Ambidexterity to overcome digital transformation challenges: A bibliometric review

Marlene Bråthen

OsloMet, Postboks 4 St. Olavs plass, 0130 Oslo, Norway.
E-mail: s341291@oslomet.no

Elisabeth Doan

OsloMet, Postboks 4 St. Olavs plass, 0130 Oslo, Norway.
E-mail: s346696@oslomet.no

Karl Joachim Breunig*

OsloMet, Postboks 4 St. Olavs plass, 0130 Oslo, Norway.
E-mail: karjoa@oslomet.no

* Corresponding author

Abstract: This paper offers a systematic literature review aided by bibliometric analysis to provide a bridge between extant research on organizational ambidexterity and digital transformation. Whereas ambidexterity is suggested as a strategy for organizations to achieve explorative and exploitative learning, surprisingly little research has addressed how these two learning modes are involved in achieving digital transformation. Our study identified nine core articles providing a foundation for further research on the link between organizational ambidexterity and digital transformation. These articles reveal how extant research addresses three dimensions (internal orientation, external orientation and structural integration) comprising nine different learning considerations involved in digital transformation. Finally, we offer three propositions for further research aiming to establish a link between organizational ambidexterity and digital transformation.

Keywords: Bibliometric Review; Digital Ambidexterity; Digital Transformation; Exploitation; Exploration; Learning Considerations; Organizational Ambidexterity.

1 Introduction

It is difficult to achieve digital transformation, and approximately 70% of all firms fail in their attempts (McKinsey, 2016). Although a great deal of research has been devoted to answering the question of how organizations survive environmental changes (e.g., Teece et al., 1997), it is complicated to learn and to adapt to changes when external conditions, such as technology, are varied. Organizational ambidexterity, the ability to simultaneously handle explorative and exploitative learning, has been suggested as a strategy to foster organizational ability to maintain daily business concerns while continuously changing to meet the business needs of tomorrow.

A large amount of previous research on both digital transformation and organizational ambidexterity, separately, exist; however, there are few reports that combine these two topics, and they mostly consist of case studies from recent years. We have not been able to identify extant literature that focuses directly on how organizations can use organizational ambidexterity to achieve the digital transformation. Therefore, the identification of a foundation that can inform both future research and practice, by taking stock of prior published research to identify a conceptual bridge between the two concepts, is urgently needed.

The purpose of this study was to assess how extant research on digital transformation and organizational ambidexterity can be bridged to enable an improved understanding of how organizations must learn to manage the digital transformation. Therefore, this study aimed to address the following research question: *How can a structured literature search utilizing bibliometric analysis of current published scientific research contribute to build a bridge between the concepts of organizational ambidexterity and digital transformation?*

The research question was answered through a structured literature search by which the final database search was used for bibliometric analysis to identify core articles for a content analysis of how the two fields can be integrated. Our search resulted in an initial sample of 1338 articles that was reduced to 279 articles. Subsequently, the articles were further narrowed down to 141 papers in our bibliometric analysis. Finally, our content analysis was based on nine identified articles, which enabled us to identify three dimensions underpinned by nine learning orientations that can function as a vantage point for further conceptualizations attempting to bridge organizational ambidexterity and digital transformation. The nine learning considerations identified describe how practitioners can address and apply learning within the three dimensions to help organizations succeed with the digital transformation. In addition, we offer three propositions for further research aiming to link insight from organizational ambidexterity theory to digital transformation.

2 Theory

2.1 Organizational ambidexterity

The Oxford Advanced Learner's Dictionary defines the term ambidextrous as: "to be able to use the left hand or the right hand equally well" (Oxford University Press, 2021). The concept of "organizational ambidexterity" was first introduced by Robert Duncan (1976) and has since then aroused great interest. The research field has grown broader as the phenomenon has been studied in several contexts such as management, organizational learning, strategy and technology innovation. Consequently, the term has been used in various ways, and the generic use of the term is vague. To prevent confusion, this paper will use the definition of Tushman and O'Reilly (1996, p. 24), who describe organizational ambidexterity as "the ability to simultaneously pursue both incremental and discontinuous innovation and change results from hosting multiple contradictory structures, processes and cultures within the same firm".

