some of the empirical findings, such as the different level of attention given to enabling factors. The initial framework's limitation of not listing all factors perceived by practitioners was lifted through the addition of new factors based on the results of the evaluation. Whilst to the best of our knowledge the current framework gives a holistic overview of enabling factors future work could identify and integrate other "blind-spots" still existing in the revised framework. Another interesting topic for future research is the different conceptualizations of enabling factors for digital transformation programs which were indicated by the high number of multiple relationships within the empirical data.

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