

## A Cognitive Perspective on Digital Transformation: Literature Review and Research Framework

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### Abstract

*Managing Digital Transformation (DT) has become a top priority for executives as technological advancements and increasing decision-making complexity accelerate challenges in navigating through DT. Acknowledging that cognition (e.g., in the form of thoughts, beliefs, and emotions) is fundamentally relevant during organizational transformation processes, we address the maturing body of DT research from a cognitive perspective. While the study of cognition in management and strategy can look back to decades of investigation, research on the role of cognition in DT is fragmented and still in its infancy. Addressing this gap, we systematically review existing research from information systems, management, and psychology on the role of cognition in DT. Based on identified antecedents, contextual factors, and consequences, and a conceptualization of cognition, we provide an integrative framework for cognitive DT research and derive four promising research avenues. We thereby provide guidelines to develop strategies for successful DT and organizational action.*

**Keywords:** cognition, digital transformation, literature review, research agenda

### 1. Introduction

Technological advancements increase the complexity for organizations to navigate through disrupted environments and to make and implement decisions for successful strategic adaptation (Vial, 2019). Digital Transformation (DT) – “a continuous complex undertaking that can substantially shape a company and its operations” - has become a strategic imperative and the topmost priority for most executives (Matt et al., 2015, p. 341). The COVID-19 pandemic has further accelerated this phenomenon. However, with only 30% of enterprises achieving their initial goals (Forth et al., 2020), managing DT remains

one of the most challenging tasks. Like every change process, the transition to this new reality contains severe risks and challenges that should not be underestimated (Vial, 2019). Given that DT is as much about people as it is about technology (Kane, 2019), scholars show a growing interest in taking a cognitive perspective to support companies in navigating through DT (Russell et al., 2020). As cognition guides managerial action in situations involving ambiguity, the shift towards DT relies heavily on the mental representations and cognitive processes of the corporate actors involved and on an understanding of how those representations relate to each other.

Vial (2019) underlines these observations by pointing toward the advantages of understanding individual micro-foundations of DT. Moreover, this view is supported by the growing field of NeuroIS with which Dimoka et al. (2012, p. 700) hoped to “trigger a revolution in IS research”, arguing that “ignoring cognitive neuroscience could be a disservice to the [Information Systems] field”. Hence, acknowledging the role of cognition when researching DT is a useful lens and necessary advancement to the traditionally behaviorism-centered DT discourse.

While the study of cognition in management and psychology research can look back to decades of investigation, research on the role of cognition in the context of DT from an Information Systems (IS) perspective is fragmented and in its infancy (Russell et al., 2020). Several scholars call for further research into cognitive foundations and acknowledge the need for a more in-depth examination of cognition related to DT (Haskamp et al., 2021; Russell et al., 2020; Vogelsang et al., 2019). In spite of prior reviews and definitional papers, systematic discussions of the meaning and implications of doing cognitive research in DT contexts have been lacking in the IS discourse. As a result, the conceptual foundations of DT cognition research have remained largely implicit, making it difficult to address opportunities and challenges that cognitive DT research confronts. Hence, a systematic review of existing research is

needed that builds on the central features of cognitive science to develop a framework and agenda for a cognitive perspective on DT. For that matter, the following research question is addressed: *What is the current body of knowledge regarding the role of cognition in the context of DT?*

To identify avenues for addressing the described challenges, we first discuss the conceptual articulation of the cognitive perspective for DT. Making use of a systematic review of existing literature we propose a framework for the study of cognition in DT and derive types, concepts, processes, influencing factors, consequences, and contextual factors of cognition in DT. The paper concludes with an outline of future research avenues.

## 2. Conceptual Background

### 2.1. Conceptual Foundations of Cognition Research

The general term cognition “involves the mental processing that uses, changes, enacts, recalls, stores, senses, and transforms knowledge in a dynamic, recursive manner” (Brymer et al., 2011, p. 121). Different theoretical positions on cognition share common ground in the idea that understanding human behavior requires consideration of mental representations and processes involving thoughts, beliefs, and emotions (Russell et al., 2020). In contrast to behaviorism and related perspectives, which argue that mental states are nothing more than unobservable, intervening variables (Fiske & Taylor, 2020) the cognitive perspective assumes that attitudes, motivations, and other mental states can be treated as constructs that exist in the mind (Sternberg & Ben-Zeev, 2001). Managerial and organizational cognition refer to the application of cognition to a managerial context (Walsh, 1995). Managers’ personal beliefs and mental models underlying their decision-making include knowledge and the understanding of current events and predictions of future developments (Stubbart, 1989). A key assumption of this perspective is that the environment cannot be objectively determined as it is enacted and represented through cognitions. Similarly, the organizational and environmental context function as sources of information that affect the content and structure of cognition. Hence, beyond decision-making, the cognitive lens is also deeply intertwined with strategic change, the need for, and the resistance to it (Kaplan, 2011). Within this broader domain, strategic cognition involves “the linkages between cognitive structures and decision processes in strategic management with respect to strategy formulation and implementation”