An important contributor to this research field is James March (1991), who introduced a distinction between the two different organizational learning modes of exploration and exploitation. Exploration aims at overcoming disruption by competitors by continuously searching for new knowledge and capabilities. Furthermore, this will give companies the opportunity and necessary competences to enter new markets, to develop new products and to improve their business processes (March, 1991; Raich and Birkinshaw, 2008; Tushman and O'Reilly, 2013).

To succeed with this process, organizations will experience a need for autonomy, experimentation and flexibility (March, 1991; Tushman and O'Reilly, 2013). In contrast, exploitation sheds light on incremental innovation (Andriopoulos and Lewis, 2009) to the extent that organizations compete in markets with mature technologies. Moreover, it focuses on leveraging existing knowledge by continuously improving and refining current competencies, products and processes (March, 1991; Raich and Birkinshaw, 2008; Tushman and O'Reilly, 2013). In order to succeed with exploitation, efficiency, control and security are needed (March, 1991; Tushman and O'Reilly, 2013).

Nonetheless, the literature on organizational ambidexterity emphasizes that it is difficult to cope with the challenge of managing the inherent tension between exploration and exploitation (March, 1991; Tushman and O'Reilly, 1996; Raisch and Birkinshaw, 2008). This can be explained by the fact that exploration reduces the speed of improvements in the organization and that exploitation makes experimentation less attractive (Levitt and March, 1988). Therefore, exploration and exploitation have a trade-off relationship (Andriopoulos and Lewis, 2009; Sinha, 2015), and most organizations tend to focus more on one of them (i.e., myopia). Commonly, organizations overestimate exploitation and underestimate exploration (Levinthal and March, 1993). The reason why exploitation is favoured can largely be explained by the fact that it ensures short-term success in which the return is positive, imminent and predictable. In contrast, exploration is ineffective in nature as the pursuit of new ideas, markets and technologies will have less certain outcomes, longer time horizons and a more diffuse effect in which the return will be uncertain, distant and often negative (March, 1991). If the organization does not manage to balance the two inherent tensions and overemphasizes one of them, it will be insufficient in the long run. Hence, several researchers have stressed the importance of balancing exploration and exploitation to secure both short-term and long-term success (He and Wong, 2004; Andriopoulos and Lewis, 2009; Tushman and O'Reilly, 2013; March, 1991; Teece, Pisano and Shuen, 1997).

2.2 Digital transformation

Digital transformation can be defined as "a change in how a firm employs digital technologies to develop a new digital business model that helps to create and appropriate more value for the firm" (Verhoef et al., 2021, p. 889). Digital transformation has emerged as an important research topic in recent years because the entrance of new digital technologies has forced incumbent firms in different sectors to transform their business. The interest in the field has resulted in different research directions (i.e., information systems, marketing and strategic management) in addition to a complex and unstructured research field (Holand et al., 2019). Therefore, it is important to distinguish the term digital transformation from related concepts such as digitization and digitalization. Digital transformation describes the changes that digital technology have on the business model at an organizational and ecosystem level. Hence, *digital transformation* has a direct impact on the whole organization, specifically the creation of value (Holand et al., 2019; Henriette et al., 2015). In contrast, *digitization* is the conversion of analogue information into a digital format at the activity level in the organization, and *digitalization* relates to the process level in the organization in which digital technologies can be used to improve existing business processes (Holand et al., 2019; Verhoef, 2021).

