Digital Technologies and their Influence on Spaces

Completed Research Paper

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Abstract

While spaces are an important theoretical concept in various research fields, the influence of digitalization on spaces is unclear. Owing to their unique characteristics, digital technologies may shape spaces differently, limiting the applicability of existing theories. To examine whether this is in fact the case, we conduct a systematic literature review, revealing that digital technologies lead to what we call "digital spaces". These are digitally open, i.e. they use digital technologies to blur boundaries between themselves and other physical or virtual spaces. Based on this insight, we provide an agenda for further research on digital spaces covering empirical validation; development of a digital spaces theory; methodical approaches to analyze digital spaces; design, constitution, reconfiguration, and discontinuance of digital spaces; interplay of different sub-spaces and boundaries in a digital space; shape and role of boundaries in digital spaces; and technologies in digital spaces.

Keywords: Digitalization, spaces, boundaries, literature review, research agenda

Introduction

Spaces are everywhere. Spaces surround us and provide room for living, working, and interacting. Their nature can be physical and material, but also abstract and imaginary (Thrift 2003). A multitude of research fields has approached the topic to analyze why and how spaces influence us and, in turn, why and how we influence spaces, especially in the organizational context (e.g., Ashforth et al. 2000; de Vaujany and Vaast 2014; Lefebvre 1991). Although findings reveal that the mutual impact is substantial, such insights might not be transferrable to digital environments. Digital technologies possess characteristics that change the capabilities of artifacts, making them open and editable (Yoo et al. 2012; Nambisan et al. 2017). This could also alter how the spaces that encompass these artifacts are constituted, reconfigured, or discontinued and, thus, how they need to be analyzed.

However, spaces research in organization studies has focused on "traditional" spaces and has not considered how digitalization affects these spaces. In management information systems (IS) research, the concept of "spaces" has not been introduced to the best of our knowledge, despite its tremendous value in investigating the physical and abstract spatial properties of the social and the material (Tyler and Cohen 2010; Wasserman and Frenkel 2011). Consequently, there is little previous research we can derive insights from regarding the role of digital technologies in spaces. Yet, since many papers deal implicitly with digital topics in the context of physical or abstract spatial properties (e.g., Phene et al. 2006; Sewell and Taskin 2015), they may collectively reveal whether digital technologies shape spaces differently. If digitalized spaces are in fact different, we need to derive research topics that help to investigate such spaces in-depth. In this paper, we address these issues by extracting the characteristics of spaces that encompass digital technologies and by contrasting them to other spaces. Based on this, we provide a research agenda to guide theory-building. Consequently, our research questions are:

How do digital technologies shape spaces? Which avenues for research arise from this?

To answer these questions, we conduct a systematic analysis of the literature related to "spaces" that has appeared since the year 2000 (Paré et al. 2016), separate papers based on whether they emphasize digital technologies, and demarcate different types of spaces through a thematic analysis (Braun and Clarke 2006). Our findings show that digital technologies lead to the emergence of what we call "virtual spaces" and "digital spaces". The former differ from traditional "physical spaces" mainly by being intangible and existing only virtually, but the unit of analysis is still a measurable, mappable, tangible, and delineated space. In contrast, digital spaces are physical or virtual spaces that are digitally open to other spaces, thus blurring the line between different spaces and the boundaries between them. This contributes to research by highlighting that the characteristics of digital technologies (Yoo et al. 2012; Nambisan et al. 2017) extend to the spaces they are part of, which changes the unit of analysis in spaces research and makes adapted or novel theorizing necessary. Also, besides offering the first systematic overview on literature relating to digital spaces, we provide a research agenda to guide further research on digital spaces. Overall, our work can serve as a stepping-stone for the development and application of a holistic theory of digital spaces in IS research.

The structure of this paper is as follows: We start with a short overview on different types of spaces. We then describe our literature review and the results in detail, before we discuss them in connection with an extensive agenda for further research. Finally, we conclude with a short summary.

Theoretical Background

In the most profound sense, the term "space" relates to the material world surrounding us. This world can be measured, mapped, and has dimensions that our bodily senses can easily grasp (Soja 1996). Taking an office as an example, such a basic space has objects such as a desk and chair in it as well as physical walls serving as boundaries to other basic spaces. We label these spaces "Type I". As a unit of analysis, Type I spaces are researched mainly in geography or architecture, often with a design science approach, i.e. an approach that seeks to actually develop a space. Works in these areas deal, for instance, with topics such as the mechanical structure of spaces (Fenci and Currie 2017) or residential mobility (Coulter et al. 2016). Notably, Type I spaces are not given and do not just come into existence without external influence; they are constituted, reconfigured, and discontinued through mutual social and material processes over time (Thrift 2003).

In the social sciences, Type I spaces are also objects of investigation, but such research mostly focuses on another type of space which we label "Type II". Here, the material construction of space, including the people in it, serves as a mere reference point for abstract kinds of spaces. For instance, such spaces can consist of similar cultures, values, or norms; are conceptualized by planners, scientists, or artists; may be captured through interactions and routines; and are lived through symbols, images, and designs (Lefebvre 1991; Thrift 2003). A concrete example is a project team. It exists in an abstract space that consists of shared tasks and goals; is brought into being non-materially through management; occurs in the interactions between people and objects; and shows itself through team titles or PowerPoint designs. There is a close connection between Type I and Type II spaces, as Type II spaces contain material elements, such as desks and chairs of the project team. However, these are not the scope of research on Type II spaces. Naturally, such spaces are hard to be assessed with a design science approach. The predominant perspective here is that of behavioral science, i.e. the analysis of behaviors and interactions in spaces.

