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Digital Transformation in Pre-Digital Organizations –  
The Move Towards Digital Ecosystems

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Die letzten vier Jahre, die diese Promotion mich begleitet hat, zeichnen mein Leben auf eine besondere Weise. Sie nahm ihren Anfang in einer Zeit, in der ich auf dem bisherigen absoluten Höhenflug meines Lebens war. In der ersten Hälfte dieser Zeit hatte ich die Energie, über ein halbes Dutzend Publikationen neben der Gründung eines Unternehmens auf den Weg zu bringen und am Ende zu veröffentlichen.

Die zweite Hälfte hätte nicht schwieriger für mich sein können. Nach dem Tod meiner Mutter, meinem eigenen Verkehrsunfall und allem, was dem folgte, hat es über ein Jahr gebraucht, bis ich die Energie hatte, das Word-Dokument „Dissertation“ überhaupt zu öffnen. Danach hat es fast ein Dreivierteljahr und dutzende Ermunterungen vertrauter Menschen gedauert, es zu Ende zu bringen. Die Promotion hat mich gefordert und an meine persönliche Grenze gebracht, nur anders, als ich es einst erwartet habe. Mit ihrem Abschluss endet dieser Abschnitt meines Lebens. In diesem Sinne.

Danke.

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*„Manchmal ist es das Schwerste, dass wir ertragen müssen, was wir nicht ändern können.  
Viele von uns denken, festhalten macht uns stark, aber manchmal ist es das Loslassen“*

*Hermann Hesse*

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**Copyright Statement**

The following sections are partly comprised of content from the research articles in this doctoral thesis. To improve the readability of the text, I omit the standard labeling of these citations.

## **Abstract**

Digital technologies change the environment of pre-digital organizations. On the one side, digital technologies lower the barriers to market entry for newly founded and existing organizations, leading to intensifying competition. On the other side, adapting digital technologies can enable new paths of value creation for pre-digital organizations. A value creation path refers to the constellation of resources necessary to fulfill a value proposition, and the organizations, traditionally organized in horizontally integrated supply chains, build the value creation chain. Thus, pre-digital organizations have historically grown structures and cultures focusing on horizontally integrated supply chains. However, new paths of value creation enabled by digital technologies differ from traditional ones. Consequently, there are barriers for pre-digital organizations to adopt digital technologies. Moreover, the resources necessary to build digital technologies and develop organizational structures are primarily limited in pre-digital organizations.

To compensate for this lack of relevant resources, pre-digital organizations are moving towards digital ecosystems. In digital ecosystems, organizations are oriented toward relevant digital resources. Then, organizations cooperate to share digital resources with other organizations in digital ecosystems. Finally, if an organization manages to orchestrate a set of (digital) resources, an altered value proposition built on a new value creation path can materialize. Ultimately, and against the backdrop of their grown structures, the digital transformation of pre-digital organizations is about developing (and subsequently evolving) digital capabilities to thrive in digital ecosystems. In this sense, digital transformation and digital ecosystems become a means to the end of the other, and pre-digital organizations in digital transformation move on to becoming parts of digital ecosystems.

In this sense, the scope of this doctoral thesis can be divided into two generalized views on the digital transformation of pre-digital organizations. First, a view on the influence of digital transformation initiatives on digital transformation. This view answers how pre-digital organizations manage digital transformation including reforming existing structures, developing new digital capabilities, and managing various digital transformation activities in parallel. Second, a view on the influence of digital ecosystems on digital transformation. This view focuses, across organizational boundaries and on a multi-level perspective, on how pre-digital organizations can leverage digital ecosystems by identifying, sharing, and orchestrating digital resources to build new or enhance existing paths of digital value creation.

The first paper approaches different pathways for building digital capabilities against existing organizational structures and culture. The second paper analyzes how pre-digital organizations can manage a portfolio of digital transformation initiatives in parallel in such that they support rather than hinder each other. The third paper provides a specific theorizing review that uncovers assumptions of existing digital ecosystems and digital transformation literature and offers converged assumptions at the intersection of digital transformation and digital ecosystems. Building on that, the fourth paper theorizes the influence of digital ecosystems on digital transformation across three mechanisms: orientation, cooperation, and orchestration. Finally, the fifth paper is an in-depth single case study on how pre-digital organization can manage their digital transformation into digital ecosystems.

In summary, this doctoral thesis contributes to a holistic understanding of a pre-digital organization's digital transformation, considering the company's transformation and the influence of its external environment.

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## **I Introduction**

### **1 Motivation**

In general, value creation paths refer to the constellation of resources and organizations necessary to fulfill a value proposition (Chandler, 1994). Historically, pre-digital organizations are established business models in traditional industries building on value creation paths that build on vertically integrated supply chains (Chaniyas et al., 2019). In practical research, a commonly used classification to describe vertically integrated supply chains is the Tier framework: A Tier 3 organization supplies parts (e.g., screws) to a Tier 2 organization that assembles components (e.g., a window). The Tier 2 organization supplies a Tier 1 organization, which assembles modules or whole systems necessary for the end product (e.g., the door). Finally, the original equipment manufacturer is supplied by the Tier 1 organizations and assembles the final product (e.g., a car). Across the whole supply chain, every pre-digital organization builds on supply-side economies of scale (Chandler, 1994; Parker et al., 2016; Porter & Heppelmann, 2014). A supply-side economy of scale unfolds if an organization successfully unlocks higher production quantities by leveraging manufacturing resources and reducing unit costs (or increasing unit quality). Over the past decades, the resource-based view of the firm established the assumption that the control of dynamic resources within an organization will lead to above-average returns and economic success (Jorde & Teece, 1989; Teece et al., 1997).

However, value creation paths built using digital technologies differ from traditional value creation paths built on manufacturing resources. Digital technologies are used as an umbrella for information, computing, communication, and connectivity technologies (Bharadwaj et al., 2013; Denner et al., 2018). Due to technological progress and the recombination of existing digital technologies, ever-new manifestations of digital technologies emerge (Yoo, 2013; Yoo et al., 2012). Digital technologies can be used to build digital resources. Digital resources can then enable new or altered value creation paths based on demand-side economies of scale (Parker et al., 2016). In most cases, the effort to build a digital technology-enabled value proposition involves comparably high upfront efforts from an organization. However, demand-side economies of scale unfold once this digital technology-enabled value proposition is in place, as the marginal costs of fulfilling the value proposition are close to zero (Parker et al., 2016). Examples are digital (video) streaming platforms like Netflix, Amazon Prime, or Disney Plus. Initially, building the digital technology from the user interface to the on-demand

download of video material is resource-intensive. However, once in place, the costs for serving the demand of one user watching one video are close to zero (Iansiti & Lakhani, 2020). Moreover, digital technologies have the characteristics of re-programmability, homogenization of data, self-referential nature (Yoo et al., 2010), convergence, and generativity (Ciriello et al., 2018). For example, the aforementioned digital technology for on-demand download of video material built by a streaming firm may be re-programmed to complement other value propositions. It can be used where downloading video material might be necessary to fulfill a specific value proposition (e.g., in streaming educative videos in a business context, recording and sharing meetings, ...). It is very likely that another organization will not invest the same amount of resources as a streaming organization in this digital technology but will license the technology already existing. Thus, due to these characteristics of digital technologies, organizations that have built digital resources to materialize one value-creation path are in a favorable position to materialize other value-creation paths at comparably low effort. Consequently, organizations that own digital resources aim to adopt their technology widely across value propositions. This is why organizations owning digital technologies push across the barriers of traditional industries (Yoo, 2013).

However, a value creation path enabled by digital resources must not only build on digital resources but can also involve physical, traditional manufacturing resources. For example, physical machinery can be equipped with artificial intelligence-based predictions to fulfill the value proposition of predictive maintenance. The traditional value proposition of the organization alters. From selling the machine to achieve a purpose in another firm's production to dedicated after-sales services involving the maintenance of the machine. However, service level agreements for machines are nothing new. In this example, the AI-based prediction might help better timing the maintenance, but the core maintenance service remains the same. However, there are value creation paths that are very different from traditional supply chains when altered by digital technologies (Iansiti & Lakhani, 2020).

To understand how digital technologies change the value creation paths for pre-digital organizations, research differentiates between supply chain and ecosystems-based value creation (Jacobides et al., 2018). Supply chain-based value creation builds on so-called generic complements – generic complements are parts of the final value proposition that can be replaced with acceptable effort (e.g., the screw or the door in the car) (Jacobides et al., 2018). Thus, a vertically integrated supply chain is (at least in parts) hierarchically controlled by the original equipment manufacturer (Jacobides et al., 2018). Ecosystem-based value creation leverages so-

called specific complements that can be unique or supermodular. A unique complement can not be replaced with an acceptable effort. For example, a state-of-the-art prediction algorithm for machinery failure may be a unique complement. Suppose the existing algorithm might be operating for a longer time. In that case, it will be trained and retrained with larger quantities of data, further improving the algorithm. Ultimately, this digital complement will be unique (Jacobides et al., 2018). Another example might be an algorithm trained on a restricted data set to which other organizations have no access. In contrast, a supermodular complement provides disproportionate benefits when combined with other complements, leading to the whole complement composition's value being more than the sum of its parts. An example is one-sided platforms like digital social media platforms, where the value of the platform grows with the number of users (Gawer & Cusumano, 2014). Another example is two-sided platforms like Amazon, where vendor value grows with the number of users and vice versa (Parker et al., 2016). In contrast to vertically integrated supply chains, the control over a value creation path in ecosystem-based value creation is distributed among the complementors owning specific complements. A value proposition will materialize if these specific complements are combined (Jacobides et al., 2018). Thus, digital ecosystems are defined as the network of at least two (inter-)dependent organizations co-creating a value proposition enabled by digital technologies (Adner, 2017; Jacobides et al., 2018; Tan et al., 2020).