Research on digital transformation has been addressed according to four different aspects: (1) characteristics, (2) drivers, (3) impacts and (4) transformed areas. First, the behaviour of digital transformation has been characterized as complex, radical, disruptive,

evolutionary and continuous. This may be confusing as some of these characteristics are contradictions, but Morakanyane, Grace and O'Reilly (2017, p. 438) assert that "While digital transformation is referred to as a radical change more than as an evolutionary process, we believe an evolutionary process is a more inclusive term that captures the fact that digital transformation evolves with time, and whenever this evolution takes place, the impacts bring about a radical change to the organization." Second, Verhoef et al. (2021) have identified three external drivers for digital transformation: digital technology, digital competition and digital customer behaviour. However, Kane et al. (2015) insist that digital capabilities are important as well, in addition to other factors such as strategies and culture. Third, the impacts of digital transformation are the effects that the organizations experience. Value creation represents the ultimate impact that organizations strive for in the process of digital transformation (Morakanyane et al., 2017). Fourth, extant research suggests several impacted areas in the process of digital transformation (e.g., Piccinini, 2015; Matt et al., 2015), but the key areas are acknowledged as operational processes, business models and customer experiences (Westerman et al., 2014; Morakanyane et al., 2017). A focus on these areas engages transformation in every aspect of the organization (Henriette et al., 2015).

To summarize, organizational ambidexterity and digital transformation are two different concepts. However, both concepts are related to learning and innovation and are necessary for long-term survival in the contemporary business environment. Organizational ambidexterity is important because it ensures a balance between exploration and exploitation in the organization, and digital transformation is valuable because it changes the business model in line with new technological innovations. Thus, it is fair to assume that an increased understanding of how organizational ambidexterity can be achieved when embarking on digital transformation processes can provide an organization with a higher success rate in its digital transformation endeavours.

3 Methodology

3.1 Research method
We conducted a systematic literature review aided by bibliometric analysis. A systematic review is a scientific investigation with a pre-planned method that involves a comprehensive search to find relevant articles and then uses explicit, reproducible criteria in the selection of articles for the review (Cook et al., 1997). Bibliometrics further indicates "the collection, the handling and the analysis of quantitative bibliographic data, derived from scientific publications" (Verbeek et al., 2002, p. 181). This method can be beneficial as it "extends the span of science by better linking efforts across research domains" and discovers "topical relationships, research trends and complementary capabilities" (Porter et al., 2002, p. 351). It can even cause the emergence of a new field of research (Fahimnia et al., 2015). Therefore, employing this method will contribute to the understanding of the existing body of knowledge for the given research field, provide a solid theoretical foundation and substantiate the presence of the research problem (Levy and Ellis, 2006).

3.2 Sample
The final search conducted in the Web of Science consisted of the search string Topic = ((Ambidext* AND Digit*) OR (Ambidext* AND Disrupt*) OR (Explor* AND Exploit* AND Digit*) OR (Explor* AND Exploit* AND Disrupt*)). Through this combination of keywords, we identified 1,338 articles, which were further used in a four-stage exclusion process. First, we excluded 2021 as a publication year and kept all the whole years to have

the opportunity to identify potential evolution in the field. Second, we excluded all papers in languages other than English to avoid misinterpretations. Third, we excluded all irrelevant document types and only included articles, reviews, proceedings, early access articles, editorial material, book chapters and book reviews. Fourth, to ensure relevance, we systematically excluded research categories consisting of unrelated information that did not contribute to our research agenda. This process consisted of two different selection methods based on the number of articles within the category.

For categories consisting of 25 or more research articles, a bibliographic co-occurrence analysis with a threshold of three was performed using the software program VOSviewer to identify relevant keywords. By examining the various clusters, we revealed if the category was focused on both organizational ambidexterity and digital transformation. To ensure that we did not overlook high-impact articles in the discarded categories, we read the abstracts of the 15 most relevant research articles for each category. For categories consisting of fewer than 25 research articles, all of the abstracts within the category were read to secure suitability. The exclusion process reduced the number of included academic articles to 279 papers.