In organization-related research, spaces have become a prominent topic. Seminal works in sociology (Lefebvre 1991) have built the foundation for organization studies (e.g., Mengis et al. 2018; Wasserman and Frenkel 2011), but these works do seldom focus on technology. Such a perspective could be provided by IS research, but the concept of spaces has not yet gained much attention here. Thus, we know little about the role of digital technologies in spaces. However, spaces that encompass digital technologies may well need to be viewed differently, owing to the characteristics of digital technologies, which especially stem from the inclusion of digital capabilities into physical materiality (Yoo et al. 2012). These characteristics make artifacts "malleable, editable, open, transferable, etc." (Nambisan et al. 2017), which has the potential to shape the spaces these artifacts are part of in previously unknown ways. As a result, the unit of analysis in spaces research would change, making adapted or novel theorizing necessary (Truex et al. 2006). This is true for Type I and Type II spaces: digitalization has

been a material, infrastructural topic from the start and is still driven by developments in hardware, bandwidth, and user interfaces, which highlights a strong potential influence of digital technologies on Type I spaces. On an abstract level, digitalization enables new connections, interactions, and routines, which indicates that Type II spaces are also affected. Finally, addressing this issue and clarifying whether digital technologies do shape spaces differently is of high theoretical and practical relevance, owing to the rising importance of digital technologies and their increasing embeddedness in both private and organizational spaces.

Method

Since no research explicitly addresses the role of digital technologies in spaces, we decided to systematically review literature dealing with spatial issues in a context in which digital technologies have a prominent role. The main goal of this research method is to summarize the acquired knowledge in a specific field, to structure and analyze this knowledge, and thereby to discover remaining gaps and starting points for future research (Rowe 2014). We sought to gain an overview on the topic of spaces in IS and IS-related articles (e.g., management, sociology, organizations, technology, and innovation). As a guideline, we selected the approach of Paré et al. (2016) because it focuses on the systematicity and transparency of the review process and the respective results.

Table 1. Methodical Approach for Developing a Definition and a Research Agenda

1 Search with very broad keyword ("spaces"):	13,009 results
2 Focus on papers with a scope on spaces *roughly* related to this paper:	118 results
3 Differentiation in two groups according to paper's focus on digital technologies	
4 Thematic analysis A to identify overarching spaces categories (iterative)	
4.1 Categories in non-digital technologies research:	Boundaries, physical spaces
4.2 Categories in digital technologies research:	Virtual spaces, digital spaces
5 Focus on papers with a scope on spaces *directly* related to this paper:	79 results
6 Development of framework to identify sub-categories (see Figure 1)	
7 Thematic analysis B to identify sub-categories of research (iterative)	
7.1 Categories that emerged first:	Design of spaces, literature overview, methods
7.2 Categories that emerged last:	Impact of spaces on behavior and/or vice versa
8 Derivation of agenda for further research based on categories and sub-categories	

To start, we developed a review plan, stating our overall goal, determining a scope for our search, and an analysis approach (see Table 1). Overall, our process is linear with an iterative structure in the analysis part (Paré et al. 2016). In step 1, we conducted a keyword search for "spaces" in the titles, abstracts, and keywords in the archives of the top 25 IS, management, organization, sociology, and technology-related journals between 2000 and 2018. This led to the inclusion of articles scheduled for release in 2019, but that appeared as online-first papers in the search. We created the list of relevant journals based on the IS basket of Eight, the Financial Times Top 50 Research Rank, the world's elite 4* journals in the ABS Academic Journal Guide 2015 (for the selected fields), and the German VHB JourQual 3 business informatics and technology as well as innovation and entrepreneurship rankings. Because our search term was very broad, the search yielded 13,009 initial results. Owing to this broadness, most of the results could be excluded straight away in step 2. To improve the quality of results, we did not include editor comments, book reviews, formatting guides for authors, and tables of content. For the rest of the results, we scanned the abstracts, and excluded all studies that referred to spaces in ways that were outside our scope, for instance as a statistical parameter (e.g., L'Écuyer et al. 2000); as a figure of speech not related to organizational issues, such as "white space" (e.g., Kerr and Phaal 2018), "semantic space" (e.g, Evangelopoulos 2016), or "research field" (e.g., Chughtai and Myers 2017); or as space in a NASA or Star Wars sense (e.g., Devezas et al. 2012). The remaining sample consisted of 118 papers that roughly related to the scope of our paper.

During step 3, we sorted the 118 papers into two categories, depending on whether or not they prominently featured digital technologies. In step 4, to inductively generate categories to structure our findings, we followed a thematic analysis approach. This enabled us to encode qualitative data by revealing and clustering themes in the data, thus fostering the emergence of a categorization for inherent information (Braun and Clarke 2006). Since we used a first thematic analysis to identify the overall categories in step 4 and conducted a second thematic analysis to identify sub-categories in step 7, we distinguish these by naming them "A" (step 4) and "B" (step 7). To start our thematic analysis A, we printed all papers as drafts in form of their titles and abstracts. We used a uniform format and omitted information on authors, journals, or publication years. This anonymization was meant to prevent us from potential biases when evaluating the articles. We read each printed draft and, in a consensual approach, we categorized the papers. In the non-digital technology papers, the first category that emerged contained papers on boundaries between spaces, followed by papers on physical spaces as a second category, i.e. papers on spatial topics in an "analog" setting (step 4.1). The first category to emerge in papers with a certain focus on digital technologies were virtual spaces, which deal with spatial topics similar to physical spaces, but in a virtual environment. We were then left with several digital technology papers in which spaces were not clearly delineated to other spaces and the boundary between spaces blurred. We categorized these papers as digital spaces (step 4.2). They provide the most insights to answer our first research question.

