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# STAGES IN DIGITAL BUSINESS TRANSFORMATION: RESULTS OF AN EMPIRICAL MATURITY STUDY

*Completed Research*

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## Abstract

*Managers and decision makers need to transform their organizational routines and structures to meet the challenges of the digital age. Even though organizational change is by no means a new topic, many companies struggle to recognize and make sense of the often very disruptive changes affecting all industries. In order to foster an understanding of the phenomenon and the development of a digital transformation strategy, this research derives typical stages in a digital business transformation process from empirical data. The nine dimensions of the digital maturity model (DMM) provide a more profound understanding of the relevant levers for managing digital transformation. The DMM was implemented together with a survey of 547 individuals from 417 organizations in Switzerland and Germany. Based on the survey data, we used the Rasch-algorithm and cluster analysis to derive five maturity stages. The findings show that while digital affinity and experimenting with digital technology are already prevalent in companies, a strategically planned transformation and usage of advanced data analytics in business processes are less common. The results from this study yield insights into how activities in digital business transformation are currently tackled and prioritized and thus contribute to the body of knowledge about organizational transformation.*

*Keywords: Digital transformation, maturity model, digital strategy, organizational change, transformation strategy.*

## 1 Introduction

Digital transformation is a technology-induced change on many levels in the organization that includes both the exploitation of digital technologies to improve existing processes, and the exploration of digital innovation, which can potentially transform the business model. Digital innovation, which is defined as the re-combination of digital technologies and physical components to create novel digital products (Yoo et al. 2010), can be perceived as potentially threatening to the organization (Abraham & Junglas 2011; Christensen 2006). Digital innovation involves transformational changes in strategy, processes, and products and thus requires the company to rethink its organizing logic (Yoo et al. 2010). The growing importance of digital technology for organizations is also reflected in the alignment between IT and business, specifically in the integration of IT-strategy and business strategy in a common digital business strategy (Bharadwaj et al. 2013). While a digital strategy consolidates and aligns the IT- and business-strategy, a digital transformation strategy specifically contains the vision, planning, and implementation of the organizational change process (Matt et al. 2015).

Digital transformation simultaneously affects multiple areas within an organization and there are many stakeholders involved in defining a transformation strategy, e.g., marketing, IT, product development, strategy or HR. All of these groups need to develop a common understanding of the prioritization of digital transformation activities. Furthermore, digital transformation has different effects in different industries. Those with a strong customer orientation and business-to-consumer (B2C) relation may experience the influences of the digital age earlier and with a greater impact than organizations with a prevailing business-to-business (B2B) focus.

The strategic transformation process involves developing a vision, strategic planning and implementation (Davis et al. 2010). However, as can be seen from the perceived urgency of this topic among practitioners, many decision-makers struggle in coming up with a viable digital transformation strategy. Managers from all industries need to define action items for the “transformation roadmap”, prioritize between different activities, and develop a strategic vision for the digital age. In the course of developing a digital transformation strategy, managers require an instrument that indicates possible areas of action, helps them to make sense of the phenomenon, and serves as a boundary object to communicate goals between the different parties involved (Berghaus & Back 2016). In order to define a digital transformation strategy, managers need to understand the current state of their organization. Transformation is not a linear process, but there are different possible courses of action. It would be beneficial for managers to know about the difficulty associated with these different measures, in order to make an informed decision about prioritizing between different steps and to lay the foundation for successful organizational change. Therefore, we need to know more about how companies actually face such a transformation, what makes them successful (Heckmann et al. 2015), and how organizations approach their transformation (Hess et al. 2016). A maturity model provides some guidance in this respect, since it gives an overview of the different areas and maps out typical paths of how organizations go about their transformation. The research question for this paper is therefore: *What stages can be observed in the process of digital business transformation and what does this tell us about how organizations prioritized different courses of action?*

In order to identify the stages within the digital transformation, we chose to design a maturity model, using the dimensions of the digital maturity model (DMM) that were developed in a previous study and adopted a quantitative approach to calculate the maturity stages. The remainder of the paper is organized as follows. Firstly, we present a short overview of the most important concepts in digital transformation, as well as those in the application of maturity models. Secondly, we explain how the data analysis was conducted. Thirdly, we describe the results of our survey and the maturity stages, before lastly discussing these findings and presenting our conclusions.