3.3 Analysis

Our analysis progressed in a three-stage process. First, we conducted a descriptive analysis of our findings to assess the development of the topic and to identify which scientific disciplines and publication outlets contributed knowledge that informed our study. Second, to secure a systematic and objective review, a bibliometric analysis was conducted with the VOSviewer application. By using the framework of science mapping, we constructed networks and were able to identify relevant concepts linked to terms such as "ambidexterity" and "digital transformation". Subsequently, we examined different clusters and identified central articles to ensure thematic relevance. Furthermore, the bibliometric analysis aimed to condense the number of publications to provide a sample of highly relevant core articles upon which we could base our content analysis. Third, we conducted a content analysis whereby the selected articles were coded and mapped in Microsoft Office Excel to look at similarities and differences to investigate the link between ambidexterity and digital transformation. Therefore, this analysis provided us the opportunity to make replicable and reasonable assumptions by interpreting the selection of the textual material.

For the descriptive analysis, we exported the final search from the Web of Science database to an Excel file. After the removal of all irrelevant data in Excel, all articles were represented by their authors, title, journal, document type and publication year. As the publication year was missing for documents categorized as early access, we manually filled in the year of the early access publications. Additionally, we included the SCImago Journal & Country rank by adding two columns: Scientific Journal Ranking (SJR) quartile and SJR indicator, which "expresses the average number of weighted citations received in the selected year by the documents published in the selected journal in the three previous years" (SCImagio, 2021). We added a third column for the journal category (i.e., Business, Management, Economics, Technology, Library and Information Science, Multidisciplinary and Organizational Behaviour). In order to assess the appropriate value for the journal category, we first visited the website of the SCImago Journal & Country Rank and each journal's website to ensure the journal discipline. When all columns were populated with values, we transformed the .xlsx file into a .txt file and uploaded it to Microsoft Power BI to create visual illustrations of the final data search.

To obtain a better overview, we exported all 279 articles into a txt. file and applied the VOSviewer program to conduct the bibliometric analysis. This program gave us the

opportunity to visualize the dataset and to identify clusters of interrelated articles. To obtain more trustworthy clusters, we created a thesaurus file that merged similar terms, e.g., "organizational ambidexterity" was replaced with "ambidexterity". We chose not to merge terms such as "exploration" and "exploitation" with the term "exploration and exploitation" as these terms theoretically can be used in different ways. A co-occurrence analysis was first conducted to identify the most relevant terms in our dataset, followed by a co-citation analysis that was conducted to provide an understanding of the relationship between the references. Furthermore, a bibliographic coupling was initially performed to find the most influential articles; however, this step ended up being a tool to narrow down our search to 141 articles.

To further limit the number of articles in our literature review, we read the abstracts of all 141 articles to ensure thematic relevance and selected the ones that contributed to answering our research question. Every article was scored on its relevance to the research question on the following scale: (A) Relevant; (B) Borderline relevant; and (C) Irrelevant. During this process, the articles that did not contain information about the concepts of organizational ambidexterity and digital transformation were discarded, e.g., articles regarding organizational performance, optimization and specific attributes to technology. This selection resulted in seven papers. In order to assure that we did not exclude any relevant papers, we carefully read all abstracts of the 23 articles published in 2021 within the final search. After the assessment, we decided to include two of the articles in our further analysis as they could contribute to answering our research question. Nine relevant articles remained for the content analysis; these articles were read thoroughly and coded in Excel to give an overview of the literature. After coding the articles, we analysed the collected information to find common features.

4 Findings

The descriptive analysis revealed an exponential growth in the number of publications per year related to research on the link between organizational ambidexterity and digital transformation (Figure 1), potentially reflecting the growing need for managers to know how to deal with technological developments.
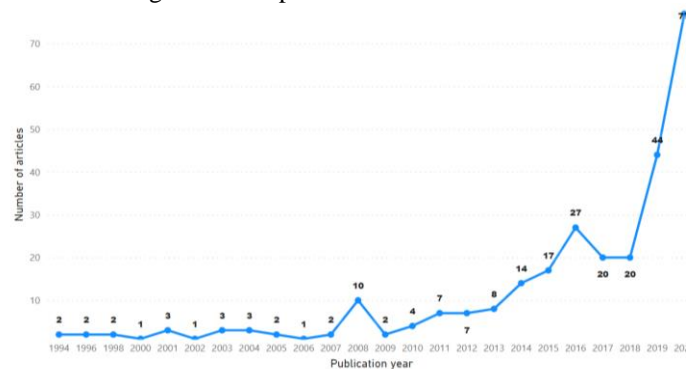