	Type I	**Type II**
Behavioral Science	• Literature overview • Methods to assess spaces • Mutual impact of space & behavior	• Literature overview • Methods to assess spaces • Mutual impact of space & behavior
Design Science	• Design of spaces	

Figure 1. Framework to Categorize Literature Related to Spaces

Regarding our second research question (i.e. a research agenda on digital spaces), we excluded further articles that did not provide insights for IS research in an organizational context, as is the scope of this paper. Excluded articles considered urban spaces (e.g., the spatial and social structure of cities through the lens of gender (Spain 2014)); market spaces (e.g., market niches or industry spaces (Popielarz and Neal 2007)); physical retail spaces (e.g., the design of supermarket outlets (Bezawada et al. 2009)); individual spaces outside the organizational context (e.g., the invasion of personal space through sexual harassment (Uggen and Blackstone 2004)); and political spaces (e.g., conflict zones or resistance organizations (Dai et al. 2013)). This step 5 left us with 79 papers that directly related to the scope of our review. To help with categorizing, we created a framework based on our theoretical background (see Figure 1) in step 6, i.e. we knew that the literature on spaces could be distinguished according to the research approach in design science and behavioral science as well as according to the perspective on spaces in Type I spaces and Type II spaces. In step 7, we applied this framework to our thematic analysis B and inductively identified sub-categories to refine the thematic categorization of the papers within the four overall categories. Similar to step 4, this analysis process was performed in an iterative and repeated manner whereas we continuously added, integrated, dismissed, and restructured our sub-categories, with the overall categorization remaining constant. When a sub-category appeared in one category, such as the mutual impact of Type I spaces and behaviors in Table 4 (Dodgson et al. 2013), we also included this sub-category in all other tables. Thus, strong and neglected areas of research are better comparable across categories. Finally, in step 8, we created an agenda for further research based on the understanding of digital spaces we could derive from the papers (and the lack of it), on neglected areas of research, and on the limitations of this paper.

Results

As noted, four categories of research on spaces emerged during our literature analysis. We call these "boundaries", "physical spaces", "virtual spaces", and "digital spaces". The first two are established topics in organizational science. The IS community has mainly dealt with issues that relate to virtual spaces, albeit not through a spaces-lens and not with a theory of spaces. Digital spaces emerged through a collection of papers on physical or virtual spaces that are connected via digital technologies. Such digital spaces, as we define them later in this paper, have not yet been investigated. Nonetheless, research can be classified as dealing with digital spaces when these were implicitly in the center of attention without the researchers specifically applying a digital spaces-lens.

The first category we could identify is "boundaries" (see Table 2). This category focuses on the delineating space between physical or virtual spaces. Similar to a box, every space has boundaries that delineate it from other spaces. Instead of investigating the space itself, research on boundaries looks at the effects of and on the boundary. A boundary could also be regarded as a very specific type of space that can be of Type I, for instance, a geographical boundary such as time or spatial distance (Cummings et al. 2009), or Type II, for instance, a boundary organization that resolves boundaries between parties with diverging interests by creating a specific boundary space (Yeow et al. 2018). We acknowledge that every analysis of boundaries entails at least two other spaces and that such papers may also be included in other categories. However, since the papers in this category concentrate on the boundary, not the surrounding spaces, they provide distinct insights that require their own category.

Table 2. Research Category: Boundaries

Design Science	**Behavioral Science**	
Type I Spaces	**Type I Spaces**	**Type II Spaces**
Design of boundaries -	**Literature overview** -	**Literature overview** -
	Methods to assess boundaries -	**Methods to assess boundaries** -
	Impact of behaviors on spaces -	**Impact of behaviors on spaces** Colman and Rouzies 2019
	Impact of spaces on behaviors Cummings et al. 2009, Elsbach 2003, Thatcher and Zhu 2006, Wilson et al. 2013	**Impact of spaces on behaviors** Ashforth et al. 2000, Brashears et al. 2017, Dery et al. 2014, Miller et al. 2006, Ollier-Malaterre et al. 2013, Pauleen and Yoong 2001, Ramarajan and Reid 2013, Sarker et al. 2018, van Osch and Steinfield 2016, Watson-Manheim et al. 2012, Yeow et al. 2018
	Mutual impact of spaces & behaviors -	**Mutual impact of spaces & behaviors** -

"Physical spaces" (see Table 3) emerged as a second category. They are the most established area of spaces research. Here, papers relate to spaces that are measurable, mappable, tangible, and delineated to other spaces through clear boundaries. This includes Type I spaces, for instance, in designing collaborative spaces (Mittleman 2009) or in investigating the effects of the physical layout of an office (Khazanchi et al. 2018), as well as Type II spaces, for instance, in examining experimental space as a delineated imaginary space whose activities are executed in a tangible, material space (Cartel et al. 2019).