In an era of digital technologies, existing organizations are asked to leverage digital resources to build new or alter existing value-creation paths. (Vial, 2019). However, different organizations have different prerequisites for adopting digital technologies. Thus, research differs between pre-digital organizations, whose business model is built mainly on traditional manufacturing resources, and born-digital organizations, whose business model is built mainly on digital resources (Chanas et al., 2019). However, existent organizational structures in pre-digital organizations are unsuitable for adopting digital technologies (Ross et al., 2019). Traditionally, pre-digital organizations utilize IT technology for efficiency in supply-side economies of scale but not as part of the value created on the demand side (Venkatraman, 1994). However, pre-digital organizations need to react to the impact of digital technologies and new digital competitors as digital technologies change customer expectations (Vial, 2019) and lower market-entry barriers (Yoo et al., 2012). For pre-digital organizations, this can be an existential threat (Sebastian et al., 2017). Thus, to remain viable in this changing environment, pre-digital organizations explore new possibilities for digital value creation (Nambisan et al., 2017). Therefore, pre-digital organizations undergo digital transformation and explore creating and

capturing value by leveraging digital technologies (Bharadwaj et al., 2013; Venkatraman, 1994; Vial, 2019; Wessel et al., 2020). Digital transformation differs from traditional IT-enabled transformations that pre-digital organizations have used to undergo. IT-enabled organizational transformations were focused on adopting an IT technology to increase efficiency and enhance an existing value proposition. In contrast, a digital transformation aims to adopt digital technologies to enable a new value proposition (Wessel et al., 2020). Moreover, digital transformation will change the organization's identity, which builds on the value proposition(s) the organization serves, and thus will require managing cultural change (Wessel et al., 2020). Hence, the capabilities pre-digital organizations build throughout managing IT transformation are insufficient to manage digital transformation (Wiesböck & Hess, 2019).

Overall, pre-digital organizations in digital transformation need to cope with different new challenges at a time. First, digital resources have characteristics that differ fundamentally from traditional manufacturing resources. Second, handling demand-side instead of supply-side economies of scale that unfold in digital ecosystems instead of vertically integrated and hierarchically controlled supply chains. Third, existing organizations are focused on and built for traditional paths of value creation, while born-digital organization's digital resources blur the barriers of traditional industries and intensify competition. In consequence, digital transformation requires new strategic imperatives (Bharadwaj et al., 2013) and remains "a highly dynamic process involving iterating between learning and doing" (Chanas et al., 2019, p. 30). Pre-digital organizations must build digital capabilities that are comprised of not only adopting digital technology but also creating new creation paths in ecosystem-based value creation while managing organizational and cultural change. Thus, pre-digital organizations launch digital transformation initiatives. However, to cope with all digital transformation requirements at a time, pre-digital organizations commonly start not only one digital transformation initiative but multiple ones in parallel.

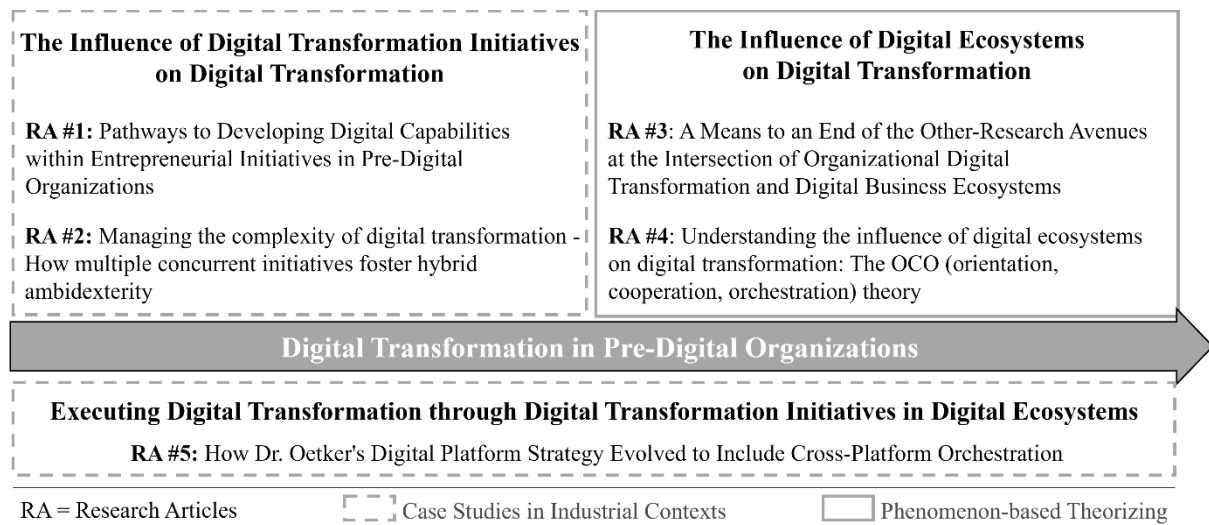
Digital transformation initiatives aim to integrate pre-digital organization's resources, e.g., information systems and production facilities into digital ecosystems (Oberländer et al., 2018; Vial, 2019). This is necessary to access external digital resources in exchange, which allows for exploring new value propositions (Oberländer et al., 2021). Hence, the change related to digital transformation relates across levels of analysis spanning individuals, organizations, and digital ecosystems (Gregory et al., 2015; Hanelt et al., 2021). However, digital transformation has, as a consequence of the historical nature of pre-digital organizations, has often been viewed mainly through an organizational level-centered view (e.g., Kaganer et al. (2023); Wessel et al.

(2020); Baiyere et al. (2020)). Taking a multi-level perspective that includes the influence of digital ecosystems is essential. Otherwise, digital transformation is incompletely understood (Zhang & Gable, 2017). Traditional information system research is centered within an organization and an existing agency of decision-makers shaping the intra-organizational use of IT technology (Venkatraman, 1994). However, empirical studies highlight that the advantages of digital technologies are located in inter-organizational value co-creation (Kim et al., 2018) and resource-sharing in digital ecosystems (Benlian et al., 2018; Fürstenau et al., 2019). In consequence, and parallel to this dissertation, research evolved to take a perspective on digital transformation from multiple levels of analysis, especially accounting for the relationship between the organizational and ecosystem levels (Hanelt et al., 2021; Plekhanov et al., 2022). Hanelt et al. (2021, p. 1159) even conclude that “digital transformation is moving firms to malleable organizational designs [...] and this move is embedded in and driven by digital business ecosystems”. Plekhanov et al. (2022) go one step further by proposing that organizations that succeed in digital transformation move from stand-alone entities to parts of digital ecosystems.

This doctoral thesis concerns digital transformation in pre-digital organizations and the challenges and opportunities outlined by digital technologies. The thesis also concerns how organizations can manage their digital transformation throughout their initiatives and how they grow from their existing supply side into the demand side economies of scale that increase in digital ecosystems.

## **2 Structure of the Thesis and Overview of Embedded Research Articles**

This section presents the structure of this cumulative dissertation, which comprises five research articles. Overall, the dissertation investigates the fundamental subject of digital transformation in pre-digital organizations. The different research articles differ in terms of methodological approaches and theoretical perspectives. Thus, the dissertation provides valuable contributions to theory and practice.

**Figure 1: Assignment of Research Articles to the Topics Structuring this Doctoral Thesis**

The remainder of this dissertation is structured as follows.

Section II.1. builds on two research articles, a single- and a multiple-case study of (a) pre-digital organization(s). Here, two of the different theoretical perspectives taken with digital capabilities in research article #1 and ambidexterity in research article #2 aim to provide a balanced view of how pre-digital organizations can influence their digital transformation by launching digital transformation initiatives. Section II.2. builds on a phenomenon-based theorizing approach. Unique to this section is that the research articles #3 and #4 build on each other. Research article #3 is a specific theorizing literature review to uncover and converge assumptions in digital transformation and ecosystems' literature streams. Research article #4 then develops a mid-range theory on the influence of digital ecosystems on digital transformation. Section II.3. builds on article #5, which is a single-case study. The article's contribution is to leverage the theoretical contributions of existent literature and from research articles #1 - #4 and embed these contributions into the example of a case study. Concretely, research article #5 recommends how a pre-digital organization can manage its digital transformation within digital ecosystems.

Section III.1 summarizes the dissertation, and section III.2 discusses its limitations and recommendations for further research. Section IV follows an acknowledgment of previous and related work, and section V lists the references. The final section, VI., is the appendix, which provides an index of research articles in VI. 1, my contributions to these articles in VI. 2, and detailed information on each research article in VI. 3. to VI. 7.

## II Research Overview

### 1 The Influence of Digital Transformation Initiatives on Digital Transformation

Digital technologies build the fundament to create new value propositions. Thus, pre-digital organizations are asked to develop and implement a digital strategy on how to adopt digital technologies (Bharadwaj et al., 2013; Ross et al., 2016). Therefore, pre-digital organizations launch digital transformation initiatives defined as pre-digital organization's activities to (re)define value-creation paths by strategizing and operationalizing the adoption of digital technologies' affordances (Gregory et al., 2015; Nambisan et al., 2017). However, multiple ways on how to set up and design these initiatives are possible (Chanias et al., 2019).

Digital transformation initiatives can be analyzed from different theoretical perspectives. Within this cumulative dissertation, research article #1 focuses on building the digital capabilities necessary to adopt digital technologies. Through the theoretical perspective of (digital) resources and the analysis of a single-case study, research article #1 presents four different types of digital transformation initiatives and the pathways they can take to build digital capabilities. Research article #2 focuses on managing the interplay between digital transformation initiatives and between digital transformation initiatives and the core organization. Through the theoretical perspective of ambidexterity and the analysis of a multiple-case study, research article #2 presents three different types of digital transformation initiatives and recommends how to manage the interplay of digital transformation initiatives.