(Thomas & Porac, 2002, p. 165). This research field investigates how cognitive structures and processes develop in an organizational context and how these structures and processes relate to decision-making, strategies, and intra-organizational dynamics. In this context, cognition can relate to an individual, organizational, and industry level (Kaplan, 2011).

Based on the foundations of cognitive research and the decision-making literature, one can label heuristics, cognitive biases, assumptions, and schemata including cognitive frames, mental models, belief structures, and mindsets as key cognitive concepts relevant for the application to a managerial context. We will give a brief introduction to these key concepts. Schemata are cognitive structures that represent knowledge about a concept or type of stimulus, including its attributes and the relations among those attributes (Fiske & Taylor, 2020). In their review on strategic cognition, Narayanan et al. (2011) identify cognitive frames as one core element of structure-related cognition alongside organizational identity and organizational routines. Referring to the knowledge structure that informs decision-making, cognitive frames act as filters managers pay attention to and consider relevant for strategy formulation and decision-making (Walsh, 1995). With increasing complexity and uncertainty in digital disruption, the adoption of simplified mental representations of the internal and external environment of the organization allows firms and decision-makers to reduce their real-world problems to more manageable representations (Levinthal, 2011). Similarly rooted in the idea of cognitive representations, mental models can be described as general beliefs built on the organization of knowledge into structured and meaningful patterns stored in memory. Alongside schemata and assumptions, cognitive biases and heuristics mark the second group of key cognitive concepts (Fleischmann et al., 2014).

According to Narayanan et al. (2011), key cognitive processes relevant for DT besides decision-making include scanning, sensemaking, issue selling, and sensegiving. Scanning processes are those processes that are forward-looking, based on actors’ cognitive maps of action-outcome linkages, and those that are backward-looking, or experience-based (Tripsas & Gavetti, 2000). Sensemaking is a cognitive process that can be described by the reciprocal interaction of information seeking, meaning ascription, and action (Narayanan et al., 2011). Together with sensemaking, the cognitive process of sensegiving shapes meaning and leads to a collective interpretation of decisions and then to action (Narayanan et al., 2011). Another relevant cognitive process is the process by which individuals affect

others' attention to and understanding of the events, developments, and trends that have implications for organizational performance, which has been referred to as issue selling (Dutton & Ashford, 1993). Further, problem-solving - a process at the higher cognitive layer that searches for solutions or finds a path to reach a given goal - is a key cognitive process and a relevant part of any transformational endeavor (Vial, 2019).

## 2.2. The Relevance of Cognition for Digital Transformation

Cognitive theories assume that cognitive factors, such as thoughts, beliefs, and emotions, are fundamentally present during organizational transformation processes (Russell et al., 2020). DT can be understood as an ongoing "process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2019, p. 121). Fueled by the constant need to adapt, the proliferation of digital technologies, shifts in customer expectations, and changing market dynamics increase the complexity for organizations to navigate toward successful adaptation (Vial, 2019). As DT incorporates redefinition resulting in essential corporate change, it requires complex decision-making and management under uncertainty. While the term DT is rather new, it can be closely linked to other, earlier introduced terms from management and IS literature (e.g., Tornatzky et al. 1990). In their early work on processes of technology innovation, Tornatzky et al. (1990) even point out the relevance of bounded rationality and the foundations of individual and group decision-making for technology innovations (Tornatzky et al. 1990). However, compared to early literature on concepts like technology innovation, the more recent academic understanding of DT goes beyond a technological shift. The process impacts business models, operational processes, end-user experience, and internal stakeholders (Henriette et al., 2015). Compared to IT-enabled change, we follow the conceptualization of DT as a process of deep, structural change that occurs through the integration of multiple technologies and fundamentally redefines organizational value and identity (Wessel et al., 2021).