Figure 1 Development in publications per year related to research on the link between organizational ambidexterity and digital transformation (N = 279 articles)

Furthermore, despite the fact that this topic is an emerging field, over half of the articles were published in highly reputable journals when assessing our database according to the SJR quartile, with a high percentage in Q1 (Figure 2).
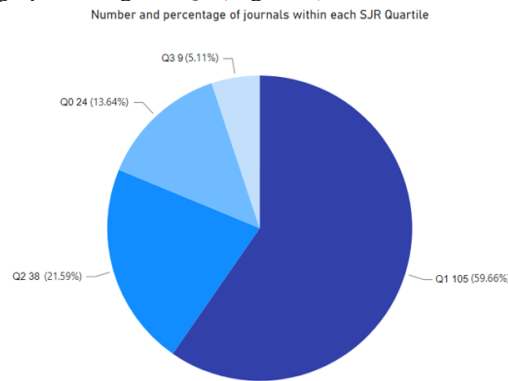
Figure 2 Number and percentage of journals within each SJR quartile.

As many journals are interested in publishing such articles, this analysis indicated that organizational ambidexterity and digital transformation may be strongly related topics. Moreover, the journals were spread across seven different categories, and 80% of the publications were published within the disciplines of technology, management and business (Figure 3).
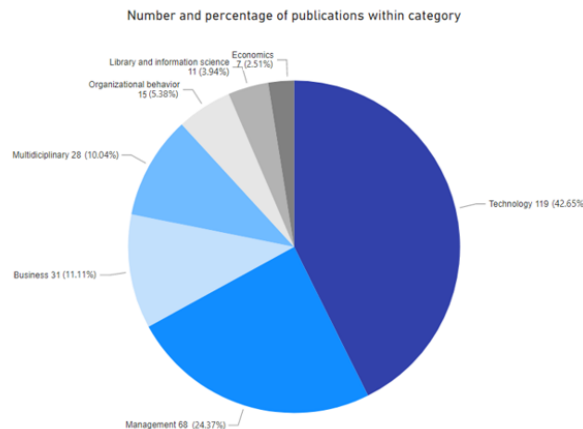

Figure 3 Number and percentage of publications within each journal category.

One explanation for this could be the rapid growth of new technologies and the emergent need to adapt to these changes as they affect consumers, organizations and society. As the discipline technology consists of approximately the same number of publications as management and business combined, organizational ambidexterity and digital transformation belong to separate research fields. However, as we categorized the journals based on subjective criteria, this could be considered as a limitation of our analysis.

The bibliometric analysis consisted of both a co-citation analysis and a co-occurrence analysis. The co-citation analysis (Figure 4) revealed that the red cluster could be connected to the research field of organizational ambidexterity. In contrast, the green cluster consisted of references addressing innovation and technological change. Therefore,

this cluster could be strongly related to digital transformation. Moreover, this analysis revealed that the two topics are only integrated to a limited extent in extant research.
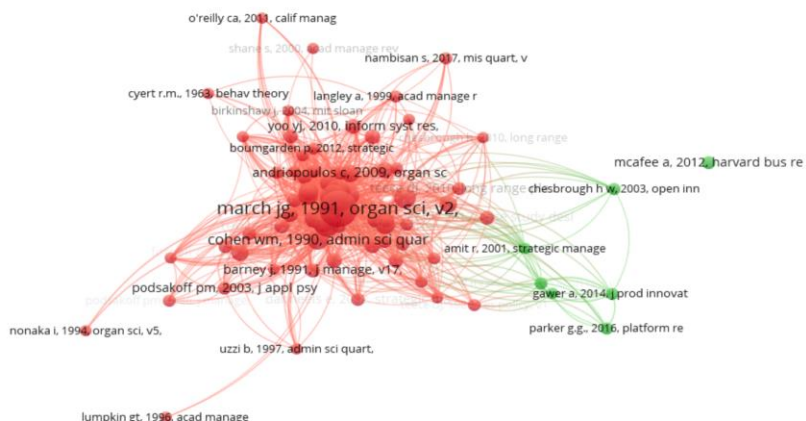
Figure 4 Network visualization of the co-citation analysis.