Table 3. Research Category: Physical Spaces

Design Science	**Behavioral Science**	
Type I Spaces	**Type I Spaces**	**Type II Spaces**
Design of physical spaces Mittleman 2009	**Literature overview** -	**Literature overview** Gieryn 2000
	Methods to assess physical spaces Downey 2006, Shah and Ward 2007	**Methods to assess physical spaces** Andersen 2006
	Impact of behaviors on spaces -	**Impact of behaviors on spaces** Battard et al. 2017, Battilana et al. 2015, Fatimah et al. 2015
	Impact of spaces on behaviors Garrett et al. 2017, Khazanchi et al. 2018, Kornberger and Clegg 2004, O'Leary and Mortensen 2010, Perkmann et al. 2019, Tyler and Cohen 2010, Wasserman and Frenkel 2011	**Impact of spaces on behaviors** Brown et al. 2005, Bucher and Langley 2016, Cartel et al. 2019, Furnari 2014, Gardner et al. 2018, Hydle 2015, Kahn et al. 2018, Kellogg 2009, Littlewood and Kiyumbu 2018, Liu et al. 2016, Livengood and Reger 2010, Shin et al. 2017, Wiedner et al. 2017
	Mutual impact of spaces & behaviors -	**Mutual impact of spaces & behaviors** de Vaujany and Vaast 2014

Our third category emphasizes "virtual spaces" (see Table 4). In virtual spaces, users interact with a virtual environment through avatars or user profiles. Virtual spaces such as a virtual world (e.g., Second Life), or an online community (e.g., a Facebook group), are still measurable, mappable, and delineated to other spaces through clear boundaries, but are intangible and only exist virtually. Papers that examine virtual spaces can again be divided into Type I spaces, concerned, for instance, with the design of virtual world tools (Saunders et al. 2012), and Type II spaces, focusing, for instance, on the visibility effects of enterprise social media-based teams on network structures (van Osch and Steinfield 2018).

Table 4. Research Category: Virtual Spaces

Design Science	**Behavioral Science**	
Type I Spaces	**Type I Spaces**	**Type II Spaces**
Design of virtual spaces Bhagwatwar et al. 2018, Biocca et al. 2007, Kohler et al. 2011, Saunders et al. 2011, Schmeil et al. 2012	**Literature overview** -	**Literature overview** Boughzala et al. 2012
	Methods to assess virtual spaces Davis et al. 2009	**Methods to assess virtual spaces** -
	Impact of behaviors on spaces -	**Impact of behaviors on spaces** van Osch and Steinfield 2018
	Impact of spaces on behaviors Animesh et al. 2011, Butler 2001, Franceschi et al. 2009, Goel et al. 2011, Goel et al. 2013, Lee and Chen 2011	**Impact of spaces on behaviors** Schultze and Orlikowski 2010
	Mutual impact of spaces & behaviors Dodgson et al. 2013	**Mutual impact of spaces & behaviors** -

The final category is "digital spaces" (see Table 5). As in virtual spaces, digital technologies have an important role, but here, spaces and boundaries are treated differently. Taken together, these papers

have in common that they do not view a boundary as a space that delineates spaces, but as a space that digitally opens spaces to another. Thus, a focus of analysis on a boundary, physical space, or virtual space is not sufficient to grasp digital spaces. They need to be viewed as a holistic construct in which boundaries between spaces blur. Again, this can be done with a focus on Type I spaces, for instance, when examining the role of collaborative technologies in distributed teams (Gupta et al. 2009), and Type II spaces, for instance, when investigating digital innovation networks (Lyytinen et al. 2016).

Table 5. Research Category: Digital Spaces

Design Science	**Behavioral Science**	
Type I Spaces	**Type I Spaces**	**Type II Spaces**
Design of digital spaces -	**Literature overview** -	**Literature overview** -
	Methods to assess digital spaces -	**Methods to assess digital spaces** Bentley et al. 2019
	Impact of behaviors on spaces -	**Impact of behaviors on spaces** -
	Impact of spaces on behaviors Virtual teams: Espinosa et al. 2007, Gupta et al. 2009, Sarker and Sahay 2004 Telework: Sewell and Taskin 2015	**Impact of spaces on behaviors** Virtual teams: Asatiani and Penttinen 2019, Breu and Hemingway 2004, Chudoba et al. 2005, Gilson et al. 2015, Schweitzer and Duxbury 2010, Shin 2004, van Alstyne and Brynjolfsson 2005 Innovation activities: Arakji and Lang 2007, Boland Jr. et al. 2007, Lyytinen et al. 2016, Phene et al. 2006, Puranam et al. 2006, Wagner et al. 2012
	Mutual impact of spaces & behaviors -	**Mutual impact of spaces & behaviors** -

Discussion and Further Research

How Digital Technologies Shape Spaces

Our analysis of papers on spatial issues with a focus on digital technologies reveals that these technologies lead to the emergence of virtual spaces, i.e. spaces similar to physical spaces, but in a virtual environment, and digital spaces, i.e. spaces that are digitally open, meaning digital technologies open and blur boundaries between one space and other physical or virtual spaces. However, although virtual spaces emerged in our thematic analysis as their own category, such spaces can also be seen as a subgroup of digital spaces. Papers we assigned to the virtual spaces category treated the virtual space as delineated to other spaces. Yet, users' perceptions of the real world must be considered, because their virtual space experiences are embedded in their experiences of physical space. Thus, in virtual spaces, digital technologies blur the boundary between physical and virtual space, effectively making it necessary to analyze virtual spaces as digital spaces in the meaning of the definition provided above. This definition can be traced back to the characteristics of digital technologies, especially their ability to make artifacts open and editable (Nambisan et al. 2017; Yoo et al. 2012). According to our literature analysis, these characteristics seem to extend to the spaces the artifacts are part of. Consequently, digital spaces need to be analyzed holistically. For instance, the development of digital innovations shows that the actions of different spaces influence one another to the extent that no analysis of a single space could explain the outcome alone (Boland Jr. 2007).