In practice, however, many companies struggle to change their habits and ways of working sufficiently to reap the maximum benefits from digital efforts (Forth et al., 2020) as transforming mechanisms are extremely challenging to successfully align and execute (Warner & Wäger, 2019).

Given this complexity and high level of uncertainty in DT strategy formulation and

implementation, decision-making, business model innovation, reactions to transformation initiatives, and other DT activities, cognitive processes and structures of stakeholders involved are likely to play a large role (Kaplan, 2011; Russell et al., 2020). Looking at DT's key building blocks as strategic responses to disruption, namely decision-making processes, and changes in the structure and value creation of the organization (Vial, 2019) while taking a cognitive perspective allows for a more nuanced understanding of challenges and success factors. For instance, organizational and environmental perceptions and resulting attitudes can impact an organization's potential to sense opportunities and threats based on technological advancements or digital-related changes in customer expectations. Similarly, decision-making and problem-solving activities are likely to be influenced by the heuristics and schemata used and the resulting framing of the situation. Also, in the course of the implementation of DT objectives in the form of projects or the development of digital business models, applying a cognitive perspective can help to understand inertia as a key challenge (Haskamp et al., 2021; Tripsas & Gavetti, 2000).

## 3. Methodology

Our goal is to give a focus and direction to future researchers by reflecting on the existing body of research on cognition in organizational DT. We assess the manner and extent to which cognitive research in a DT context articulates the conceptualization of a cognitive perspective reviewed above. We decided on a systematic review following established guidelines (Brocke et al., 2009; Webster & Watson, 2002) as the aim of the study is to develop a clear understanding of the current body of knowledge on the broad phenomenon of cognition in DT (Paré et al., 2015). More specifically, our review can be classified as a theoretical review as we draw "on existing conceptual and empirical studies to provide a context for identifying, describing, and transforming into a higher order of theoretical structure" (Paré et al., 2015, p. 188). Our sample of papers focuses on a representative set of articles thereby organizing prior research on the given topic and examining relationships to facilitate the development of new theories.

Figure 1 gives an overview of the search strategy and the search terms used in different databases yielding 656 total hits. In the initial screening phase duplicates, articles that are non-English, and those not in the form of a research article (e.g., panel, commentary) have been removed. In the second screening phase, the titles, keywords, and abstracts of the remaining 491 articles were analyzed regarding

their fulfillment of inclusion criteria. We only included those articles that were directly related to the lens (cognition) and the context (DT) of interest, excluding for instance studies on DT without a direct link to a cognitive concept or process. As only very few studies exist that directly focus on DT from a cognitive perspective, we have chosen a two-sided approximation strategy for our inclusion criteria. Based on the conceptualization of DT by Vial (2019) and Wessel et al. (2021) we included “digital”, “technology”, and “transformation” as additional keywords. This procedure ensured that we also included earlier published studies that did not directly use the label DT and those studies that have a strong connection to a cognitive concept or theory. Studies that were not meeting the conceptualization of DT, for instance those looking at IT-enabled change, were only included if the use of a cognitive lens was a dominant theme in the paper. Similarly, studies that did not fully meet our conceptualization of cognition were only included if they had DT as a major theme. Also, an organizational setting had to be present, excluding research conducted in public or medical settings. An additional backward and forward search was conducted, adding 10 further articles. The final dataset consisted of 61 articles from IS, management, and (organizational) psychology.

The papers were analyzed in an iterative and concept-centric manner. We carried out selective coding to generate a comprehensive allocation of codes to our set of articles. Due to page limitations, the concept matrix containing the mapping of each code category with each article is not included in the article. Regarding the analysis of the papers, we followed the building blocks of theory (Whetten, 1989), starting

with our phenomenon of interest including the before reviewed types, concepts, and processes of cognition research. We then extracted the DT-related context into influencing antecedent factors, contextual factors, and consequences. Following Appio et al. (2021) we distinguished between individual and team level, organizational level, and environmental level to investigate cognition in DT. Further, for coding within the organizational process level of consequences, we adapted Vial’s (2019) building blocks of DT, namely the use of digital technologies, strategic response, organizational barriers, and change in the value creation process. In the last step, we consolidated the analysis within an integrative framework. Based on underrepresented areas drawing from a problematization analysis we were able to identify under-researched areas in our framework which we translated into future research areas. More specifically we included two parameters in the process of labeling an area under-researched: Firstly, the number of papers existing on the specific area and subareas. Secondly, we scanned every paper not older than 10 years for their suggestions for future research during our analysis.