However, the co-occurrence analysis (Figure 5) revealed that the keywords "ambidexterity" and "digital transformation" are related to each other, meaning that even though the two keywords are in different clusters, they can be seen in the context of each other. Therefore, organizational ambidexterity is in some way connected to what is already written about digital transformation. Furthermore, our findings reveal that "digital transformation" is a "hot" topic, with an average publication year of 2020. On the other hand, "ambidexterity" is frequently included in the publications with an average publication year of 2018.32. As ambidexterity is a concept that has existed for a long time, the late average publication year can be explained by an increasing interest in the concept in recent years. Thus, ambidexterity can also be considered as a relatively popular topic.
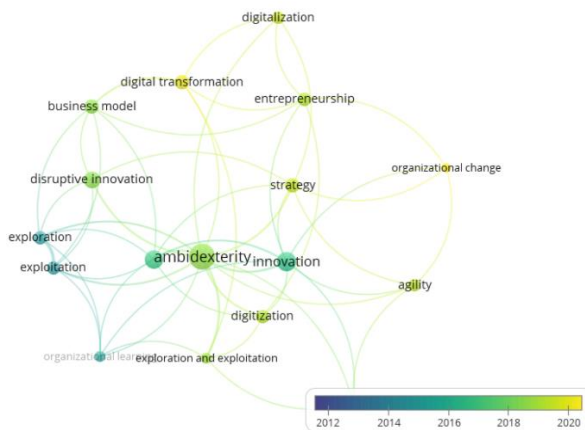
Figure 5 Overlay visualization of the co-occurrence analysis.

The content analysis of the final nine articles (Chan et al., 2018; Del Giudice et al., 2021; Magnusson et al., 2020; Mahmood and Mubarik, 2020; Molloy and Ronnie, 2020; Montealegre et al., 2019; Scuotto et al., 2019; Steiber and Älange, 2020; Wu et al., 2021) identified three dimensions (i.e., internal orientation, external orientation, and structural integration) that were addressed in the extant research related to organizational learning and digital transformation.

4.1 Internal orientation

Internal orientation addresses the involvement of employees in an organization. This involvement is necessary to succeed with the digital transformation as it is difficult for the management to carry out the digital transformation without the support of the employees. These articles highlight that it is important for an organization to include its employees in the digital transformation and that they get the opportunity to utilize their competence. In this way, organizations can benefit from resources they already possess. As internal orientation involves exploiting the existing human resources, this dimension can be linked to exploitation in the context of organizational ambidexterity. Our findings also indicate that organizations can facilitate exploitation based on the following three learning considerations: active communication, a decentralized structure and continuous learning. First, active communication facilitates good communication within the organization so that the employees feel they are part of the digital transformation. Second, a decentralized structure ensures that the organization involves the employees in an effective way. Third, continuous learning guarantees that the employees have the opportunity to continually evolve to remain relevant resources for the organization. Therefore, organizations must facilitate internal orientation as it emphasizes the importance of involving the employees in the organization.