## 2 Prior research

Organizational change and technology-induced business transformation have been of great interest for researchers of various disciplines for a long time (Palmer et al. 1957). A multitude of theories, such as Punctuated Equilibrium (Romanelli & Tushman 1994) or Continuous Change (Brown & Eisenhardt 1997) are used to support our understanding of change mechanisms. However, the current debate on digital transformation (Berman 2012) reveals that the changes induced by the simultaneous and dynamic influences of digitization on user behavior, organizations, and industries, constitute a new kind of transformation that provides new challenges (Matt et al. 2015).

### 2.1 Digital transformation

The term “digital transformation” can be applied to both changes at the industry and organizational level. For the purpose of this paper we refer to organizational changes only. Digital transformation encompasses both *process digitization* with a focus on efficiency, and *digital innovation* with a focus on enhancing existing physical products with digital capabilities (Yoo et al. 2012).

The increasing proliferation of digital technologies has been an important catalyst for organizational transformation in the past decades (Yoo et al. 2012), enabling organizations to exploit new use cases (Matt et al. 2015), integrate digital technologies and business processes (Liu et al. 2011), and potentially facilitate key business improvements (Fitzgerald et al. 2013). The term transformation refers to a *fundamental change* within the organization, which has a major impact on organizational strategy and structures (Matt et al. 2015; Kotter 1995) and the distribution of power (Wischnevsky & Damanpour 2006). It therefore requires companies to realign and initiate a change process regarding their internal structures as well as their business models, which is without a doubt a challenging organizational learning process (Schuchmann & Seufert 2015). Digital transformation is a change process that is actively designed and executed (Besson & Rowe 2012), and therefore, it is necessary to understand the mechanisms of digitization and establish a common understanding within the company.

### 2.2 Maturity models

A maturity model consists of dimensions and criteria, which describe the areas of action, and maturity stages that indicate the evolution path towards maturity. Maturity models are a tool that mainly enable an assessment of the status quo (Becker et al. 2009) and indicate a potential, anticipated or typical development path to the desired target state (Pöppelbuß & Röglinger 2011; Paulk et al. 1993). Maturity models are used in two ways. In their *descriptive* functionality, maturity models reveal the dimensions which need to be designed, and in their *prescriptive* functionality, they enable companies to define courses of action or capabilities needed to reach the desired stage of maturity. Maturity models are a topic of growing interest in IS research (Becker et al. 2010). The field of digital transformation is too broad to enable the use of a maturity model in its prescriptive functionality, since evolution paths in digitization are not linear, and it is not clear whether a company at the highest maturity stage actually performs better than its competitors (Mullaly 2014).

For this study we use the maturity model in its *descriptive* functionality, in order to show the dimensions (e.g. “product innovation”) with which digital transformation affects the organization and to develop the maturity stages from empirical data, in order to derive a typical transformation path. This path groups activities according to difficulty and should therefore not be understood as linear evolution towards a fixed target state.

### 3 Research Design

In order to answer our research question, we used the Digital Maturity Model (DMM) from a previous study (Berghaus & Back 2016) and took an inductive, quantitative approach to calculate the maturity stages (Lahrmann et al. 2011). Instead of defining the maturity stages beforehand, e.g., based on evidence from the literature, this methodology enables us to calculate the stages using the actual response data of participants and, therefore, provides a better description of the actual criteria prioritization. Our research design consists of three steps: (1) developing the dimensions of the DMM through a literature review, expert interviews, and focus groups, (2) an online-survey among 547 individuals, and (3) the data analysis using the Rasch-algorithm and cluster analysis to calculate the maturity stages. We applied descriptive statistics to analyze the maturity score for individual participants, as well as results within the dimensions.

#### 3.1 Dimensions of the DMM

This summary provides a short background on the development of the DMM, which was described comprehensively in a previous study (Berghaus & Back 2016). The dimensions of the DMM and the corresponding items were developed through literature analysis, interviews and focus groups. In the literature review, we analyzed 70 academic publications on digital business transformation, as well as 16 existing maturity assessments. In addition, we conducted exploratory interviews with seven decision makers and digital transformation leaders. All literature and interview transcripts were open-coded, which resulted in a set of criteria that were clustered into dimensions. The first set of criteria and dimensions was evaluated in a focus group with eleven participants. The final nine dimensions of the DMM are (1) customer experience, (2) product innovation, (3) strategy, (4) organization, (5) process digitization, (6) collaboration, (7) information technology, (8) culture & expertise, and (9) transformation management. After finalizing the dimensions based on the feedback, an item pool was written up and the first item set collaboratively re-worked by the researchers and the participants of the first focus group, using an online-document. In a second focus group, the item pool was discussed and evaluated regarding comprehensiveness, relevance, and completeness. Based on the feedback from the focus group, the item set was finalized.