While this example also highlights that previous research provides first insights on digital spaces, such insights largely remain limited to the contexts of virtual teams, digital innovations, and virtual worlds. As the research in other categories shows, many more spaces need to be understood, for instance, issues regarding strategizing (Hydle 2015) or organizational leakage (Brashears et al. 2017). Thus, it is necessary to develop a research agenda that can serve as a foundation for the IS community to explore digital spaces in all key facets. Based on our thematic analyses A and B, we propose the following ten areas of research to advance our understanding of digital spaces.

Agenda for Further Research

1) Empirical validation

As necessary as it is to examine the influence of digital technologies on spaces, it is likely that we did not cover all relevant aspects. Our literature-based findings need verification, adjustments, and extensions. Qualitative enquiry can accomplish a holistic conceptualization of digital spaces, since such a contemporary phenomenon is best studied within its real-life context (Yin 2013). Thus, we call for empirical studies to improve the foundation for research on digital spaces as laid out in this paper. In doing so, it is especially important to extract the main properties of digital spaces to make such a holistic concept assessable for future research.

2) Development of a holistic digital space theory

With some exceptions, which are limited to physical spaces (Tyler and Cohen 2010; Wasserman and Frenkel 2011), the papers in our analysis rarely used a theory of spaces as a foundation. In most cases, they deal implicitly with topics relating to spaces. However, without an overarching theoretical foundation, such highly fragmented findings are hard to generalize. Classical space theories (e.g., Lefebvre 1991) provide such a foundation and seem to work well for analyzing physical spaces; but owing to their openness, digital spaces need adapted theories. We need to investigate how classical space theories can be transferred to digital spaces (Truex et al. 2006) or need to develop a theory of digital spaces to answer questions such as why and how digital spaces are organized the way they are. In addition, as the digital open boundary is the main characteristic of a digital space, a theory must explain what kinds of openness exist, how they come into being, and what effects they have.

3) Methodical approach

Questions revolving around the methodical assessment of physical spaces have provided notable insights, for instance, on the benefits of using GPS data to analyze physical spaces (Downey 2006). Owing to their complex infrastructure, similar questions need to be raised and answered for digital spaces. Findings from virtual spaces may serve as a basis, for instance, regarding the aspects of a virtual world that deserve special attention (Davis et al. 2009), but these need to be enhanced so as to paint a holistic picture of the best approaches to digital space analysis. A broad range of methods needs to be evaluated to ensure we cover the technological, material, and (in)tangible specifics of a digital space as well as the social particularities resulting from their openness (Bentley et al. 2019).

4) Design of digital spaces

In organization studies, the task of actually designing physical spaces has only attracted little attention (Mittleman 2009). Such investigations are left to architects. With its close relationship to informatics, design science plays a much larger role in IS, which is reflected in an abundance of works relating to the design of virtual spaces (e.g., Biocca et al. 2007; Saunders et al. 2011). However, we know little about how digital spaces should be designed, especially to interweave spaces and boundaries as efficiently as possible with each other. This would allow us to provide practitioners with recommendations, for instance concerning the creation of digital hubs or in setting up innovation tasks with a co-creating community.

5) Constitution of digital spaces

The influence of space on behavior is the most researched sub-category across all kinds of spaces. Their mutual interplay and how behaviors shape spaces is much less understood, particularly in the context of digital spaces. The relevance of such research becomes clear when we look at the many actions

organizations take to set up digital units to digitally transform their business (Haffke et al. 2017). Insights indicate, for instance, that rigid and flexible approaches need to be balanced (Asantiani and Penttinen 2019), but how do such procedures as well as issues such as frames, beliefs, habits, or the interactions of different actors affect the constitution of digital spaces? Considering the complexity of a digital space, such questions need to be answered to provide guidance for organizations.

6) Reconfiguration of digital spaces

Similar questions as on the constitution of digital spaces can be raised on their reconfiguration. Even research dealing with physical space reconfiguration has just begun to emerge (Battard et al. 2017). Insights indicate that reconfiguration is a complex process that involves extensive analyses of Type I and Type II spaces. The digital context adds another layer of complexity, since blurred boundaries lead to other sources of impulses for reconfiguration, which in turn are affected by reconfiguration. Looking at reconfiguration processes through a digital spaces lens could provide valuable insights, for instance, to investigate the adoption of structure-changing techniques such as agile methods (Cao et al. 2013).

7) Discontinuance of digital spaces

After the constitution and reconfiguration of spaces, investigating the discontinuance of digital spaces is a logical final step. Issues of (re-)integration, for instance, an internally founded digital hub or an externally acquired startup into an established organization, have already been addressed in a digital context (Puranam et al. 2006), so there is a foundation to build on. Various ways to discontinue digital spaces, such as pause or demise, need to be investigated to establish an understanding of why and how digital spaces disappear or live on, most likely retaining an influence on the spaces they were connected to.