## 4. Results

### 4.1. Conceptualization of Cognition in Digital Transformation

Our review revealed which types, concepts, and processes of cognition are predominantly researched in a DT context. We found that most of the studies refer to managerial cognition with a strong focus on

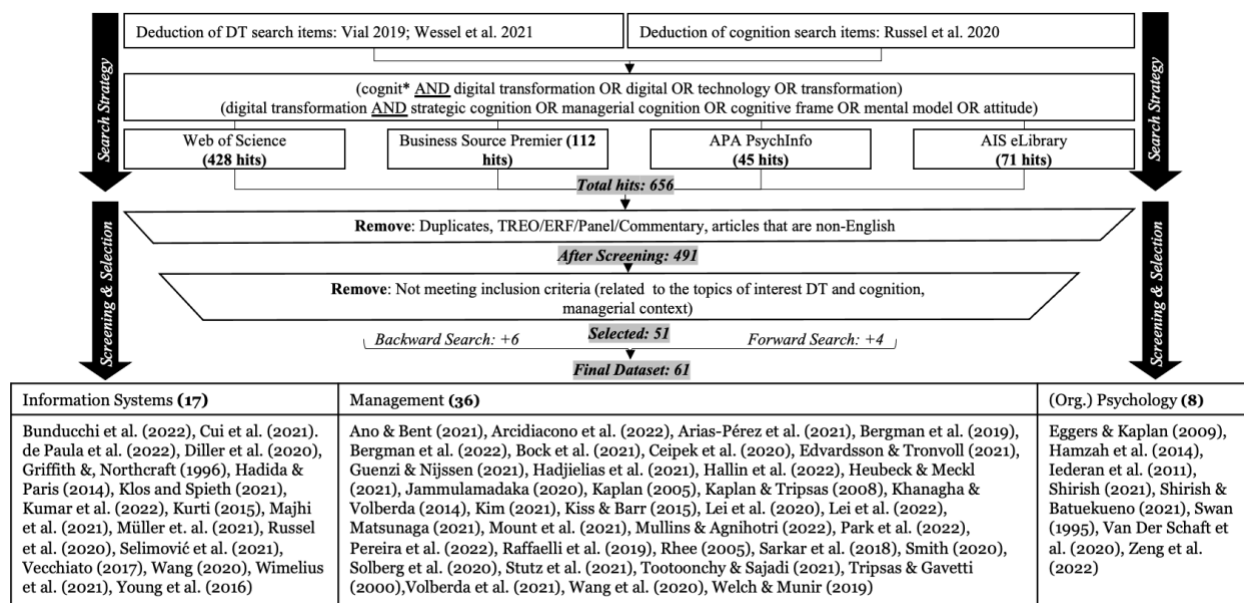


Figure 1. Procedure for extracting and screening literature

thoughts and beliefs. None of the empirical studies was explicitly looking at emotions as a key factor nor looked at the dynamics evolving from thoughts, beliefs, and emotions.

To entangle the understanding and use of cognition in existing DT research, we analyzed the cognitive concepts researched in the studies. In contrast to studies referring to cognitive processes or cognition in general, 75% of the studies explicitly mention a cognitive concept. Cognitive frames, mental models and belief structures, schemas, cognitive biases, and mindset have been identified as related concepts with the highest dominance within the dataset. Most studies refer to specific manifestations and types of cognitive concepts, such as cognitive frame flexibility (Raffaelli et al., 2019), cognitive schema richness (Iederan et al., 2011), shared mental models (Kude et al., 2019), positive and negative biases (Griffith & Northcraft, 1996), and rigid and growth mindset (Ceipek et al., 2021; Solberg et al., 2020). While most of the areas built on the initial schema construct related to bounded rationality (Walsh, 1995) where cognitive frame flexibility and shared mental models are dominant themes, heuristics and biases are addressed less often in the sample.