After the first implementation of the study in 2015, we updated and revised the item set for this present research. These changes were evaluated in another focus group with seven experts from different Swiss companies. Eligible experts have more than 10 years professional experience, have been more than two years in their current company, are in a position of leadership, and have a good overview of the activities related to digital transformation in their respective companies. The internal consistency of scales was tested using Cronbach's  $\alpha$ , in order to ensure the homogeneity of items within the scale (DeVellis 2003). The analysis showed good values ( $>.85$ ) for all dimensions (see *Table 1*).

Dimension	Criteria (Item ID)	$\alpha$
1. Customer Experience (CX)	<ul style="list-style-type: none"> <li>• Experience design (CX1, CX2, CX3, CX4)</li> <li>• Analytics (CX5, CX6, CX7)</li> </ul>	.88
2. Product Innovation (PI)	<ul style="list-style-type: none"> <li>• Business segment extension (PI1, PI2)</li> <li>• Innovation capability (PI3, PI4)</li> <li>• Customer integration (PI5, PI6)</li> </ul>	.90
3. Strategy (ST)	<ul style="list-style-type: none"> <li>• Strategic innovation (ST1, ST2, ST3)</li> <li>• Digital commitment (ST4, ST5, ST6, ST7)</li> </ul>	.93

4. Organization (OR)	<ul style="list-style-type: none"> <li>• Digital team set-up (OR1, OR2)</li> <li>• Organizational agility (OR3, OR4, OR5)</li> <li>• Partner network (OR6, OR7)</li> </ul>	.85
5. Process Digitization (PD)	<ul style="list-style-type: none"> <li>• Digital marketing communication (PD1, PD2, PD3)</li> <li>• Automation (PD4, PD5)</li> <li>• Data-driven business (PD6, PD7)</li> </ul>	.89
6. Collaboration (CO)	<ul style="list-style-type: none"> <li>• Teamwork (CO1, CO2)</li> <li>• Knowledge management (CO3, CO4)</li> <li>• Flexible working (CO5, CO6)</li> </ul>	.85
7. Information Technology (IT)	<ul style="list-style-type: none"> <li>• Agile project management (IT1, IT2)</li> <li>• Integrated architecture (IT3, IT4)</li> <li>• IT-expertise (IT5, IT6)</li> </ul>	.88
8. Culture & Expertise (CU)	<ul style="list-style-type: none"> <li>• Digital affinity (CU1, CU2, CU3)</li> <li>• Readiness to take risk (CU4, CU5)</li> <li>• Error culture / No blame culture (CU6, CU7)</li> </ul>	.90
9. Transformation Management (TM)	<ul style="list-style-type: none"> <li>• Governance (TM1, TM2)</li> <li>• Performance measurement (TM3, TM4)</li> <li>• Management support (TM5, TM6, TM7)</li> </ul>	.94

Table 1: Dimensions and corresponding criteria of the DMM

### 3.2 Data collection

The 60 items of the DMM were presented in an online-questionnaire. The participants were asked to indicate, on a 5-step Likert-scale, to what degree they agree with the statements, from “0 – do not agree” to “4 – fully agree”. An additional option “I don’t know” was provided. The questionnaire was publicly accessible and communicated through various newsletters, personal mailings, and social media. Data was collected between mid-October 2015 and end of January 2016. Besides the items measuring the maturity criteria, the questionnaire contained general questions about the company size, industry, position, and country of the participants, as well as questions about the prioritization of activities in the *past* two years, and the focus area for the *next* two years regarding digital transformation.

### 3.3 Data analysis

For the analysis of data and the calculation of maturity stages, we used a quantitative approach. By applying the Rasch-algorithm to the survey data we were able to derive a *metric* for each item that represented its level of difficulty (Lahrmann et al. 2011; Friedel & Back 2012). The software JMetrik was used to derive the metrics. The higher the metric score, the greater the difficulty of the item. Therefore, the easiest items have a negative metric, and a metric score of “0” represents the mean difficulty. Through hierarchical cluster analysis, we built five clusters of items with similar difficulty that represent the five maturity stages of the DMM.

For the analysis of the individual maturity scores, we used a combination of two scores (Friedel & Back 2012): the *cluster maturity* represents the sequential fulfilment of items. Only when a defined threshold for each cluster is passed, is the participant assigned to the next cluster. This means that participants cannot reach a higher overall maturity by achieving only the difficult items and at the same

time, neglecting basic requirements. The *point maturity* represents the overall fulfilment of all items, regardless of their difficulty. This allows participants who do not pass the threshold in one cluster, but have a better *overall* score fulfilment, to skip a cluster. The *overall maturity score* is the mean average of point maturity and cluster maturity.