8) Interplay of different sub-spaces and boundaries in a digital space

Because a digital space is digitally open, spaces interact with other spaces. Take the example of a wholesale company that undergoes digital transformation. Its logistics department experiences increasing automation and becomes more connected to other departments, such as purchasing and sales, providing them with an increasing amount of data. We know little about how the interactions of these spaces and the digitally open boundary shape the very same spaces and the behaviors of the people and objects in them. This is even more relevant, as research shows that different parts of a large space do not act or react in a uniform way to external impulses (Kahn et al. 2018). Analyzing spaces, boundaries, and their interactions together would allow us to gain deeper insights into such processes.

9) Shape and role of boundaries in digital spaces

In physical spaces, boundaries delineate one space from another. In digital spaces, boundaries open a space to other spaces, i.e. it may be more appropriate to speak of interfaces instead of boundaries. These interfaces can take interesting shapes, for instance, in the case of immersive technologies such as Virtual and Augmented Reality (AR), where the boundary integrates one space into another in the visual perception of the user, while some of the user's other senses keep the spaces apart (Huang et al. 2019). In addition, there are digital spaces in which many types of boundaries come together, for instance, if the abovementioned wholesale company introduces AR to direct workers and provides them with additional information in their warehouse. We need to know more about the different forms of boundaries in the context of digital spaces and how they shape behavior and space as well as vice versa.

10) Technologies in digital spaces

Different digital technologies lead to different forms of spaces and boundaries, as described above. Another example is Artificial Intelligence (AI): When a digital hub uses AI, for instance through an interface in the form of voice control, digital spaces take other forms than in the cases of immersive technologies or traditional IS, such as desktop-based applications with self-written code. Furthermore, owing to their different technological foundations, such spaces will develop differently over time. Although technology selection is a key issue for organizations (Krishnan and Bhattacharya 2002), we know little about possible classes of technologies in digital spaces and how they constitute, reconfigure, or discontinue spaces and behaviors (see points 4 to 7), lead to a specific interplay between different subspaces (see point 8), or cause a specific shape and role of boundaries (see point 9).

Conclusion

Our aims were to examine how digital technologies shape spaces and to provide a research agenda that allows us to investigate such spaces in-depth. After distinguishing spaces research into research on Type I spaces, i.e. basic spaces that can be measured, mapped, and have dimensions that our bodily senses can easily grasp, and research on Type II spaces, i.e. abstract spaces that, for instance, can be captured through interactions and routines, we conducted a thorough systematic literature review. By means of an iterative thematic analysis in 25 top journals relevant to the topic and to our field we categorized 79 papers into four categories: boundaries, physical spaces, virtual spaces, and digital spaces, each with sub-categories that follow the differentiation in Type I and Type II spaces. Virtual spaces and digital spaces can be traced back to the inclusion of digital technologies in spaces.

Following this analysis, we argued that virtual spaces can be seen as a part of digital spaces and defined digital spaces as physical or virtual spaces that are digitally open, i.e. they use digital technologies to blur boundaries between themselves and other physical or virtual spaces. This definition relates directly to findings from the literature regarding the characteristics of digital technologies (Nambisan et al. 2017; Yoo et al. 2012). Based on our literature review and stemming from the limitations of this paper, we derived ten points for further research that allow us to come to a deeper understanding of digital spaces. Thus, we provide a starting point for a thorough understanding of a crucial element of our individual and organizational life.

References

Andersen, P. B. 2006. "Activity-Based Design," *European Journal of Information Systems* (15:1), pp. 9-25.

Animesh, A., Pinsonneault, A., Yang, S.-B., and Oh, W. 2011. "An Odyssey into Virtual Worlds: Exploring the Impacts of Technological and Spatial Environments on Intention to Purchase Virtual Products," *MIS Quarterly* (35:3), pp. 789-810.

Arakji, R. Y. and Lang, K. R. 2007. "Digital Consumer Networks and Producer-Consumer Collaboration: Innovation and Product Development in the Video Game Industry," *Journal of Management Information Systems* (24:2), pp. 195-219.

Asatiani, A. and Penttinen, E. 2019. "Constructing Continuities in Virtual Work Environments: A Multiple Case Study of Two Firms with Differing Degrees of Virtuality," *Information Systems Journal*, https://doi.org/10.1111/isj.12217.

Ashforth, B. E., Kreiner, G. E., and Fugate, M. 2000. "All in a Day's Work: Boundaries and Micro Role Transitions," *Academy of Management Review* (25:3), pp. 472-491.

Battard, N., Donnelly, P. F., and Mangematin, V. 2017. "Organizational Responses to Institutional Pressures: Reconfiguration of Spaces in Nanosciences and Nanotechnologies," *Organization Studies* (8:11), pp. 1529-1551.

Battilana, J., Sengul, M., Pache, A.-C., and Model, J. 2015. "Harnessing Productive Tensions in Hybrid Organizations: The Case of Work Integration Social Enterprises," *Academy of Management Journal* (58:6), pp. 1658-1685.

Bentley, C. M., Chib, A., and Poveda, S. 2019. "A Critical Narrative Approach to Openness: The Impact of Open Development on Structural Transformation," *Information Systems Journal*, https://doi.org/10.1111/isj.12226.

Bezawada, R., Balachander, S., Kannan, P. K., and Shankar, V. 2009. "Cross-Category Effects of Aisle and Display Placements: A Spatial Modeling Approach and Insights," *Journal of Marketing* (73:3), pp. 99-117.

Bhagwatwar, A., Massey, A., and Dennis, A. 2018. "Contextual Priming and the Design of 3D Virtual Environments to Improve Group Ideation," *Information Systems Research* (29:1), pp. 169-185.