We understand cognitive processes as the application context for a specific cognitive concept. The majority of studies focused on cognitive scanning and sensemaking processes, including the role of attention, noticing, recognizing, and interpreting external stimuli. Wang (2020) for instance, investigates the influences of organizational IT attributes on managerial noticing prior to sensemaking. Studies investigating different types of attention find that (holistic) managerial attention positively affects the speed of making investment decisions (Khanagha & Volberda, 2014), and product innovation (Rhee, 2015). Another positive effect of specific attention was found by Eggers and Kaplan (2009), showing that CEO attention to emerging technology can amplify the effects of industry orientation. We found two studies that reach beyond a proof of concept by investigating the underlying mechanisms of how public managers perceive and make sense of open government (Marmier & Mettler, 2020) and demonstrating the positive effects of adaptive sensemaking methods for strategy teams confronted with ambiguous digital challenges (Welch & Munir, 2019). Another key cognitive process investigated is decision-making. Swan (1995) showed that cognitions of individuals shape the outcomes of strategic choices regarding the design of the innovation. Other decisions in a DT context like investment in IoT innovations (Ceipek et al., 2021), new venture strategic actions (Kiss & Barr, 2015),

investments in emerging technologies (Hamzah et al., 2014), product innovations (Rhee, 2015), and market entry (Vecchiato, 2017) have been analyzed - mainly as outcomes of cognitive concepts. Issue selling and sensegiving processes are so far only indirectly touched. Solberg et al. (2020), for instance, show that employees' beliefs about technological change are likely to influence their engagement in or withdrawal from their company's DT initiatives and give recommendations on how to change existing mental models. Problem-solving was not explicitly addressed in any of the studies. However, as problem-solving is an overarching process, consisting of elements like sensemaking and decision-making, the majority of research is indirectly linked to this process.

## 4.2. Integrative Research Framework for Cognitive Digital Transformation Research

Cognition is a relational perspective that requires context to unfold. Following the building blocks of theory (Whetten, 1989) we, therefore, look at the factors that impact cognitive concepts, which we call influencing factors, at the consequences, and the contextual factors moderating the relational effects in the context of DT.

Synthesizing the results from the literature analysis, we developed an integrative framework for investigating DT from a cognitive perspective (Figure 2). The framework does not claim to be comprehensive. Its purpose is to provide a representative overview of existing and emerging research streams on cognition in DT, to help researchers identify under-explored avenues, and to support interested practitioners in understanding the potential points of action regarding cognition in DT.

**Influencing Factors:** The majority of studies do not explicitly look at the sources and emerging factors of cognition in DT but include them while focusing on the consequences of cognitive aspects. Early studies on managerial cognition have shown that individual conditions and changes (e.g., personality and experience) influence cognitive concepts like managerial beliefs. In our sample, we identified only seven studies that looked at individual factors shaping cognitive concepts in a DT context, from which only Hamzah et al. (2014) explicitly looked at how prior experience, knowledge, expertise, and existing beliefs affect the formation of mental models. When looking at further factors shaping cognitive concepts such as managerial mental models, strategy researchers showed the relevance of firm diversity and organizational role structures on the organizational level (Calori et al., 1994). Applied to DT research, existing organization IT attributes (Wang, 2020),

interactions of producers, users, and institutions (Kaplan & Tripsas, 2008), different branches and job levels (Marmier & Mettler, 2020), differences in social networks of firms, and institutional change (Iederan et al., 2011) are exemplary organizational conditions and changes shaping cognitive factors. As a third category of antecedents of cognitive concepts, we identified environmental conditions and changes. External conditions like technological change (Solberg et al., 2020), technological disruptions (Vecchiato, 2017), and the availability of data (Marmier & Mettler, 2020) create employees' digital mindsets, managers' beliefs about customer needs, and mental models. Even though only a few studies explicitly address those factors, digital disruption and resulting environmental changes are a predominant context in which researchers locate their cognitive DT studies. In general, the current body of DT research investigating antecedents of cognitive concepts in a DT context is scarce, especially when looking at the potential of individual and organizational factors in explaining the emergence and variance of cognitive concepts like managerial mental models.

**Consequences:** Our results show that a major research stream of DT literature using a cognitive lens is the study of the effects of cognitive concepts on organizational processes and outcomes. We found 41 studies in our sample matching this category. Vial (2019) identified strategy and business models, organizational structure and processes, people and culture, technology, and innovation as relevant areas

affected by DT. We applied the described building blocks as subcategories within changes in the DT process and added individual and team-level outcomes, as well as organizational impact. We hereby acknowledge that cognition can affect DT as a process and an outcome, as well as individual factors.