## 4 Findings

The online-survey was publicly available, and participants were invited personally, through social and traditional media, and through business networks. We received 555 completed questionnaires. For the final data analysis, the following data sets were eliminated: questionnaires that only contained “I don’t know” answers (1); double entries (2); and clearly frivolous or test entries (5). For the calculation of the maturity stages, all answers for the same company were merged. This resulted in a final data set of 547 participants of 417 companies mainly from Switzerland (69%) and Germany (28%).

### 4.1 Maturity stages

Through cluster analysis of the weighted items, we identified the following five maturity stages. Understanding what criteria and activities described in these items were already fulfilled by most participants, gives us an indication on both difficulty and prioritization, as well as a probable sequence of digital transformation activities in the participating companies. Items that are already fulfilled by many participants can be seen as groundwork, while items with a higher degree of difficulty might be more advanced courses of action that build on previous activities. The following five stages were deduced from the items in each cluster.

#### 4.1.1 Stage 1 – Promote & Support

The items clustered in this stage are mainly related to strategic prioritization, flexible work, and management support of digital transformation. Basic digital services for existing products and a consistent customer experience across multiple channels were initiated. Employees are familiar with existing digital products. The internal IT ensures the availability of relevant digital technologies and keeps the infrastructure up-to-date. Digitization has become a priority on the strategic agenda. Digital transformation projects are supported and prioritized by top, senior, and middle management. Also, flexible and mobile work that is enabled by digital technology has already been established.

Stage	Dimension	Item ID	Short description of item	Metric
1	Strategy	ST7	Digital transformation as continual strategic change project.	-1.05
1	Collaboration	CO5	Employees work from home or on the move.	-0.82
1	Customer Experience	CX2	Customer interaction via both traditional and digital channels.	-0.77
1	Strategy	ST4	High value of digital business in overall strategy.	-0.76
1	Strategy	ST6	Promotion and prioritization of digital products.	-0.68
1	Organization	OR1	Digital product creation across all departments and functions.	-0.66
1	Information Technology	IT4	Regular update of IT infrastructure.	-0.61
1	Transformation Management	TM5	Top management recognizes the importance of digital business.	-0.6
1	Transformation Management	TM7	Senior mgmt. takes responsibility for digital transformation.	-0.56

1	Strategy	ST5	Core competencies for commercial success in digital future.	-0.55
1	Information Technology	IT5	Internal IT department ensures relevant digital technologies.	-0.53
1	Collaboration	CO3	External experts involved to develop knowledge of digitization.	-0.52
1	Culture & Expertise	CU3	Employees are familiar with digital products.	-0.48
1	Collaboration	CO6	Promotion of flexible, mobile work.	-0.42
1	Organization	OR2	Operational management across channels.	-0.41
1	Product Innovation	PI1	Product and service expansion with digital services.	-0.39
1	Collaboration	CO4	Internal experts on digital topics act as contact persons.	-0.34
1	Customer Experience	CX1	Customer experience is consistent across all channels.	-0.26
1	Transformation Management	TM6	Middle management promotes digital transformation projects.	-0.26

Table 2: Items clustered in maturity stage 1

This indicates that an awareness of digitization among both management and employees, which supports initial digitization initiatives, constitutes the first stage of digital business transformation and is therefore labeled “promote & support”.

#### 4.1.2 Stage 2 – Create & Build

In this stage, digital innovation plays a more prominent role, both at the strategic level and within product innovation. The strategic importance of innovation is stressed by explicitly promoting digital innovation, and systematically evaluating potential in new technologies. This also includes evaluating internal communication or service processes, in terms of whether they can be improved by digital technologies. Suitable conditions for innovation are created by strengthening digital competencies, collaborating more strongly with the internal IT department, liaising with external partners, such as start-ups or universities, and also by allocating dedicated resources, time, and budget to digital innovation. Considering the focus on ideation and creativity, as well as strengthening digital activities within the company, this stage is labeled “create & build”.