#### **Research Article 1# - Pathways to Developing Digital Capabilities within Entrepreneurial Initiatives in Pre-Digital Organizations**

*“These [entrepreneurial initiatives] are all things that have little to do directly with our core business because they involve completely different capabilities, different KPIs, and different complexities, (...) away from the competencies we have today. We can't bring our marketing expertise to bear, we can't use our sales team for it, and certainly not our own production and supply chain.”*

– #10, Head of Corporate Strategy (research article #1)

Pre-digital organizations need to adopt digital technologies to enable digital value propositions (Nambisan et al., 2017). However, a pre-digital organization's past success is building on existing capabilities (Grant, 1991, 1996a). These existing capabilities may support but may also hinder digital transformation (Yeow et al., 2018). Existent IT capabilities differ significantly

from digital capabilities (Li et al., 2018). To adapt to digital technologies, a pre-digital organization needs to develop digital capabilities (Wiesböck & Hess, 2019). Only then can pre-digital organizations manage to exploit digital resources. Digital capability refers to defining and executing the digital strategy (Gurbaxani & Dunkle, 2019) and creating digital value propositions (Vial, 2019). Innovation can be at the organizational level of processes, products, services, and business models (Nambisan et al., 2017; Soluk & Kammerlander, 2021). However, the existing organizational structure is built to amplify and exploit the existing capabilities (Grant, 1996b). Thus, pre-digital organizations in digital transformation face the challenge of overcoming internal structures and barriers (Vial, 2019). Pre-digital organizations need to (re)align their resources (Yeow et al., 2018) as well as modify the existing structures (Jöhnk et al., 2020). Therefore, launching several digital transformation initiatives is practical to find the proper structure for a specific organization (Drechsler et al., 2020). Launching multiple digital transformation initiatives simultaneously is sufficient to cope with emerging market opportunities (Gassmann et al., 2012). Subsequently, research article #1 focuses on the research question of “*How do the pathways for developing digital capabilities differ within a pre-digital organization?*” (research article #1).

Research article #1 is based on a single-case study at FoodLtd, which analyzes six different initiatives from 2016 to 2020. The data is presented in Table 1.

**Table 1: Overview of the Collected Data**

Type	Amount	Documented
Interviews	26	1,444 minutes of transcripts
Informal Conversations	47	Notes from 33 hours of conversation
Observations	22	Notes from 65 h of observation
Internal Documents	414	-
Public Data	40	206 pages

FoodLtd globally operates several lines of business, including asset investments such as production facilities. However, since 2016, digital technologies have begun to change the behavior of end consumers, which is why FoodLtd has been searching for an approach to respond to these developments. Consequently, a digital strategy was developed, and six digital transformation initiatives were launched. The initiative *category website* is a recipe website leveraging social and mobile technologies for a novel consumer experience built and operated by FoodLtd. *Category shops* are comprised of acquiring and merging different successful e-commerce shops in FoodLtd’s core business category. *The content shop* began as independent but soon became a merger of the digital transformation initiatives of *category website* and

*category shop*. The fourth initiative is *event platform*: A cooperation with a third party to utilize their digital platform technology for events around the products of FoodLtd. Another cooperation is the *AI app*, which leverages machine learning to build a digital service for FoodLtd's products. Finally, the initiative *consumer community* is a self-build value co-creation social platform for the consumers of FoodLtd.

The analysis of the single-case study across the six initiatives yields two characteristics that define the pathways to build digital capabilities in pre-digital organizations. First, the source of digital capability development might be inorganic or organic. Second, the set-up of involved actors might be independent or interdependent. Therefore, the six analyzed initiatives can be categorized into four possible pathways: capability acquisition, nascent partnership, multi-unit orchestra, and (new-)unit head-start.

Every one of these pathways has individual advantages and disadvantages. For example, the inorganic pathways (capability acquisition and nascent partnership) have a comparably high speed of digital capability development vs. the organic pathways (multi-unit orchestra or (new-)unit head-start). However, the reapplicability in other digital transformation contexts tends to be higher if a digital capability is built up organically. Hence, pre-digital organizations may choose a different pathway for digital transformation initiatives. Pre-digital organizations might combine two or more pathways in one digital transformation initiative. Which pathway is sufficient at a time depends on the digital strategy of a pre-digital organization. Table 2 gives a comprehensive overview of the four pathways.

Thus, research article #1 contributes to understanding how digital transformation manifests in pre-digital organizations by suggesting different pathways for building up digital capabilities to adapt to digital technologies. Moreover, practitioners can use the four pathways to orientate and decide how they manage their specific digital transformation initiatives.

**Table 2: Observed Pathways at FoodLtd, their Characteristics, and Materializations**

<b>Pre-digital Organization's Pathway</b>	<b>Capability Acquisition</b>	<b>Nascent Partnership</b>	<b>Multi-Unit Orchestra</b>	<b>(New-)Unit Head-Start</b>
<i>Digital transformation initiatives at FoodLtd</i>	<i>CategoryShop</i>	<i>EventPlatform (Phase II), AIApp</i>	<i>CategoryWebsite, ContentShop, consumer community</i>	<i>EventPlatform (Phase I), ConsumerCommunity (Future Phase)</i>
<b>How is the pathway to developing digital capabilities characterized?</b>				
<b>Source of development</b>	Inorganic	Inorganic	Organic	Organic
<b>Set-up of involved actors</b>	(Tending toward) Independent	Interdependent	Interdependent	Independent
<b>How had the pathway materialized in the digital transformation of FoodLtd?</b>				
<b>Pathway requirements were given with/when/if ...</b>	... organic build-up of digital capabilities not possible or lacked justified efforts. ... A concrete business model was known and a long-term commitment was available. ... pre-digital organization knows how to evaluate and acquire digital firms.	... organic build-up of digital capabilities was not possible or lacked justified efforts. ... openness towards how the business model develops throughout the partnership. ... pre-digital organization knows how to partner with digital firms.	... high acceptance of failure and changing routes as well as necessary efforts. ... a leadership commitment or vision that gave long-term orientation. ... pre-digital organization wants to take an internal approach to develop digital capabilities.	... decoupling from PDO's structures and freedom to choose methods/tools. ... business developers with talent and skills in digital technologies were available. ... pre-digital organization wants to take an internal approach to develop digital capabilities.
<b>Speed of development</b>	<b>High</b> (due to direct acquisition of necessary digital capabilities)	<b>High</b> (as partner provided the necessary digital capabilities)	<b>Low</b> (as units need time to determine how to approach the build-up)	<b>Medium</b> (alongside validating a business model and its foundation)
<b>Chance of successful value proposition establishment</b>	<b>Medium</b> (only if digital capabilities were usefully combined)	<b>High</b> (if partners were adequate for digital capability development)	<b>Low</b> (as units searched for business models while developing digital capabilities)	<b>Medium</b> (the pathway alone was not comprehensive for establishing a business model)
<b>OI conflicts during the development</b>	<b>Low</b> (due to the avoidance of complex actor constellations)	<b>Medium</b> (dependent on the attitude and capabilities of the partners)	<b>High</b> (due to the diverse background of the pre-digital units)	<b>Low</b> (as decoupling from all structures was possible)
<b>Digital capability re-applicability in other digital transformation contexts</b>	<b>Medium</b> (digital capabilities are business model specialized)	<b>Low</b> (even though digital capability variety may be available, re-applying them was not the digital transformation initiative's focus)	<b>High</b> (a broad variety was developed, including the capability of applying these in other digital transformation contexts)	<b>Medium</b> (the digital capabilities were only of help for validating business models)

## **Research Article 2# - Managing the Complexity of Digital Transformation - How Multiple Concurrent Initiatives foster Hybrid Ambidexterity**

*“There is a corporate strategy, [...] then there is the IT strategy, then there is the one from our management, [...] and of course we also have an e-commerce strategy. [...] our management has ensured that the company’s existing strategies are incorporated into our strategy.”*

#4 Manager, E-Commerce: Marketing & IT (research article #2)

Pre-digital organizations in digital transformation launch multiple digital transformation initiatives. This results in concurrent approaches leading to organizational complexity. Within a pre-digital organization, the digital transformation initiatives interplay with the core organization as well as with each other (Jöhnk et al., 2020). In consequence, a pre-digital organization must develop the digital capability to manage competing concerns in digital transformation (Nadkarni & Prügl, 2021; Svahn et al., 2017) or otherwise, digital transformation might be stalled overall (Soh et al., 2019). Ultimately, digital transformation effectiveness can be hampered not only by individual initiatives that fail to build digital capabilities and adopt digital technologies. Moreover, digital transformation effectiveness can be hindered by pre-digital organizations failing to address the organizational complexity between digital transformation initiatives and the core organization and between the digital transformation initiatives (research article #2).

A theoretical perspective to manage the conflict between exploiting the concurrent businesses and exploring new business opportunities is ambidexterity (O.-K. Lee et al., 2015; Tushman & O'Reilly, 1996). Structural ambidexterity focuses on dual, separated organizational structures: One organizational structure for exploitation and one for exploration (e.g., two different business units) (Haffke et al., 2017). Contextual ambidexterity focuses on parallel exploitation and exploration activities within one organizational structure (e.g., one business unit) (Gibson & Birkinshaw, 2004). A combination of both structural and contextual ambidexterity is called hybrid ambidexterity (Chen, 2017; Ossenbrink et al., 2019). Research article #2 thus focuses on the question, *“How do incumbents manage the interplay between multiple concurrent digital transformation initiatives, and how does this foster hybrid ambidexterity?”*

Research article #2 is built on a multiple-case study at AutoCo, FoodCo, and MedCo. The data is presented in Table 3.