The individual and team-level outcomes identified in our sample can be grouped into employee engagement and team effects. Researchers found, for instance, that employees' beliefs about technical change (Solberg et al., 2020), their socio-cognitive processes (Grotherr et al., 2019), and the flexibility of their cognitive frames (Raffaelli et al., 2019) influence the (emotional) engagement in DT initiatives. Surprisingly, only a few of the selected studies investigate trust, job satisfaction, or cognitive inertia as outcomes of specific cognitive concepts or processes. Most studies in our sample analyzed the impact of cognition on changes in the organizational DT process. Regarding the impact of cognition on the use and implementation of new digital technologies, we found that cognitive processes and cognitive biases can explain the underutilization of IT artifacts (Ferratt et al., 2018) and the implementation success of new technologies (Griffith & Northcraft, 1996). Even though technology plays a crucial role in DT, more studies look at the strategic response to disruption when investigating the effects of cognition on process outcomes. Khanagha and Volberda (2014), for instance, show that managerial attention positively affects the speed of making investment decisions.

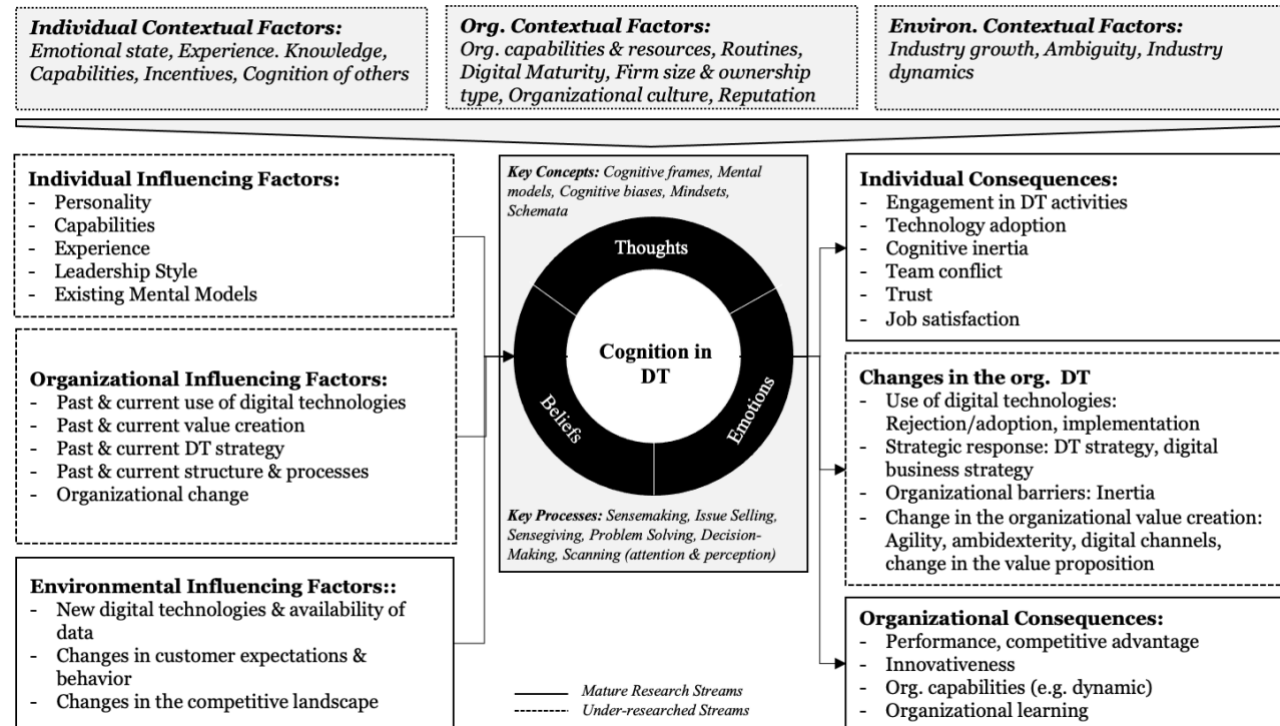


Figure 2. Integrative framework for cognitive digital transformation research

When looking at organizational barriers, researchers found that employees' mental model components can build barriers to technology adoption (Hamzah et al., 2014) and that nudging can help to overcome status quo bias in government-led DT (Schirmacher et al., 2019). Even though we found studies in every building block area, there is still potential for investigating the effects of cognition on changes in the process, especially in the area of changes in value creation, which has been labeled crucial within DT (Vial, 2019).

As a third category, we identified organizational consequences, including economic impact, innovation impact, strategic adaptation, capability building, and organizational learning. Innovation activities, understood as an outcome, are impacted by cognition in DT as holistic attention (Rhee, 2015) and cognitive frames (Ceipek et al., 2021; Kaplan, 2011) influence the likelihood of product innovation, patenting emphasis, and investments in IoT innovation. Looking at strategic change and adaptation, Eggers and Kaplan (2009) found that managerial cognition can share an established firm's adaptation to technical change. Surprisingly, none of the studies in our sample focused on direct economic outcomes or organizational learning as an outcome of cognition in DT, indicating a potential for future research. Further, only little emphasis was given to the interplay with other individual or organizational factors that influence the presented relationships or cross-industry analyses.