4.2 External orientation

External orientation involves searching for new knowledge and capabilities outside an organization in order to manage the digital transformation. Sometimes internal expertise alone is not sufficient, and there is an explicit need to involve external stakeholders such as customers, suppliers, universities, or other businesses. By entering a collaboration with external stakeholders, an organization can obtain necessary expertise. If an organization does not acknowledge the need for collaboration and resists committing to a collaboration, it can limit its ability to respond to changing environments. As external orientation involves exploring new opportunities, this dimension can be linked to exploration in the context of organizational ambidexterity. Our findings indicate that organizations can facilitate collaboration and exploration with the help of at least one of the following three antecedents: partnership, network and internship. First, by entering a partnership, the organization can acquire value from the other party through shared knowledge and experiences. Second, by participating in networks, the organization can renew their existing base by gaining new insights. Third, by introducing internships, the organization can bring in people who possess the competence and capabilities they lack. Therefore, organizations should enter collaborations with external stakeholders.

4.3 Structural integration

Structural integration involves integrating internal orientation and external orientation. As these two orientations can be linked to exploitation and exploration, it can be difficult for an organization to balance the tensions between them simultaneously and achieve organizational ambidexterity. Most organizations tend to focus more on one of them; in most cases, exploitation is preferred as it ensures short-term success. However, to survive

in the long run and to succeed with digital transformation, organizations need to prioritize both exploitation and exploration continuously. Our findings indicate that organizations can facilitate organizational ambidexterity in the context of digital transformation based on the following three antecedents: knowledge sharing and knowledge sharing practices, a dual focus and a digital infrastructure. First, knowledge and knowledge sharing practices are necessary to integrate the acquired external knowledge with the internal knowledge to create value. Second, a dual focus in the management is important to ensure the operation of the business both today and in the future. Third, a digital infrastructure must be in place to integrate new technologies. Therefore, an organization needs to have a business model that allows it to adapt quickly to new changes in the market.

5 Conceptualization

The three dimensions with the nine identified learning concerns identified in the extant research illustrate how organizations must orient themselves to be able to use organizational ambidexterity to achieve digital transformation, as illustrated in Figure 6.
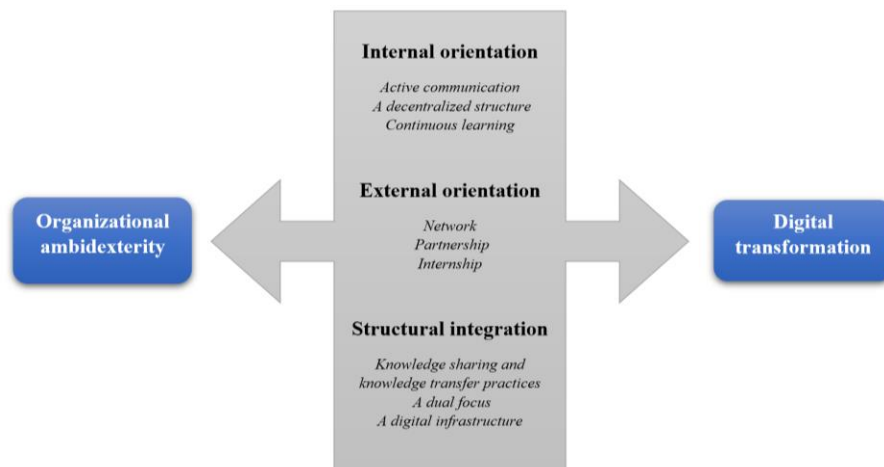
Figure 6 The conceptual bridge between organizational ambidexterity and digital transformation.

Our findings indicate that the three learning considerations within internal orientation focus on the employees within the organization. Thus, we are offering the following proposition:

> *P1: In order to succeed with digital transformation, organizations must secure exploitation by facilitating active communication, a decentralized structure and continuous learning internally.*

Furthermore, our findings illustrate that external orientation consists of three learning considerations involving obtaining new knowledge and capabilities outside the organization. Hence, P2 is offered:

P2: In order to succeed with digital transformation, organizations must secure exploration by facilitating partnerships, networks and internships externally.

Finally, our findings imply that the three learning considerations within structural integration must be present in order to integrate internal orientation with external orientation. P3 is therefore offered:

P3: In order to succeed with digital transformation, organizations must manage to balance the tensions between exploitation and exploration by integrating knowledge sharing and knowledge transfer practices, a dual focus and a digital infrastructure.