Biocca, F., Owen, C., Tang, A., and Bohil, C. 2007. "Attention Issues in Spatial Information Systems: Directing Mobile Users' Visual Attention Using Augmented Reality," *Journal of Management Information Systems* (23:4), pp. 163-184.

Boland Jr., R. J., Lyytinen, K., and Yoo, Y. 2007. "Wakes of Innovation in Project Networks: The Case of Digital 3-D Representations in Architecture, Engineering, and Construction," *Organization Science* (18:4), pp. 631-647.

Boughzala, I., de Vreede, G.-J., and Limayem, M. 2012. "Team Collaboration in Virtual Worlds: Editorial to the Special Issue," *Journal of the Association for Information Systems* (13:10), Article 6.

Braun, V., Clarke, V. 2006. "Using Thematic Analysis in Psychology," *Qualitative Research in Psychology* (3:2), pp. 77-101.

Brashears, M. E., Genkin, M., and Suh, C. S. 2017. "In the Organization's Shadow: How Individual Behavior Is Shaped by Organizational Leakage," *American Journal of Sociology* (123:3), pp. 787-849.

Breu, K. and Hemingway, C. 2004. "Making Organisations Virtual: The Hidden Cost of Distributed Teams," *Journal of Information Technology* (19:3), pp. 191-202.

Brown, G., Lawrence, T. B., and Robinson, S. L. 2005. "Territoriality in Organizations," *Academy of Management Review* (30:3), pp. 577-594.

Bucher, S., and Langley, A. 2016. "The Interplay of Reflective and Experimental Spaces in Interrupting and Reorienting Routine Dynamics," *Organization Science* (27:3), pp. 594-613.

Butler, B. S. 2001. "Membership Size, Communication Activity, and Sustainability: A Resource-Based Model of Online Social Structures," *Information Systems Research* (12:4), pp. 346-362.

Cao, L., Mohan, K., Ramesh, B., and Sarkar, S. 2013. "Adapting Funding Processes for Agile IT Projects: An Empirical Investigation," *European Journal of Information Systems* (22:2), pp. 191-205.

Cartel, M., Boxenbaum, E., and Aggeri, F. 2019. "Just for Fun! How Experimental Spaces Stimulate Innovation in Institutionalized Fields," *Organization Studies* (40:1), pp. 65–92.

Chudoba, K. M., Wynn, E., Lu, M., and Watson-Manheim, M. B. 2005. "How Virtual Are We? Measuring Virtuality and Understanding its Impact in a Global Organization," *Information Systems Journal* (15:4), pp. 279-306.

Chughtai, H. and Myers, M. D. 2017. "Entering the Field in Qualitative Field Research: A Rite of Passage into a Complex Practice World," *Information Systems Journal* (27:6), pp. 795-817.

Colman, H. L. and Rouzies, A. 2019. "Postacquisition Boundary Spanning: A Relational Perspective on Integration," *Journal of Management*, https://doi.org/10.1177/0149206318759400.

Coulter, R., van Ham, M., and Findlay, A. M. 2016. "Re-thinking Residential Mobility: Linking Lives through Time and Space," *Progress in Human Geography* (40:3), pp. 352-374.

Cummings, J. N., Espinosa, J. A., and Pickering, C. K. 2009. "Crossing Spatial and Temporal Boundaries in Globally Distributed Projects: A Relational Model of Coordination Delay," *Information Systems Research* (20:3), pp. 420-439.

Dai, L., Eden, L., and Beamish, P. 2013. "Place, Space, and Geographical Exposure: Foreign Subsidiary Survival in Conflict Zones," *Journal of International Business Studies* (44:6), pp. 554-578.

Davis, A., Murphy, J., Owens, D., Khazanchi, D., and Zigurs, I. 2009. "Avatars, People, and Virtual Worlds: Foundations for Research in Metaverses," *Journal of the Association for Information Systems* (10:2), Article 1.

de Vaujany, F.-X. and Vaast, E. 2014. "If These Walls Could Talk: The Mutual Construction of Organizational Space and Legitimacy," *Organization Science* (25:3), pp. 713-731.

Dery, K., Kolb, D., and MacCormick, J. 2014. "Working with Connective Flow: How Smartphone Use is Evolving in Practice," *European Journal of Information Systems* (23:5), pp. 558-570.

Devezas, T., de Melo, F. C. L., Gregori, M. L., Salgado, M. C. V., Ribeiro, J. R., and Devezas, C. B. C. 2012. "The Struggle for Space: Past and Future of the Space Race," *Technological Forecasting and Social Change* (79:5), pp. 963-985.

Dodgson, M., Gann, D. M., and Phillips, N. 2013. "Organizational Learning and the Technology of Foolishness: The Case of Virtual Worlds at IBM," *Organization Science* (24:5), pp. 1358-1376.

Downey, L. 2006. "Using Geographic Information Systems to Reconceptualize Spatial Relationships and Ecological Context," *American Journal of Sociology* (112:2), pp. 567-612.

Elsbach, K. D. 2003. "Relating Physical Environment to Self-Categorizations: Identity Threat and Affirmation in a Non-Territorial Office Space," *Administrative Science Quarterly* (48:4), pp. 622-654.

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., and Herbsleb, J. D. 2007. "Team Knowledge and Coordination in Geographically Distributed Software Development," *Journal of Management Information Systems* (24:1), pp. 135-169.

Evangelopoulos, N. 2016. "Thematic Orientation of the ISJ within a Semantic Space of IS research," *Information Systems Journal* (26:1), pp. 39-46.