**Table 3. Overview Of The Collected Case Data**

<i>Case</i>	<b>Case 1 – AutoCo</b>	<b>Case 2 – FoodCo</b>	<b>Case 3 – MedCo</b>
<i>Industry</i>	Automotive	Food and beverages	Medical aids
<i>Employees</i>	~300,000	~10,000	~3,000
<i>Years in business</i>	>130	>120	>100
<i>Claimed digital transformation focus</i>	Establishing a digital championship to resolve individual mobility consumers' needs	Building a digital food ecosystem to explore digital business model opportunities	Becoming the industry benchmark for digital-enabled individual health solutions
<i>Data</i>	8 interviews Field observations, internal presentations, documents, and publicly available media information	10 interviews	12 interviews

Overall, ten analyzed digital transformation initiatives were characterized into three different types. First, the innovation-focused digital transformation initiatives are characterized by structural ambidexterity and are focused on (digital) value creation paths in cooperation with external actors. Examples of innovation-focused digital transformation initiatives are accelerators (Cohen et al., 2019; Coletti & Landoni, 2018; Singh et al., 2020), incubators (Hausberg & Korreck, 2020), or (digital) corporate venture capital (S. U. Lee et al., 2018). Second, delivery-focused digital transformation initiatives are characterized by structural ambidexterity and are organizational substructures that are, to a certain extent, independent of omitting organizational barriers and focused on adopting digital technologies within the pre-digital organization (Hansen et al., 2019; Sebastian et al., 2017). Delivery-focused digital transformation initiatives comprise internal hubs (Svahn et al., 2017), labs (Holotiuk & Beimborn, 2019), or units (Jöhnk et al., 2020). Third, change-focused digital transformation initiatives are characterized by contextual ambidexterity. They differ from the latter two in that they span across the organization and are specifically dedicated to building digital capabilities (Dremel et al., 2017) or driving cultural change (El Sawy et al., 2016) to support the digital transformation strategy.

For example, at AutoCo, one digital transformation initiative per type existed. The delivery-focused digital transformation initiative was a legally separated digital unit for marketing and sales. The innovation-focused digital transformation initiative was a legally separated entity to build new digital business models. Lastly, the change-focused digital transformation initiative was an organization-wide spanning digital and cultural change program. At FoodCo, there were two delivery-focused, one innovation-focused and one change-focused digital transformation initiative. At MedCo, the situation was similar to AutoCo, with one digital transformation initiative per type existing.

Overall, the analysis suggests that pre-digital organizations may deliberately launch different digital transformation initiatives to cover various aspects of their digital transformation. The findings of research article #3 conclude that pre-digital organizations can then achieve hybrid ambidexterity if they combine structural and contextual ambidexterity-focused digital transformation initiatives. Contextually ambidextrous digital transformation initiatives can especially connect the explorative activities of structurally ambidextrous digital transformation initiatives with the activities of exploitation-focused core organizations.

However, thoughtful interplay management is necessary to achieve a fruitful interplay between the digital transformation initiatives and the core organization. Different digital transformation initiatives can co-exist, but their interdependencies across the organization and its structure require deliberate management. Otherwise, the digital transformation initiatives may compete with each other or the core organization (Nadkarni & Prügl, 2021). Pre-digital organizations can manage this challenge among five management aspects (i.e., strategic alignment, governance, methods/ IT, people, and culture). Research article #3 formulates concrete approaches for interplay management for both interplay management between digital transformation initiatives and between digital transformation initiatives and the core organization. For example, to manage the interplay between digital transformation initiatives, an organization can set distinct success measures that reflect the specific focus of digital transformation initiatives. However, pushing new digital tools and methods is a united purpose across all digital transformation initiatives.

The theoretical contribution of research article #3 adds to the developing fields of hybrid ambidexterity and characterizing digital transformation initiatives. Further, it contributes to understanding digital transformation as a process by understanding how an organization that starts with a single digital transformation initiative evolves into a portfolio of multiple digital transformation initiatives and builds the digital capability of digital transformation initiatives interplay management.

## **2 The Influence of Digital Ecosystems on Digital Transformation**

Digital technologies create an open-ended space of digital opportunities (Henfridsson et al., 2018; Oberländer et al., 2021). Thus, digital technologies change the creation of value beyond organizational limits; hence, digital transformation is a phenomenon of multi-level nature (Plekhanov et al., 2022). While the last chapter focused on how pre-digital organizations can foster digital transformation by launching and managing digital capabilities, this chapter

extends this discussion to the external environment. Due to the properties of digital technologies, digital transformation is a process that pre-digital organizations can not stem in isolation but are required to move to digital ecosystems. The analysis of this chapter further specifies digital technologies by the term of digital resources, which are the building blocks of a technology. Historically, the theoretical perspective of the resource-based view is focused on internally owned and controlled resources (Oberländer et al., 2021). Digital resources, which are digital technologies' building blocks, differ from this view. Digital resources are a specific class of digital objects (Kallinikos et al., 2013; Piccoli et al., 2022) that “(1) are modular, (2) encapsulate objects of value, namely assets and/or capabilities, and (3) are accessible by way of a programmatic interface” (Piccoli et al., 2022, p. 2293).

These properties of digital technologies are why understanding digital transformation beyond the organizational level is essential. Digital ecosystems are defined as a network of at least two (inter-)dependent organizations co-creating a joint value proposition through digital technologies (Adner, 2017; Jacobides et al., 2018; Tan et al., 2020). The definition of interdependency among organizations in digital ecosystems stems from the complementary resources for value creation. Complementary resources are either unique or supermodular, whereby unique resources are non-reproducible by other organizations, and supermodular resources provide disproportionate benefits when combined (David J. Teece, 2018; Jacobides et al., 2018). The properties of modularity and access by programmatic interface allow for the sharing of digital resources among organizations. This becomes important for digital value creation since building digital resources may not be possible in adequate time or effort by pre-digital organizations (research article #4). In consequence, digital transformation is a game played by partners (research article #3).

To unpack digital transformation holistically across the organizational and ecosystem levels of analysis. Research article #3 is a literature review that uncovers isolated assumptions in digital transformation and digital ecosystem literature and proposes convergent assumptions for multi-level theorizing. Research article #4 builds on that and presents a mid-range theory on the influence of digital ecosystems on digital transformation named OCO (orientation, cooperation, orchestration) theory.

**Research Article #3 – A Means to an End of the Other - Research Avenues at the Intersection of Organizational Digital Transformation and Digital Business Ecosystems**

The prerequisite for research article #3 is the idea of theorizing reviews following Leidner (2018). The methodology of a theorizing review differs from a “classical” literature review, which Leidner (2018) labels as assessing review. While an assessing review summarizes a stream of literature on what is known, the theorizing review aims to uncover the thinking behind a stream of literature. The theorizing review focuses on what are "patterns in the research streams and to uncover what is missing" (Leidner, 2018, p. 554).

Research article #3 analyzes the individual research streams of digital transformation and digital ecosystems. This approach aims to uncover implicit assumptions in both research streams. Thus, the research question is “*What is a shared foundation for theory on digital transformation's and digital ecosystems' intersection, and what are corresponding avenues for future research?*” (research article #3). Table 4 depicts the methodology of the literature review. First, a “classical” assessment review was assessed to synthesize the existent literature of both streams. Subsequently, the specific theorizing review is used to identify the gaps in research by uncovering assumptions of each research strategy and proposing converging assumptions at their intersection. However, it is essential to note that this analysis does not suggest that something is “misunderstood” but focuses on uncovering what has mainly influenced the “thinking” within a stream of research.

**Table 4: Research Methodology**

Phase	Methodological Approach	Steps per Phase	Methodological Guidance
Phase a	Assessing review (synthesize and describe)	a.1 Problem definition a.2 Literature search a.3 Screening for inclusion a.4 Quality assessment a.5 Data extraction a.6 Data interpretation	Webster and Watson (2002); vom Brocke et al. (2015); Templier and Paré (2018)
Phase b	Specific theorizing review (theorize and identify research gaps)	b.1 Iterative assumption extraction b.2 Discussion of extracted assumptions b.3 Proposal of convergent assumptions b.4 Proposal of future research avenues	Dubin (1978); Whetten (1989); Bacharach (1989); Leidner and Alavi (2001); Rivard (2014)

The literature stream of digital transformation and digital ecosystems share ground in digital technologies. Both follow an understanding that digital technologies contribute to profound

changes in society at large and in a wide variety of industries, asking and enabling incumbent organizations to transform (Vial, 2019). Moreover, the significant changes in value creation and capture facilitated the emergence of digital platforms in the recent two decades (Tan et al., 2020; Vial, 2019). However, digital transformation literature originates in IT transformation and organizational strategy literature. Here, the resource-based view of the firm is primarily focused on which owned and controlled resources allow for a competitive advantage (Grant, 1996a, 1996b). The literature matured in parallel to the rise of digital technologies. IT's role within organizations developed from a predominant focus on efficiency to a role as an enabler for networks of organizations (Venkatraman, 1994). Thus, digital transformation focuses on the digital improvement process of individual pre-digital organizations. Digital ecosystem literature originates in extending or rejecting metaphors drawn from existing theories of biological ecosystems applied to describing networks of organizations (Bogers et al., 2019; Moore, 1993). Therefore, it matured into an independent theoretical perspective separated from other theories on networks of inter-organizational relationships. E.g., digital ecosystems are networks where organizations depend on other organizations' co-existence and the sharing of specific complementary digital resources (Jacobides et al., 2018). Thus, digital ecosystems focus on digitally enabled value co-creation among organizations.