**Contextual Factors:** The contextual factors refer to moderators that affect the strength or direction of the relationship between cognition and outcomes and the formation of cognitive concepts or have been researched in combination or comparison with cognition within the same study. On an individual and team level, we identified studies looking at the interrelations between experience, knowledge, expertise, and beliefs (Hamzah et al., 2014) and the interplay of team cognition, teamwork, and taskwork (Hadjielias et al., 2021) in the formation of cognitive concepts relevant in a DT context. Knowledge bases and the interaction with cognitions have also been analyzed in the context of how they shape changes in the DT process (Swan, 1995). Even though affect plays a crucial role in current cognition research (Dolan, 2002), only four studies integrate the dynamics between cognition and emotion in a DT context. This finding could indicate a promising avenue for further research on individual factors.

Also on an organizational and task-specific level, researchers have acknowledged the relatedness of cognition by addressing contextual factors. Kude et al. (2019) for instance found that task-specific factors, like the level of task novelty, reinforce the positive effects of shared mental models on team performance.

As one of few studies integrating multiple concepts and acknowledging their dynamics, Li et al. (2018) found that managerial cognition renewal can only together with managerial social capital development, business team building, and organizational capability building explain how ill-equipped SMEs successfully drive DT.

Other interesting factors that might influence known effects of cognition and the emergence of cognitive concepts are existing resources, organizational culture, and identity, as well as reputation. Investigating the role of these factors holds potential for strengthening the research stream on cognition in DT and its dynamics regarding other organizational concepts. As for the third category, environmental contextual factors, researchers looked at factors like the level of ambiguity of the digital challenges (Welch & Munir, 2019), industry growth (Kiss & Barr, 2015), and the interactions of producers, users, and institutions (Kaplan & Tripsas, 2008).

Looking at how cognition unfolds in DT-related practice requires the integration of multiple influencing factors and research streams. In general, studies investigating individual, organizational or environmental dynamics are scarce compared to studies focusing on distinct consequences. Despite its relevance, we have not found one study that integrates all three levels (individual, organizational, and environmental). We, therefore, label the whole area of contextual factors as a potential field for further research.

### 4.3. Future Research Avenues

Following a problematization approach (Alvesson & Sandberg, 2020) and by developing the integrative framework for cognitive DT research, we identified promising avenues for future research. Hence, the categories within Figure 3 are directly linked to the underrepresented factor areas of the presented framework.

The analysis shows that cognition is addressed depending on the underlying concept. The bandwidth of how cognitive concepts are framed shows that cognitive DT research bridges disciplines and that concepts from cognitive psychology evolve as mature objects in management and, more frequently, also in IS research. One significant potential of connecting and building on different research fields besides analyzing established psychological concepts in an organizational context is the adaptation of measurement tools. The recent popularity of the Repertory Grid method in IS research (Tan & Hunter, 2002) shows the potential of psychological measures. Future advancements could rely on neuroscience and

the adoption of biometrics and neuroimaging methods. The findings also indicate a focus on individual-centered studies, mostly concerned with the CEO's or Entrepreneur's cognition. The emerging stream of top management team (TMT) and upper echelon research in the management field can be identificatory for a potential shift in the cognitive DT research towards the same direction. This potential is further emphasized by the call for more practitioner-oriented research with higher external validity in managerial psychology (Mitchell, 2012) and by recognizing that strategic decisions are most frequently influenced by more than one individual.

Within the area of influencing factors, there is a lack of research looking at individual factors like personality and leadership style. Moreover, organizational factors shaping cognition on DT were identified as an underrepresented area with the potential for investigating past and current organizational characteristics, structures, or ownership types and how they influence the emergence of specific cognitive concepts and processes in a DT context. The field of studies looking at cognition and the linkages to consequences covers a much wider range of factors compared to antecedent studies and can be defined as further matured. However, despite the high practical relevance in this area, there are still factors that have not been investigated yet. Analyzing the economic impacts of specific cognitive concepts or processes in combination with underlying mechanisms and moderating factors within one integrative study could add up to a better understanding of the role of cognition in DT. Scholars have stressed the importance of strategy and a human perspective compared to technology's role in a DT context (Kane, 2019). However, the findings on consequences show that technology is still a primary research context within the literature combining cognition and DT. Hence, emphasizing so far underrepresented applications such as strategy, culture, or organizational structure could be of great potential for further studies in cognitive DT research.