Stage	Dimension	Item ID	Short description of item	Metric
2	Collaboration	CO2	Tools with videoconferencing and screen sharing.	-0.19
2	Process Digitization	PD4	Regularly check core processes for improvements.	-0.17
2	Collaboration	CO1	Digital platforms to cooperate with internal and external partners.	-0.16
2	Strategy	ST2	Promote digital innovation.	-0.15
2	Culture & Expertise	CU7	Evaluate errors in order to improve.	-0.14
2	Information Technology	IT1	Adjust our digital services at short notice.	-0.13
2	Information Technology	IT6	Internal IT department provides advice to the other departments.	-0.11
2	Product Innovation	PI2	New digital business ideas or business model implemented.	-0.09



2	Process Digitization	PD1	Digital channels integrated into communications & service processes.	-0.09
2	Product Innovation	PI3	Suitable conditions for developing digital innovations.	-0.08
2	Organization	OR7	Standardized, efficient procedures for cooperation with partners.	-0.08
2	Strategy	ST3	Systematic evaluation of technologies and digital innovations.	-0.06
2	Culture & Expertise	CU2	Digital competencies as important criterion in recruiting.	-0.06

Table 3: Items clustered in maturity stage 2

#### 4.1.3 Stage 3 – Commit to transform

The items in this cluster belong mainly to the dimension of culture & expertise, but also to organization and transformation management. While in stage 2, the focus appears to be on experimenting with digital innovations, in stage 3, the digital transformation affects the internal culture and organizational structure more profoundly. Important capabilities within the company culture are a proactive error management and the communication of learning from failed projects, as well as willingness to take risks. Items related to the dimension “organization” describe a flexible organization that collaborates with partners and that is able to react quickly to changes. A company that is willing to perceive digitization as more radical change to their organization, needs to define roles and responsibilities for all processes related to the digital transformation, as well as creating a strategic plan for the transformation process that the company is willing to follow.

Due to the focus on activities with regard to company culture, changing organizational structures, and a more systematic transformation management, this stage is labeled “commit to transform”.

Stage	Dimension	Item ID	Short description of item	Metric
3	Product Innovation	PI4	Our employees regularly contribute ideas for digital products.	0.03
3	Organization	OR4	Able to react quickly to changes.	0.05
3	Culture & Expertise	CU1	Digital expertise as core component in developing employees.	0.11
3	Culture & Expertise	CU5	Digital innovation even when financially risky.	0.12
3	Organization	OR6	Partner network for digitization.	0.15
3	Culture & Expertise	CU6	Failed digital projects are communicated in a proactive manner.	0.15
3	Process Digitization	PD5	Automated routine processes.	0.16
3	Transformation Management	TM2	Defined roles, responsibilities and decision-making processes.	0.16
3	Culture & Expertise	CU4	Readiness to take risks with existing business.	0.2
3	Transformation Management	TM1	Digital transformation follows a defined strategic plan.	0.24

Table 4: Items clustered in maturity stage 3

4.1.4 Stage 4 – User-centered & elaborated processes

The items in the fourth cluster are related to a variety of dimensions. One common ground appears to be user-centeredness. This is revealed by the involvement of users in innovation processes, the personalization of customer experiences, and the focus on customer data when designing interaction. Another commonality is that digital transformation has progressed and shown results. The company is known as a digital innovator within the respective industry, and transformation goals, as well as KPIs for digital channels, are determined and reviewed periodically. Another indicator is digital ambidexterity, which is the ability to drive day-to-day operations alongside digital innovations (Gregory et al. 2015; Raisch & Birkinshaw 2008).

For the focus on open innovation by involving users, personalizing customer experiences and processes based on usage data, and the improvement of processes by determining measurable goals, this stage is labeled “user-centered & elaborated processes”.

Stage	Dimension	Item ID	Short description of item	Metric
4	Information Technology	IT2	Test and modify new products using prototypes.	0.29
4	Organization	OR5	Pursue digital innovations alongside usual business operations.	0.31
4	Information Technology	IT3	Connect systems quickly to other services via open interfaces.	0.31
4	Transformation Management	TM4	Periodically review digital transformation goals.	0.33
4	Process Digitization	PD6	Data analysis results guide possible actions and strategic decisions.	0.39
4	Product Innovation	PI5	Customers included in the development of new product ideas.	0.49
4	Product Innovation	PI6	Customer testing to improve digital products.	0.51
4	Customer Experience	CX3	Digital content designed according to individual user situation.	0.52
4	Customer Experience	CX6	Insights derived from customer and interaction data.	0.52
4	Strategy	ST1	Regarded as drivers of digital innovation in industry.	0.56
4	Process Digitization	PD2	Goals for digital channels determined and reviewed.	0.57

Table 5: Items clustered in maturity stage 4

Stage 5 – Data-driven enterprise

The items with the highest difficulty metric are clustered in stage 5. These items are related to the use of advanced data analytics technologies for expenditure planning, collating customer data across multiple channels, real-time analysis, and personalizing customer interactions accordingly. This data is often available, however, only advanced companies use it appropriately for decision support or product development. Preconditions for the implementation of a data-driven business are internal expertise for data utilization, appropriate technological infrastructure, and data governance across different business units.