Building on that analysis, research article #3 provides the set of assumptions presented in Table 5. The assumptions in digital transformation or digital ecosystem literature can be matched with each other across different topics: resource interdependence, competition dynamics, structural evolution, and locus of control.

**Table 5: Derived Convergent Assumptions of  
Digital Transformation and Digital Ecosystems**

<b>Nr.</b>	<b>Topic of Assumption</b>	<b>Assumption in Digital Transformation Literature</b>	<b>Assumption in Digital Ecosystem Literature</b>	<b>The Missing Link in Assumptions</b>	<b>Convergent Assumption</b>
1	<i>Resource interdependence</i>	Organizations require external resources for digitally-enabled value creation.	Organizations mutually share resources for digitally-enabled value (co-)creation.	Organizations can leverage resources from digital ecosystems for digital transformation. Vice versa, digital ecosystems require organizations to contribute resources for mutual, digitally-enabled value (co-)creation.	<i>Digital transformation requires and enables resource-sharing in digital ecosystems.</i>
2	<i>Coopetition dynamics</i>	Organizations must act due to digitally-driven competition and disruption.	Organizations balance collaboration and competition (coopetition).	Organizations engage in digital transformation to protect against disruption. In digital ecosystems, organizations shield each other from digital disruption through coopetition.	<i>Digital transformation seeks protection that can be provided by the coopetition dynamics of digital ecosystems.</i>
3	<i>Structural evolution</i>	Organizations transform in an ongoing process fueled by digital technologies.	Organizations realign in an ongoing process required for digitally-enabled value (co-) creation.	Organizations need to continuously evolve in digital transformation and digital ecosystems driven by digital technologies. Evolution is triggered if an organization facilitates new value propositions or (re-)aligns with others who have done so.	<i>Digital ecosystems require organizations to co-evolve, fueling their ongoing digital transformation.</i>
4	<i>Locus of control</i>	Organizations need to overcome hierarchy-based value creation and static control paradigms.	Organizations are engaged in ecosystem-based value (co-) creation and dynamic holarchies.	Organizations need to develop dynamic control for activities across digital ecosystems. That offers a way forward for hierarchy-based control mechanisms, which digital transformation aims to overcome.	<i>Digital ecosystems facilitate dynamic control structures that organizations need to develop within digital transformation.</i>

Following this assumption, research article #3 critically discusses that digital transformation literature in parts considers digital ecosystems as merely "some kind of interconnectivity that comes with digital". Against this backdrop, research article #3 proposes an overarching effect between digital transformation and digital ecosystems: Digital transformation and digital ecosystems may be one possible means to an end of each other in facilitating digital technologies. Combining both perspectives in joint theorizing may help to understand the need for interdependence in leveraging and sharing digital resources to create digitally-enabled value. Digital transformation and digital business ecosystems might have a cyclical and iterative interrelationship. Understanding this relationship is especially important since pre-digital organizations' digital transformation might be ineffective if organizations cannot master the challenges of digital technologies without digital ecosystems.

#### **Research Article #4 – Understanding the Influence of Digital Ecosystems on Digital Transformation: The OCO (Orientation, Cooperation, Orchestration) Theory.**

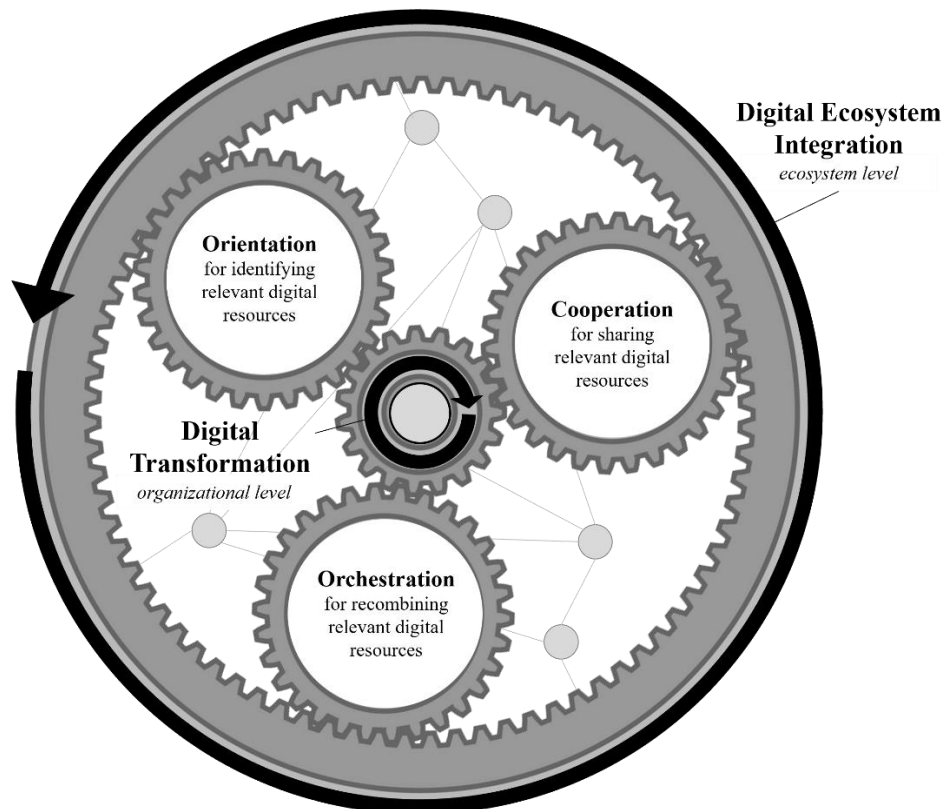
Building on research article #3, research article #4 develops a theory on the influence of digital ecosystems on digital transformation. It extends prior work showing that digital ecosystems play a relevant role in digital transformation by providing a deeper understanding of *how* digital ecosystems influence digital transformation. This helps to avoid two types of fallacies (Burton-Jones & Gallivan, 2007; Wang, 2021): First, in a contextual fallacy, relevant influences from a higher level could be neglected for spurious influences from a lower level. Second, overlooking the interaction of entities at different levels may result in cross-level fallacies. In consequence, OCO theory calls for a view of digital transformation beyond the organizational structure (Hanelt et al., 2021). The research question is: "*How does a digital ecosystem influence an organization's digital transformation?*" (research article #4).

The development of OCO theory follows a phenomenon-based theorizing approach (Fisher et al., 2021). Throughout the development of the theory, the assumptions of research article #3 were further developed by assessing the phenomenon of digital ecosystems' influence on digital transformation through different theoretical perspectives. After testing a perspective of symbiosis from biological research and path constitution theory from organizational science, a digital resource perspective assisted the OCO theory's development. However, the building of theory remains a process characterized by imagination (Leidner, 2018; Rivard, 2014), with results that cannot be made traceable by merely reprocessing the applied methods (Markus &

Rowe, 2021). The resulting OCO (orientation, cooperation, orchestration) theory of digital transformation is a so-called mid-range theory. The presented proposition allows researchers to derive testable hypotheses to potentially disprove the theory (Gregor, 2006; Merton, 1968).

OCO theory applies a digital resource-based perspective (Henfridsson et al., 2018; Oberländer et al., 2021; Piccoli et al., 2022) and focuses on the organization's digital ecosystem integration to theorize the influence of a digital ecosystem on an organization's digital transformation through three interdependent mechanisms, i.e., orientation, cooperation, and orchestration. OCO theory defines digital transformation as "*an ongoing change process that redefines an organization's value proposition through digital technologies*". Further, digital ecosystem integration is defined as "*an organization integrates into digital ecosystems if it continuously aligns its actions and resources with other digital ecosystems members' actions and resources to co-create a value proposition*". Finally, digital transformation effectiveness is defined as "*the purposeful and timely realization of a new value proposition enabled by digital technologies*". (research article #4)

Figure 2 symbolizes OCO theory with the example of a planetary gear. Whenever one of the three OCO mechanisms is in motion, an organization's digital transformation evolves, and the digital ecosystem integration deepens.

**Figure 2: Overview of the Orientation, Cooperation, and Orchestration Theory.**

Consequently, digital ecosystem integration is an overarching effect set in motion by cross-level interactions between the organizational and the ecosystem levels. Moreover, cross-level interactions exist in every mechanism: Bottom-up interactions from the organization to the ecosystem level and top-down interactions from the ecosystem to the organization level.

In the orientation mechanism, the bottom-up interactions uncover existing competitive internal resources compared to others' resources. In contrast, the top-down interactions uncover new digital resources required in the digital ecosystem at the ecosystem level. Overarching digital ecosystem integration allows for the identification of relevant digital resources.

In cooperation mechanisms, bottom-up interactions grant access to an organization's digital resources to digital ecosystem members at the organizational level. In contrast, the top-down interactions allow the digitally transforming organization to access relevant digital resources from other digital ecosystem members on the ecosystem level. Overarching, digital ecosystem integration enables sharing these relevant digital resources with other organizations.

In the orchestration mechanism, bottom-up interactions align digital resource design on the organizational level with a digital ecosystem's governance standards, and top-down interactions

assemble digital resources on the ecosystem level to create new digitally enabled value propositions. Overarching, digital ecosystem integration allows us to recombine these relevant digital resources effectively.

The explanation of how digital ecosystems influence digital transformation is summarized in the propositions of Table 6. The first proposition per mechanism proposes that deeper digital ecosystem integration will more likely lead to identifying, sharing, and recombining digital resources. Then, the second proposition per mechanism suggests that the more an organization can identify, share, and recombine a digital resource, the more likely the digital transformation will be effective. The six propositions combined suggest that the deeper an organization’s digital ecosystem integration, the more likely a digital transformation will be effective.