We want to emphasize that all three propositions must be present to secure organizational ambidexterity and for the organization to succeed with the digital transformation in the long run. However, this can be difficult in practice as the propositions constitute contradictions, and the organization may only manage to facilitate some of them. An illustration of the relationship between the different dimensions are shown in Figure 7.
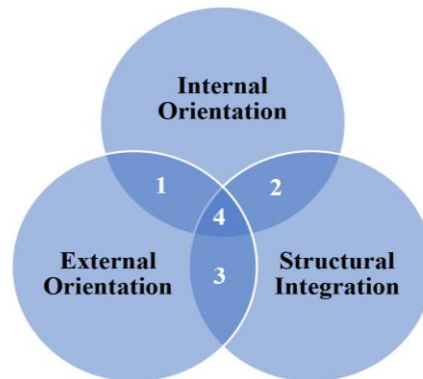
Figure 7 A Venn diagram of the relationships between the different dimensions.

An organization attempting to achieve digital transformation can be positioned at one of the four intersections shown in Figure 7. If the organization is located in intersection 1, it facilitates both exploitation and exploration. As the organization lacks integration mechanisms, it will be difficult to balance the tensions between these contradictions in the long run, which can lead to less cooperation, non-optimal use of resources and an unprofitable operation.

Furthermore, if the organization is located in intersection 2, it facilitates exploitation and possesses integration mechanisms. Therefore, an organization in this intersection will lack exploration, which is important for long-term success. Without facilitating exploration, the organization will have a shortage of new ideas and knowledge, have difficulties with following market trends and changes, and not be able to survive in the long run.

In addition, if the organization is located in intersection 3, it will facilitate exploration and possess integration mechanisms. The lack of exploitation will make it difficult for the organization to operate profitably because it does not utilize its internal resources optimally. Therefore, this can result in an inefficient use of resources, organizational inertia and an unprofitable operation.

Finally, if the organization facilitates all three dimensions, it will be located in intersection 4. This is the most optimal intersection point as the organization will succeed with its digital transformation process due to achieving organizational ambidexterity. Based on the fact that digital transformation constitutes an evolutionary process, being located in intersection 4 is something it must continuously strive for, as it can easily end up in intersection 1, 2 or 3 due to the challenge of balancing the tension of exploitation and exploration over time. To be located in these intersections can work in the short term, but if the organization does not strive to end up in intersection 4, it will be difficult to succeed with the digital transformation in the long run.

6 Conclusion

This study examined the extant published research in order to answer the research question: *How can a structured literature search utilizing bibliometric analysis of current published scientific research contribute to build a bridge between the concepts of organizational ambidexterity and digital transformation?* To investigate the bridge between organizational ambidexterity and digital transformation, we conducted descriptive, bibliometric, and content analyses. Our findings illustrate that there is a lack of research bridging these two concepts and that the field is immature and under development.

We provide two theoretical contributions in this study. First, based on the identification of nine core articles, we revealed how extant research has addressed three very different dimensions and nine associated learning considerations when describing how organizational ambidexterity contributes to digital transformation. The identification of these three dimensions can function as a vantage point for further theory development bridging organizational ambidexterity and digital transformation. To aid this development, three propositions (P1, P2 and P3) were offered.

Second, our suggested Venn diagram illustrates the overlapping relationships between the dimensions. Organizations will often be located in one of the non-optimal intersections (1, 2 or 3) as it is in practice challenging to facilitate all three dimensions simultaneously. Therefore, it is important that organizations continuously strive to be in intersection 4 as it facilitates all the dimensions and thus a successful digital transformation. Overall, our contribution constitutes an exemplary starting point for those who want to conduct further research on this theme. In addition, it is a valuable contribution for managers as it will increase their understanding of how ambidexterity can be utilized in order to succeed with digital transformation.

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