The most advanced stage in the maturity model has been labeled “data-driven enterprise”, since all items in this cluster relate to the collection, analysis, and sense-making of customer data in business processes, and the utilization of measureable indicators for goal-setting or decision-making.

Stage	Dimension	Item ID	Short description of item	Metric
5	Transformation Management	TM3	Digital transformation goals are defined measurably.	0.66
5	Customer Experience	CX5	Customer and interaction data collated across different channels.	0.71
5	Process Digitization	PD3	Expenditure planning for communication based on media usage.	0.72
5	Organization	OR3	“Early warning” system to identify relevant technologies.	0.78
5	Customer Experience	CX4	Personalized digital customer communication.	0.85
5	Process Digitization	PD7	Expertise in big data used to develop new products.	0.97
5	Customer Experience	CX7	Customer data analyzed and acted upon in real time.	1.35

Table 6: Items clustered in maturity stage 5

### 4.2 Distribution of maturity scores

After defining the maturity stages, we calculated the individual maturity scores for each company that participated in the survey, as described in Section 3.3. *Figure 1* gives an overview of the overall maturity scores of the 417 companies that participated in our survey. The overall maturity score is the mean average of cluster maturity and point maturity. The majority (>80%) of participants reach maturity scores 2 and 3, with very few companies achieving the highest maturity scores 4.5 and 5.

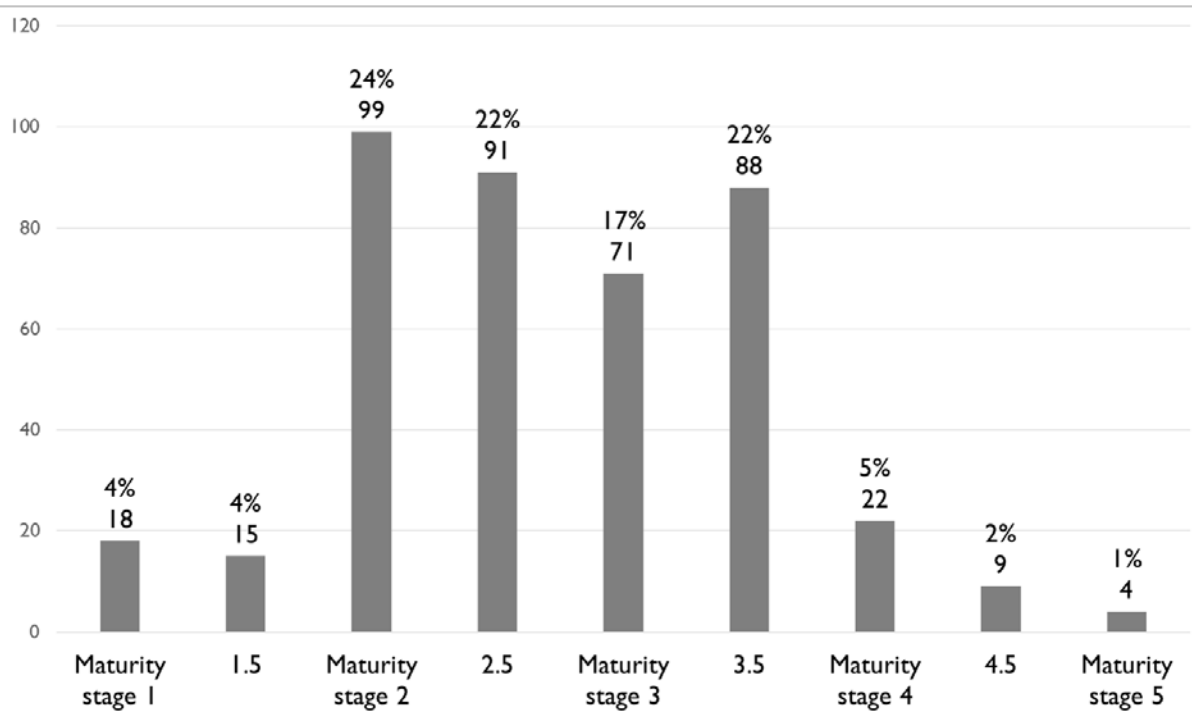


Figure 1: Distribution of overall maturity scores among participating companies (n=417)