**Table 6: Proposition of the OCO Theory of Digital Transformation**

<b>Mechanism</b>	<b>Proposition</b>
<b>Orientation</b>	P1.a: The deeper an organization’s digital ecosystem integration, the more likely it can identify relevant digital resources.
	P1.b: The more an organization can identify relevant digital resources, the more likely its digital transformation is effective.
<b>Orchestration</b>	P2.a: The deeper an organization’s digital ecosystem integration, the more likely it can share relevant digital resources.
	P2.b: The more an organization can share relevant digital resources, the more likely its digital transformation is effective.
<b>Orchestration</b>	P3.a: The deeper an organization’s digital ecosystem integration, the more likely it can recombine relevant digital resources.
	P3.b: The more an organization can recombine relevant digital resources, the more likely its digital transformation is effective.

The theoretical contribution of the OCO theory is two-fold. First, OCO theory adds to the theory on digital resources. All three mechanisms – orientation, cooperation, and orchestration – build on digital resources. Significantly, research article #3 adds to the strategic importance of digital resources for digital transformation (Piccoli et al., 2024). Organizations cannot develop all relevant digital resources alone but must access digital ecosystems to identify, share, and recombine digital resources. Second, OCO theory specifies the overarching effect of digital ecosystem integration on digital transformation. This expands existing multi-level work (Hanelt et al., 2021; Plekhanov et al., 2022; Wang, 2021) which has specifically highlighted the relevance of digital ecosystems for digital transformation but also relates to the work of Venkatraman (1994) who argued for shifting the focus in IS research from intra-organizational efficiency to inter-organizational value creation. This turns out to be more critical than ever in digital transformation.

**Figure 3: Overview of Future Research Themes Expanding the OCO Theory’s Contribution**

Future research themes – theoretical	OCO theory’s contribution	Future research themes – empirical
Examination of inter-relationships among OCO mechanisms and interactions	OCO mechanisms of digital transformation and underlying cross-level interactions	Empirical investigation of ‘the OCO mechanisms’ and interactions’ contingencies
Theorizing the influence of an organization’s digital transformation on a digital ecosystem	Overarching influence of a digital ecosystem on an organization’s digital transformation	Empirical validation/falsification of the digital ecosystem’s influence on digital transformation

Research article #4 ends by providing four future research themes depicted in Figure 3. Two of these themes focus on empirical and theoretical research. While the first three research themes concentrate on developing OCO theory further, the last research theme has a different role. The theme of empirical validation/falsification is an essential element of the theorizing itself - core criteria of theory development is the theory being falsifiability and thus non-tautological in itself (Bacharach, 1989).

**3 Executing Digital Transformation through Digital Transformation Initiatives in Digital Ecosystems**

**Research Article #5 – How Dr. Oetker's Digital Platform Strategy Evolved to Include Cross-Platform Orchestration**

Research article #5 differs substantially from the prior four articles' methodological approach and target audience. As a contribution to MISQ Executives, it is written for CEO/CTO/CDOs as its primary audience. Due to this approach, it has no specific theoretical perspective that informs the analysis of empirical data or a piece of theorizing. Instead, it is a distinct advance of the theoretical contributions of existent literature and the specific insights of research articles #1 - #4.

Concretely, research article #5 recommends how to manage digital transformation within digital ecosystems. In the example of Dr. Oetker, a globally active, fast-moving consumer goods player, the research article ultimately suggests four tactics for digital platforms (as a relevant subset of digital ecosystems) and six principles for digital transformation management. Hence, the research article informs decision-makers on how they can approach launching

multiple digital transformation initiatives that span within the pre-digital organization but also into the external environment – the digital ecosystem. Consequently, it guides the development of digital capabilities and adopting digital technologies to create (new) value propositions. The research article discusses possible ways to craft and implement a digital strategy.

The case of Dr. Oetker has focused on a sub-form of digital ecosystems: Digital platforms are a digital infrastructure for exchanging complements, whereas digital marketplaces and social media are prominent examples of digital platforms (Benlian et al., 2018; Fürstenau et al., 2019; Hein et al., 2020). Furthermore, digital platforms differ from the traditional linear supply chains (Parker et al., 2016) Dr. Oetker was used to operate.

The case of Dr. Oetker has focused on a sub-form of digital ecosystems: Digital platforms are a digital infrastructure for exchanging complements, whereby digital marketplaces and social media are prominent examples of digital platforms (Benlian et al., 2018; Fürstenau et al., 2019; Hein et al., 2020). Furthermore, digital platforms differ from the traditional linear supply chains (Parker et al., 2016) Dr. Oetker was used to operate. In addition to a focus on competitors, suppliers, and customers, pre-digital organizations are asked to learn to focus on collaborators and complementors (Shapiro & Varian, 1999). However, empirical platform literature frequently focuses on actors like *Google, Apple, Facebook, Amazon, Alibaba, or Tencent*) who occupy central positions as sponsors or owners of large digital platforms (Fink et al., 2020). Thus, research article #5 is focused on pre-digital organizations that are required to develop digital platform strategies.

The example of Dr. Oetker’s digital transformation strategy is not a pure success story. Over three phases, Dr. Oetker’s approach has moved from simply competing for digital platform ownership in the first phase to collaborating to own and complement digital platforms in the second phase. Ultimately, in the third phase, Dr. Oetker began to build its foundations for orchestrating digital resources.

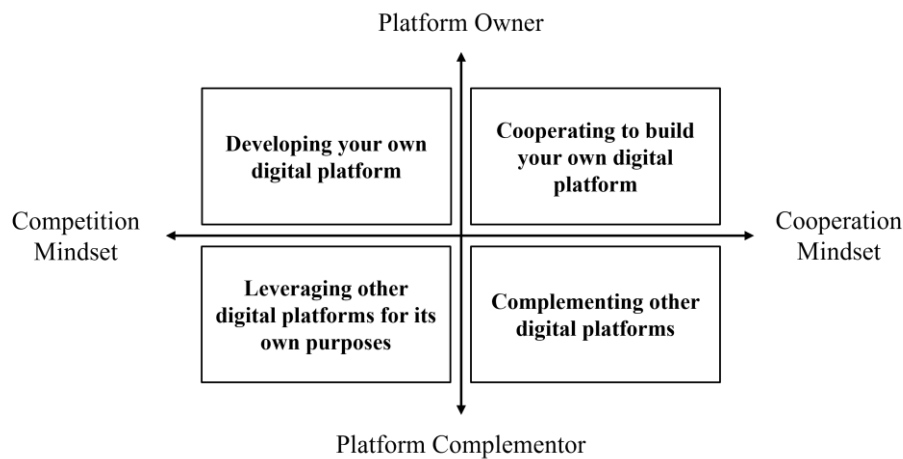
**Table 7: Main Initiatives Around Digital Platform Strategy at Dr. Oetker**

Year	2017–2018	2018–2019	2020–2021
<b>Phase of Digital Platform Strategy</b>	Compete for Digital Platform Ownership	Collaborate to Own and Complement Digital Platforms	Foundations for Orchestrating Cross-Platforms

<p><b>Main Initiatives</b></p>	<p>Build <i>kuchenfreude.de</i>, <i>backen.de</i> and <i>MBSS</i> platform. Pivots in all three initiatives.</p>	<p>Cooperating to build <i>BakeNight</i> and <i>BakeTwister</i>. Build <i>BakerSquare</i> and complement platforms within <i>backen.de</i>.</p>	<p>Process of digital platform strategy making in the <i>AllAboutCake</i>. Begin managing interplays and cross-ecosystem balancing.</p>
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In the three phases of developing a digital platform strategy at Dr. Oetker, the mechanisms of the OCO theory of research paper #4 become visible. First, Dr. Oetker learned the mechanism of orientation. Beginning its digital transformation journey, Dr. Oetker launched several digital transformation initiatives at a time to build its digital platforms. However, Dr. Oetker learned that it is crucial to identify relevant digital resources in the first place and then deliberately decide which digital resources to own and build (or acquire) and which digital resources to share with other organizations. Thus, Dr. Oetker's management is to build digital capabilities for orientation in digital ecosystems. Subsequently, Dr. Oetker learned the mechanism of cooperation. Dr. Oetker pivoted in all launched digital transformation initiatives and began collaborating with other organizations. A more balanced approach to building own and leveraging other digital resources was developed. Concretely, Dr. Oetker builds digital capabilities to assess the digital resources of different organizations. Therefore, Dr. Oetker learned the mechanism of orchestration. Dr. Oetker deliberately built an organizational structure to manage the digital transformation initiatives. Concretely, Dr. Oetker builds digital capabilities in learning to manage the interplay between digital transformation initiatives across digital ecosystems.

In particular, research article #5 offers insight into how a pre-digital organization can manage cooperation mechanisms. It was this mechanism that Dr. Oetker “struggled” most and tested various approaches. The insights suggest four different strategies depicted in Figure 4.

**Figure 4: Four Tactics within Traditional Firms' Digital Platform Strategy**

First, a pre-digital organization can leverage its own resources to build a digital platform and compete with all other potential digital platforms that address the same value propositions. Second, pre-digital organizations that lack dedicated digital resources to develop a digital platform may seek platform ownership by cooperating with partners who can provide the resources necessary. Third, pre-digital organizations can enter digital platforms as complementors, offering dedicated services and/or products. Finally, organizations can alienate existing digital platforms for their purposes, for example, by promoting their own services or platforms to consumers (Karhu et al., 2020). In either case, the tactics involve trade-offs.

In addition to these strategies, research article #3 introduced six principles for making decisions on digital platform strategy. These principles build on Dr. Oetker's learning and are designed for pre-digital organizations to reflect on and rethink their choices in digital platform strategy. E.g., on principle concerns, *"the stronger your firms past focus were on value chain control, the more seriously you should reflect if this is determining a choice to build platforms"* (research article #5). Thus, research article #3 intends to stimulate other organizations to share information about and develop theories on digital platform strategy.