Additionally, we labeled the whole stream of contextual factors and interrelations of cognition with other factors as a research stream to be explored, as the majority of studies investigates cognitive concepts independent from other influencing factors on the organizational, individual and environmental level. Here, the advantages of cognition in DT as an interdisciplinary research topic can unfold. The current predominance of outcome-focused studies found in the analysis will potentially evolve into process-oriented research and studies focusing on dynamics with other concepts. In this regard, the call for understanding the dynamics between cognitive

aspects, capabilities, and the role of emotion has significant potential for future studies. Studies from the DT literature highlighting the complex nature of DT and criticizing oversimplified understandings (Drechsler et al., 2020) underline how a focus on contextual factors and interrelations could help to increase the maturity of the research field.

Based on the findings, we can see that the literature on cognitive aspects in the DT process builds on strategy-centered cognition research. The studies directly address linkages of cognitive elements with outcomes, enabling factors of those cognitive influences, and interrelations with other concepts instead of focusing on a "proof of concept", which was described as the earliest phase in strategic cognition research (Kaplan, 2011). This shows that although the body of literature is in its infancy based on the overall number of studies, research in related areas helps to achieve an initial high level of maturity. Figure 3 gives an overview of the research avenues and questions that can guide future cognitive DT researchers.

<i>Research Avenue</i>	<i>Exemplary Research Questions</i>
<b>Individual and org. influencing factors of cognitive aspects in DT</b>	<p><b>How</b> are different leadership styles influencing the emergence of cognitive concepts related to organizational change?</p> <p><b>What</b> is the relationship between past and current organizational characteristics, structures / ownership types and the emergence of specific cognitive concepts and processes in a DT context?</p>
<b>Relations of cognition with other concepts and factors in a DT context</b>	<p><b>Under which</b> individual (e.g., emotion, behavior, capabilities), organizational (e.g., capabilities, structure), and environmental conditions (e.g., environmental turbulence, ambiguity) evolve favorable cognitive concepts and processes regarding DT decision-making and change?</p> <p><b>How</b> are dynamics between different stakeholders influencing the emergence and effects of cognitive concepts and processes in DT?</p>
<b>Cognition in DT decision-making processes</b>	<p><b>How</b> can we enhance managerial decision-making in a DT context (e.g., through de-biasing)?</p> <p><b>In which</b> situations is de-biasing decision-making crucial?</p> <p><b>How</b> can we make use of psychological and neuroscientific methods to enhance managerial decision-making?</p>
<b>Cognition in DT related organizational change implementation</b>	<p><b>What</b> are strategies to counteract cognitive inertia in DT projects?</p> <p><b>How</b> does the interplay of cognition and affect influence the implementation and acceptance of DT initiatives (on an individual level / within the interplay of different actors)?</p> <p><b>How</b> does cognition on individual / team level relate to organizational identity / organizational learning?</p>

**Figure 3. Future research avenues**



## 5. Conclusion

The goal of this review was to investigate the potential of a cognitive perspective for the management of DT processes in organizations and to lay the foundation for establishing a cognitive DT research stream by analyzing the current body of research. We are addressing the maturing body of general DT research and its peaking practical relevance in combination with insights from management, IS, and psychology by providing a profound understanding of the conceptualization, the emergence, the consequences, and the contextual factors of cognition in DT.

From a theoretical perspective, we provide an integrated framework for cognitive DT research that was developed based on a systematic review. Further, the research avenues provide a focus and direction for future researchers. From a managerial perspective, this study can guide leadership to develop actionable points for organizational decision-making for DT. We are convinced that organizations should formulate strategies that consider the role of cognition in managing DT initiatives. Here, our framework can be used to better understand the cognitive mechanisms and processes that influence managerial action in practice. This is a necessary step and foundation for developing effective actions to tackle the challenges of successfully transforming.

We do not claim exhaustiveness with our sample and the review is subject to limitations like the low conceptual maturity of cognition in a managerial context and individual biases during the coding process. However, the developed framework in combination with the derived research avenues contributes to IS research by integrating different disciplines, systematically analyzing and consolidating existing knowledge, and laying the foundation for future cognitive DT research.

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