The analysis of results per industry shows that the highest mean maturity scores were reached in the IT & telecommunication industry (3.22), in retail / wholesale (2.98), and in transportation / logistics

(2.94). These companies have been affected by digitization early on and therefore, have already initiated programs within their organization. By contrast, the lowest mean maturity scores were observed with banks (2.42), in the machine industry (2.38), and in the consumer goods industry (2.23). The low results for banks comes as a surprise, since fintech start-ups have been seriously challenging the business model of established banks with digital services. However, these results can partially be explained by the comparably high participation of smaller banks, which on average achieved lower maturity scores than larger corporate banks.

### 4.3 Analysis within the dimensions

By multiplying the survey data (Likert value) with the metric, we calculated the degree to which the maturity criteria in each dimension were achieved. The mean achievement in each dimension also gives us an indication of which dimensions are difficult to achieve and which are easier. The dimensions with the lowest mean achievement are “customer experience” (37%) and “process digitization” (41%). This indicates that these are rather advanced activities that might be more difficult for organizations to tackle. By contrast, the dimensions “strategy” (51%) and “collaboration” (56%) received the highest mean achievement rates. This might either indicate that these dimensions are easier to deal with for organizations, or that they subsume activities that are started earlier and therefore are more mature than other dimensions.

Dimension	CX	PI	ST	OR	PD	CO	IT	CU	TM	Mean achievement
CX										37%
PI	.71									46%
ST	.62	.83								51%
OR	.62	.73	.75							45%
PD	.75	.78	.76	.77						41%
CO	.52	.70	.64	.64	.63					56%
IT	.58	.65	.63	.73	.67	.63				47%
CU	.55	.69	.72	.74	.70	.67	.63			47%
TM	.56	.70	.80	.75	.72	.70	.67	.74		47%

Table 7: Correlation matrix and mean achievement rates per dimension

We also assessed the correlations between dimensions in order to identify any possible connections (see Table 7). The highest positive correlations were found between strategy and product innovation (.83); and strategy and transformation management (.80). The correlation between strategy and transformation management is not surprising. It shows that companies which regard digital transformation as an important part of their strategic agenda also have management support, define roles and responsibilities, as well as performance indicators for transformation. The high correlation between strategy and product innovation indicates that companies which make digitization a strategic priority are also willing to experiment with digital technologies and go about launching new digital solutions early on.

## 5 Discussion

The findings of the maturity study provide deeper insight into the stages of digital business transformation. The following conclusions can be drawn from the empirical findings.

**Digital commitment and affinity among employees are important prerequisites for digital transformation that often preexist within the workforce.**

The findings of this study show that among the easiest criteria are relatively many items related to digital affinity and employee commitment, such as the use of digital tools for collaborating with other employees and external partners, the appointment of internal experts on digital topics, the familiarity of employees with digital products, and the promotion of digital innovation within the company. This shows that the workforce is used to using digital technologies in their daily work and they are open towards digital transformation. In this respect, our findings differ from the experience of some decision makers, who suspect resistance towards digital transformation, and prior research has shown that innovation processes are often constrained by resistance, slow accommodation and adoption (Svahn et al. 2009; Abraham & Junglas 2011). We suggest that when initiating a digital transformation process, managers can exploit the inherent affinity and openness of the workforce by adapting their leadership style accordingly and carefully managing the change process. It is evident that management support and persuasive, effective communication facilitate the transformation process (Kezar & Eckel 2002). Other research has stated that leadership styles change towards transformational leadership, calling for employee self-motivation and self-responsibility (Bass 1990). Another leadership style suitable for organizational change is so-called servant leadership, which is based on considering the needs of the followers, that is the employees, and gaining their trust, so that they are open to change (Dierendonck & Sousa 2016; Baldomir & Hood 2016). Adapting their their leadership style enables managers to take advantage of any preexisting affinity or even enthusiasm towards digital innovation.

**The use of digital data requires more strategic collaboration between IT and business.**

Our findings show that items related to big data analytics and usage are among the most difficult items at maturity level five. This indicates that – while the exploitation of big data for value generation is high on the agenda of many managers – real time analytics of customer data and acting upon these insights remains difficult for most companies. The results also show that the difficult items include both technical tasks, such as the actual collection of customer data across different channels or connecting systems using open interfaces, and business tasks, such as designing personalized content according to the individual user situation. There are many available sources of digital data, such as from customer interaction, but they are often not properly used and exploited. All data-related activities receive the lowest achievement rates in our survey. It seems difficult to form organizational practices on how to use the available data, who takes ownership, and how to set-up these new workflows and governance structures. The integration of several systems where this data is stored is a challenge for IT, and in many large and globally operating companies, the exchange of data across organizational and regional units is unsatisfactory. In many organizations, the corporate IT has a mainly executional role as opposed to a strategically thinking and innovative one.