### III Summary and Limitations

#### 1 Summary

In recent years, digital transformation moved into the focus of organizational transformation literature (Hanelt et al., 2021; Wessel et al., 2020). The influence of digital technologies changes how pre-digital organizations manage the creation and capture of (digital) value (Oberländer et al., 2021). Especially, leveraging demand-side economies of scale differing

substantially from the supply-side economies of scale pre-digital organizations require new approaches to organizational management (Parker et al., 2016). This doctoral thesis addresses three overarching topics alongside the challenge of pre-digital organizations' digital transformation:

First, *the influence of digital transformation initiatives on digital transformation* concerns the range of activities available for pre-digital organizations. In this vein, the doctoral thesis focuses on the pathways different digital transformation initiatives can take to build digital capabilities to adopt digital technologies (research article #1). Pre-digital organizations can choose from four different pathways that differ in the characteristics between the source of digital capability development (organic vs. inorganic) and between the set-up of involved actors (independent vs. interdependent). Which pathway is suited best for a pre-digital organization depends on the prerequisites of the organization's historic structure and capabilities as well as the goal of its digital transformation strategy. As digital transformation strategy evolves, so will the pathways to build digital capabilities in pre-digital organizations, which will change over time within an organization. Moreover, the doctoral thesis offers insights into managing multiple concurrent initiatives at a time (research article #2). To cope with digital technologies' speed and far-reaching consequences, a pre-digital organization is likely to launch various digital transformation initiatives simultaneously. Suppose the interplay management between digital transformation initiatives and between digital transformation initiatives and the core organization is appropriately done. In that case, pre-digital organizations can achieve that explorative and exploitative activities will fruitfully support each other. If the activities are not managed appropriately, pre-digital organizations risk that different digital transformation initiatives and the core organization hinder each other and ultimately can stall the organization's digital transformation. Secondly, *the influence of digital ecosystems on digital transformation* concerns the role of the external environment in digital transformation. The doctoral thesis contributes a mid-range theory explaining digital ecosystems' influence on organizations and how they increase through the three mechanisms of orientation, cooperation, and orchestration (research article #4). To provide the theoretical basis for this theory development, it is necessary to analyze the literature and its underlying assumptions (research article #3). Overall, the theory on the influence of digital ecosystems on digital transformations proposes that the more profound the digital ecosystem integration is, the more likely an organization's digital transformation will be effective. Here, digital resources are essential since they fuel the integration into digital ecosystems. Pre-digital organizations are asked to learn to identify,

share, and recombine digital resources. Thirdly, *executing digital transformation through digital transformation initiatives in digital ecosystems* acknowledges the influence of both digital transformation initiatives and digital ecosystems and subsequently offers practical guidance for decision-makers to navigate digital transformation (research article #5). Here, the example of Dr. Oetker's case provides four tactics to approach digital platforms as well as six principles for managing digital transformation in digital ecosystems.

## **2 Limitations and Future Research**

This doctoral thesis and all its research articles have individual limitations. Future research can build on these limitations to verify or falsify this doctoral thesis's theoretical and practical assertions. Moreover, future research can pick up the merits of this doctoral thesis and follow the resulting avenues for developing new insights and knowledge on digital transformation in pre-digital organizations.

Section II.1. on the influence of digital transformation initiatives on digital transformation builds on a single and multiple case study. Hence, the results might be biased due to case specifics (e.g., industry, pre-digital organizations history, digital transformation strategy, or the examined initiatives). Furthermore, the set of interviewed managers within the organization and the experts analyzing these interviews might be biased. Despite the efforts to triangulate the data sources and analyze each interview using dedicated methods and a minimum of two independent authors, the research can remain biased. Thus, an avenue for further research is additional case studies in different industries by different teams of authors. E.g., all case companies are from the “German Mittelstand”. Thus, analyzing firms from northern or southern America will likely lead to different nuances and insights on digital transformation in pre-digital organizations.

Section II.2. on the influence of digital ecosystems on digital transformation builds on an exhaustive analysis of existent literature and a process of phenomenon-based theorizing. Hence, despite the best efforts to follow established literature research methods, the theorizing might miss relevant publications and thus miss a piece of existing knowledge. Moreover, building theory will always remain a process that builds on the creativity of involved authors and, therefore, might not be reproducible by other teams of authors. As Bacharach (1989, p. 513) puts it, "there may be a fine line between satisfying the criteria of the internal logic of theory and achieving a creative contribution" (P. 513). However, the theorizing meets the criteria of theory development as being falsifiable and providing utility (Bacharach, 1989). Thus, an

avenue for further research is to operationalize and empirically assess the propositions between the constructs of OCO theory. Moreover, an important avenue for further research is to theorize the influence of digital transformation on digital ecosystems since this doctoral thesis only provides a theory on the influence of digital ecosystems on digital transformation.

Ultimately, I sincerely hope this doctoral will help future researchers and practitioners analyze, theorize, and manage digital transformation effectively.

#### **IV Acknowledgement of Previous and Related Work**

Across all research articles, I collaborated with colleagues from the Project Group Business and Information Systems Engineering of the Fraunhofer Institute for Applied Information Technology (FIT) and the Research Center Finance and Information Management (FIM). These colleagues were associated with the University of Augsburg, the University of Bayreuth, and the Technical University of Applied Sciences Augsburg.

As a consequence, the research articles of this dissertation build on previous work conducted in organizations, as mentioned earlier. I want to highlight the theoretical contributions of Professor Dr. Robert Keller, Professor Dr. Anna-Maria Oberländer, and Professor Dr. Maximilian Röglinger and their research team. Research articles #1 and #2 build on the research of IT capability and digital transformation management (Hinsen et al., 2019; Jöhnk et al., 2021; Keller, Ollig, & Fridgen, 2019; Keller, Stohr, et al., 2019; Oesterle et al., 2020). Research articles #3 and #4 build on the research on exploring and managing digital innovation innovation (Blume et al., 2020; Kreuzer et al., 2022; Oberländer et al., 2021; Oberländer et al., 2018). Finally, research article #5 differs from the prior four, focusing on addressing top management. Thus, the article builds on both the organization, as mentioned earlier, and the knowledge of how to approach such an article (e.g., Rieger et al. (2019)) and Professor Dr. Hans-Ulrich Buhl's distinct network allowed me to access the insights and experience of Dr. Oetker's top management.

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## VI Appendix

### 1 Index of Research Articles

#### **Research Article #1: Pathways to Developing Digital Capabilities within Entrepreneurial Initiatives in Pre-Digital Organizations.**

Keller, Robert; Ollig, Philipp, Rövekamp, Patrick. Pathways to Developing Digital Capabilities within Entrepreneurial Initiatives in Pre-Digital Organizations: A Singel Case Study. *Business & Information Systems Engineering* (2022).

Weblink/DOI: <https://doi.org/10.1007/s12599-021-00739-3>

(VHB-Jourqual 3 & 4: Category B)

#### **Research Article #2: Managing the complexity of digital transformation - How multiple concurrent initiatives foster hybrid ambidexterity.**

Jöhnk, Jan; Ollig, Philipp; Rövekamp, Patrick; Österle, Severin. Managing the complexity of digital transformation - How multiple concurrent initiatives foster hybrid ambidexterity. *Electronic Markets* (2022).

Weblink/DOI: <https://doi.org/10.1007/s12525-021-00510-2>

(VHB-Jourqual 3 & 4: Category B)

#### **Research Article #3: A Means to an End of the Other-Research Avenues at the Intersection of Organizational Digital Transformation and Digital Business Ecosystems.**

Karnebogen, Philip; Oberländer, Anna Maria; Rövekamp, Patrick. A Means to an End of the Other-Research Avenues at the Intersection of Organizational Digital Transformation and Digital Business Ecosystems. *Proceedings of the 42nd International Conference on Information Systems (ICIS 2021). Austin, Texas.*

Weblink: [https://aisel.aisnet.org/icis2021/adv\\_in\\_theories/adv\\_in\\_theories/2](https://aisel.aisnet.org/icis2021/adv_in_theories/adv_in_theories/2)

(VHB-Jourqual 3 & 4: Category A | Nominated for Best Theory Development Paper Award)

**Research Article #4: Understanding the influence of digital ecosystems on digital transformation: The OCO (orientation, cooperation, orchestration) theory.**

Oberländer, Anna Maria; Karnebogen, Philip; Rövekamp, Patrick; Röglinger, Maximilian; Leidner Dorothy. Understanding the influence of digital ecosystems on digital transformation: The OCO (orientation, cooperation, orchestration) theory. *Information Systems Journal* (2024).

Weblink/DOI: <https://doi.org/10.1111/isj.12539>

(VHB-Jourqual 3 & 4: Category A | Part of the Senior Scholars' List of Premier Journals)

**Research Article #5: How Dr. Oetker's Digital Platform Strategy Evolved to Include Cross-Platform Orchestration.**

Rövekamp, Patrick; Ollig, Philipp; Buhl, Hans Ulrich; Keller, Robert; Christmann, Albert; Remmert, Pascal; Thamm, Tobias. How Dr. Oetker's Digital Platform Strategy Evolved to Include Cross-Platform Orchestration. *MIS Quarterly Executive* (2022).

Weblink: <https://aisel.aisnet.org/misqe/vol21/iss1/5>

(VHB-Jourqual 3 & 4: Category B)

During my PhD, I also contributed to other publications, which are listed below. These publications are not part of this dissertation

- Häckel, Björn; Huber, Rocco; Rieg, Marius; Rösch, Carla; Rövekamp, Patrick. Das Service Design Framework zur strukturierten Entwicklung datenbasierter Services. *HMD Praxis der Wirtschaftsinformatik* (2021).  
Weblink/DOI: <https://doi.org/10.1365/s40702-021-00725-z>  
(VHB-Jourqual 3: Category D, VHB-Jourqual 4: Category C)
  
- Rövekamp, Patrick; Schöpf, Michael; Wagon, Felix; Weibelzahl, Martin. For better or for worse? On the economic and ecologic value of industrial demand side management in constrained electricity grids. *Energy Policy* (2023).  
Weblink/DOI: <https://doi.org/10.1016/j.enpol.2023.113781>  
(VHB-Jourqual 3: Category B, VHB-Jourqual 4: Category n.a., Cite Scpre 2023: 17.3, Impact Factor 2023: 9.3)
  
- Rövekamp, Patrick; Schöpf, Michael; Wagon, Felix; Weibelzahl, Martin; Fridgen, Gilbert. Renewable electricity business models in a post feed-in tariff era. *Energy* (2021).  
Weblink/DOI: <https://doi.org/10.1016/j.energy.2020.119228>  
(VHB-Jourqual 3: Category n.a., VHB-Jourqual 4: Category B, Cite Score 2023: 14.9, Impact Factor 2023: 9)
  
- Thimmel, Markus; Fridgen, Gilbert; Keller, Robert; Rövekamp, Patrick. Compensating balancing demand by spatial load migration – The case of geographically distributed data centers. *Energy Policy* (2019).  
Weblink/DOI: <https://doi.org/10.1016/j.enpol.2019.06.063>  
(VHB-Jourqual 3: Category B, VHB-Jourqual 4: Category n.a., Cite Scpre 2023: 17.3, Impact Factor 2023: 9.3)

## **2 Individual Contributions to the Research Articles**

This cumulative dissertation comprises five research articles representing the main body of work. All articles were developed in teams with multiple co-authors. This section details the respective research settings and highlights my contributions to each article.

### **Research Article #1.**

I co-authored this research paper with Robert Keller and Philipp Ollig. All authors contributed equally to this paper. I provided the design of the research methodology and the whole data collection as well as analysis through mainly interviews. Further, I build the initial draft for results and discussion of the work.

### **Research Article #2.**

I co-authored this research paper with Jan Jöhnk, Severin Oesterle, and Philipp Ollig. All authors contributed equally to this paper. Specifically, I supported the data analysis stage. the presentation of the results, and the discussion, including the theoretical and practical implications of the paper.

### **Research Article #3.**

This research article was developed by a team of three co-authors (Philip Karnebogen, Anna Maria Oberländer, and Patrick Rövekamp). All authors contributed equally to this paper. Within the project, I provided the initial research idea and literature review. Within the elaboration on the results, I was responsible for the construct of the digital ecosystem and supported the development of the contribution. Finally, I took part in revising the manuscript and presenting it at the *42nd International Conference on Information Systems*.

### **Research Article #4.**

I co-authored this research article with Anna Maria Oberländer, Patrick Rövekamp, Maximilian Röglinger, and Dorothy Leidner. This research article builds on the idea of research article #3. I was involved across all parts of the research process, from the initial idea, the literature review, and data analysis to building the contribution. Concretely, I was responsible for the literature on digital ecosystems and digital transformation. Further, I was involved in writing the whole paper from the initial submission and extensively revising it during the review process.

**Research Article #5.**

This research article was developed by a team of six authors (Patrick Rövekamp, Hans Ulrich Buhl, Robert Keller, Albert Christmann, Pascal Remmert, and Tobias Thamm). I was assigned as the lead author of the paper. As the leading author, I collected the data, did the analysis, crafted the results, and contributed significantly to the methodology. Further, I had the leading role in writing all sections of the manuscript. Additionally, I was working on preparing the article's refinement and revising it through one revision. While, to a large extent, this article reflects my work, all co-authors promoted the advancement of the paper throughout the entire project.

### **3 Research Article #1**

#### **Pathways to Developing Digital Capabilities within Entrepreneurial Initiatives in Pre-Digital Organizations.**

Authors: Keller, Robert; Ollig, Philipp; Rövekamp, Patrick.

Published in: *Business & Information Systems Engineering* (2022).

**Abstract:** To enable new digital business models, pre-digital organizations launch entrepreneurial initiatives. However, in developing the required digital capabilities, pre-digital organizations often face challenges as they are marked by the ways they have historically grown their organizational identity. Research on how pre-digital organizations can develop digital capabilities remains scarce. We draw on a single case study to illustrate potential pathways for the development of digital capabilities. We identify two key characteristics: the source of digital capability development and the set-up of the actors involved. We synthesize four possible pathway manifestations, discuss the dynamic nature of pathway combinations, and suggest that managing a portfolio of pathways may be crucial for pre-digital organizations. Therefore, our study contributes to a better understanding of digital transformation in pre-digital organizations. Furthermore, we provide guidance for practitioners to reflect on when deciding which pathways to follow.

#### 4 Research Article #2

##### **Managing the complexity of digital transformation - How multiple concurrent initiatives foster hybrid ambidexterity.**

Authors: Jöhnk, Jan; Oesterle, Severin; Ollig, Philipp; Rövekamp, Patrick.

Published in: *Electronic Markets* (2022).

**Abstract:** Incumbent companies are launching digital transformation initiatives (DTIs) to cope with technological changes, challenging competitive environments, increasing customer demands, and other digitalization challenges. The DTI spectrum is broad and covers structural and contextual changes. Companies often launch multiple concurrent DTIs, resulting in considerable organizational complexity. However, there has been very little research into the successful management of the interplay between DTIs. Drawing on five management aspects (strategic alignment, governance, methods/IT, people, and culture) and insights from three case companies, we elucidate DTIs' interplay, illustrating that beneficial DTI interplay management leads to a complementary duality instead of a competing dualism in organizational ambidexterity. We explicate that multiple concurrent DTIs can foster structural and contextual ambidexterity, which lead to hybrid ambidexterity, concluding that contextual ambidexterity coheres and balances exploration and exploitation efforts. Thereby, we contribute to a better understanding of DTIs, their interplay management, and their roles to foster hybrid ambidexterity.

## 5 Research Article #3

### **A Means to an End of the Other - Research Avenues at the Intersection of Organizational Digital Transformation and Digital Business Ecosystems.**

Authors: Karnebogen, Philip; Oberländer, Anna Maria; Rövekamp, Patrick.

Published in: *Proceedings of the 42nd International Conference on Information Systems (ICIS 2021). Austin, Texas.*

Abstract: Digital technologies pose challenges and opportunities to individual and ecosystems of organizations. To date, two mostly isolated research streams study these related phenomena: Organizational digital transformation (ODT), focusing on the digital improvement process of individual incumbents and digital business ecosystems (DBEs), focusing on digitally-enabled value co-creation among organizations. Joining the forces of both research streams, our work aims to assess what empirical evidence and theory exist at their intersection. After conducting an assessing review, a theorizing review, and extracting assumptions in isolation, we derive four convergent assumptions for building future theory at their intersection along four topic areas: resources, coopetition, evolution, and control. We propose that ODT and DBEs can be a means to an end of the other connected in a cyclical relationship to meet digitally induced challenges. By presenting avenues for further research, our work builds a foundation for future theory at the intersection of ODT and DBEs.

## 6 Research Article #4

### **Understanding the influence of digital ecosystems on digital transformation: The OCO (orientation, cooperation, orchestration) theory.**

Authors: Oberländer, Anna Maria; Karnebogen, Philip; Rövekamp, Patrick; Röglinger, Maximilian; Leidner, Dorothy.

Published in: *Information Systems Journal* (2024).

Abstract: Digital transformation is a complex, multi-level phenomenon that still challenges research and practice. Recent research has highlighted the influence of digital ecosystems on digital transformation, but we lack knowledge about how this relationship unfolds across the organisational and the ecosystem levels. Following a phenomenon-based theorising approach and applying a digital resource-based view, we present the OCO (orientation, cooperation, orchestration) theory of digital transformation. The OCO theory explains the relationship between an organisation's digital transformation and its integration into a digital ecosystem. We uncover and explain three interdependent mechanisms, that is, orientation, cooperation, and orchestration, that are set in motion by cross-level interactions between the organisational and the ecosystem levels and that centre around digital resources. Our work advances the frontier of multi-level digital transformation research explaining the influence of a digital ecosystem on digital transformation. We conclude through six propositions that the deeper its digital ecosystem integration, the more likely an organisation's digital transformation is effective. Therewith, we aim at mobilising future digital transformation research to bridge the organisational and the ecosystem levels and provide four future research themes. Our work also encourages practitioners to acknowledge and manage the influence of digital ecosystems on digital transformation.

## 7 Research Article #5

### **How Dr. Oetker's Digital Platform Strategy Evolved to Include Cross-Platform Orchestration.**

Authors: Rövekamp, Patrick; Ollig, Philipp; Buhl, Hans Ulrich; Keller, Robert;  
Christmann, Albert; Remmert, Pascal; Thamm, Tobias.

Published in: *Management Information Systems Quarterly Executive* (2022).

Abstract: Fueled by digital technologies, digital platforms have entered the longstanding industries dominated by traditional firms. Incumbents are required to develop a strategy across all digital platform activities, which comprises two major elements. First, one of four tactics is chosen to approach a specific platform. Second, cross-platform orchestration, which a) manages the platforms' interplay with the firm's business strategy and b) balances the tactics across ecosystems to ensure their viability, is performed. This study examines the digital platform strategy adopted by Dr. Oetker. Moreover, based on Dr. Oetker's journey, we provide three recommendations on how to handle digital platform strategies in traditional firms.