This calls for a more strategic collaboration between IT and business departments, since research indicates that the IT department is no longer entirely in charge of digital innovation, and employees outside IT also innovate with digital technologies (Tumbas et al. 2015). Since a good understanding of possible fields of application of digital technologies is fundamental to innovation, the IT department and business departments need to collaborate more closely on digital transformation, e.g. by strengthening business-capabilities within IT (Bassellier & Benbasat 2004) or by increasing the IT-knowledge of executives (Turel & Bart 2013).

**Digital transformation seems to be intuitively managed rather than strategically planned.**

Many items clustered in the first two maturity stages relate mainly to acknowledging the importance of digital transformation and experimenting with digital innovation. Defining a strategic vision, roles and responsibilities, measureable goals, and constantly reviewing the transformation roadmap are items clustered in later stages. The analysis of overall maturity scores of organizations showed that industries that were challenged early by digital disruption have achieved higher scores than other in-

dustries, such as manufacturing, which are also labeled “latecomer industries”. This indicates that at the beginning of the transformation process, companies tend to experiment with digital innovation or react to external changes, while only at a later stage does a more systematic planning of the transformation process evolve. This also shows that consolidating digital initiatives into an organizational change program is demanding. Some companies deal with the strategic importance of digital transformation by establishing a C-level role responsible for promoting, communicating and consolidating activities with regard to digital transformation (Horlacher & Hess 2016), or establish a dedicated implementation team for developing organizational change strategies (Higgins et al. 2012).

## **5.1 Contribution**

Coping with the challenges of digital transformation is of considerable interest to both researchers and practitioners. Digitalization creates multiple challenges for organizations, including the alignment of business and IT (Reynolds & Yetton 2015), new roles of CDO and CIO (Horlacher & Hess 2016; Weill & Woerner 2013), and the development of digital transformation strategies (Matt et al. 2015). Understanding the stages of digital transformation contributes to the body of knowledge on enterprise transformation processes, which entail unplanned and radical organizational changes, as opposed to evolutionary ones (Kotter 1995). For practitioners, the results may help managers to assess the status quo of their organization and identify possible new courses of action. This understanding can contribute to more systematic and strategic change processes, as opposed to intuitive reactions to external turbulence. Furthermore, even though a maturity model suggests that a more advanced stage produces better performance, this correlation is not proven and even may not exist at all. The maturity model in this study is simply used for mapping out the typical stages, but every company needs to decide whether the activities in each stage are appropriate, feasible, and relevant for the specific industry, business model, and competitive context.

## **5.2 Limitations**

This research has produced some interesting and useful findings, but we wish to point out some limitations that need to be considered when interpreting the results. First of all, the survey data is based exclusively on participant self-assessment, which might cause a certain bias. In order to mitigate such risk, further research could complement this survey with expert evaluations, in order to correct any bias. Also, the survey requires participants to assess their organization, which might be difficult, depending on the level and degree of insight on which a participant can draw. We also acknowledge that even though the scales have been carefully developed, based on the literature and multiple focus groups, a final evaluation of the measurement instrument, as demonstrated for example in Raber, Epple, Winter, & Rothenberger (2016), has not yet been conducted. Lastly, it should be mentioned that the questionnaire was only presented in one of the four official Swiss languages (German) and therefore, the results are limited to this user group.

## **6 Conclusion**

In this research, we set out to better understand how organizations tackle their digital transformation, by inductively designing maturity stages for a predefined set of criteria. The results from our empirical study show that understanding the strategic importance of digitization, as well as using digital technologies for collaboration are already undertaken in the majority of companies. However, creating a personalized customer experience based on big data analysis or automating processes, is characterized by lower achievement rates. This indicates that the primary stages of the digital transformation process are related to creating awareness, promoting the potential offered by digital technologies, and experimenting with digital innovation. In the next stages, companies start to go about digital transformation in a more systematic and strategically planned manner, by creating measurable goals and defining

roles and responsibilities in the organization. These results help practitioners as well as researchers, in better understanding the processes by means of which organizations actually engage in their digital transformation.

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