Fatimah, Y. A., Raven, R. P. J. M, and Arora, S. 2015. "Scripts in Transition: Protective Spaces of Indonesian Biofuel Villages," *Technological Forecasting and Social Change* (99), 1-13.

Fenci, G. E. and Currie, N. G. R. 2017. "Deployable Structures Classification: A Review," *International Journal of Space Structures* (32:2), pp. 112-130.

Franceschi, K., Lee, R. M., Zanakis, S. H., and Hinds, D. 2009. "Engaging Group E-Learning in Virtual Worlds," *Journal of Management Information Systems* (26:1), pp. 73-100.

Furnari, S. 2014. "Interstitial Spaces: Microinteraction Settings and the Genesis of New Practices between Institutional Fields," *Academy of Management Review* (39:4), pp. 439-462.

Gardner, T. M., Munyon, T. P., Hom, P. W., and Griffeth, R. W. 2018. "When Territoriality Meets Agency: An Examination of Employee Guarding as a Territorial Strategy," *Journal of Management* (44:7), pp. 2580-2610.

Garrett, L. E., Spreitzer, G. M., and Bacevice, P. A. 2017. "Co-Constructing a Sense of Community at Work: The Emergence of Community in Coworking Spaces," *Organization Studies* (38:6), pp. 821-842.

Gieryn, T. F. 2000. "A Space for Place in Sociology," *Annual Review of Sociology* (26:1), pp. 463-496.

Gilson, L. L., Travis Maynard, M., Jones Young, N. C., Vartiainen, M., and Hakonen, M. 2015. "Virtual Teams Research: 10 Years, 10 Themes, and 10 Opportunities," *Journal of Management* (41:5), pp. 1313-1337.

Goel, L., Johnson, N. A., Junglas, I., and Ives, B. 2011. "From Space to Place: Predicting Users' Intentions to Return to Virtual Worlds," *MIS Quarterly* (35:3), pp. 749-771.

Goel, L., Johnson, N., Junglas, I., and Ives, B. 2013. "Predicting Users' Return to Virtual Worlds: A Social Perspective," *Information Systems Journal* (23:1), pp. 35-63.

Gupta, A., Mattarelli, E., Seshasai, S., and Broschak, J. 2009. "Use of Collaborative Technologies and Knowledge Sharing in Co-Located and Distributed Teams: Towards the 24-h Knowledge Factory," *Journal of Strategic Information Systems* (18:3), pp. 147-161.

Haffke I., Kalgovas, B., and Benlian, A. 2017. "The Transformative Role of Bimodal IT in an Era of Digital Business," in *Proceedings of the 50th Hawaii International Conference on System Sciences*, Hawaii, USA, pp. 5460-5469.

Huang, F., Huang, J., and Wan, X. 2019. "Influence of Virtual Color on Taste: Multisensory Integration between Virtual and Real Worlds," *Computers in Human Behavior*, https://doi.org/10.1016/j.chb.2019.01.027.

Hydle, K. M. 2015. "Temporal and Spatial Dimensions of Strategizing," *Organization Studies* (36:5), pp. 643-663.

Kahn, W. A., Barton, M. A., Fisher, C. M., Heaphy, E. D., Reid, E. M., and Rouse, E. D. 2018. "The Geography of Strain: Organizational Resilience as a Function of Intergroup Relations," *Academy of Management Review* (43:3), pp. 509-529.

Kellogg, K. C. 2009. "Operating Room: Relational Spaces and Microinstitutional Change in Surgery," *American Journal of Sociology* (115:3), pp. 657-711.

Kerr, C., and Phaal, R. 2018. "Directing the Technology Intelligence Activity: An 'Information Needs' Template for Initiating the Search," *Technological Forecasting and Social Chance* (134), pp. 265-276.

Khazanchi, S., Sprinkle, T. A., Masterson, S. S., and Tong, N. 2018. "A Spatial Model of Work Relationships: The Relationship-Building and Relationship-Straining Effects of Workspace Design," *Academy of Management Review* (43:4), pp. 590-609.

Kohler, T., Fueller, J., Matzler, K., and Stieger, D. 2011. "Co-Creation in Virtual Worlds: The Design of the User Experience," *MIS Quarterly* (35:3), pp. 773-788.

Kornberger, M. and Clegg, S. R. 2004. "Bringing Space Back in: Organizing the Generative Building," *Organization Studies* (25:7), pp. 1095-1114.

Krishnan, V. and Bhattacharya, S. 2002. "Technology Selection and Commitment in New Product Development: The Role of Uncertainty and Design Flexibility," *Management Science* (48:3), pp. 313-327

L'Écuyer, P., Cordeau, J.-F., and Simard, R. 2000. "Close-Point Spatial Tests and their Application to Random Number Generators," *Operations Research* (48:2), pp. 308-317.

Lee, Y. and Chen, A. N. K. 2011. "Usability Design and Psychological Ownership of a Virtual World," *Journal of Management Information Systems* (28:3), pp. 269-308.

Littlewood, D. C. and Kiyumbu, W. L. 2018. "'Hub Organisations in Kenya: What Are They? What Do They Do? And What Is their Potential?," *Technological Forecasting and Social Change* (131), pp. 276-285.

Liu, C. C., Srivastava, S. B., and Stuart, T. E. 2016. "An Intraorganizational Ecology of Individual Attainment," *Organization Science* (27:1), pp. 90-105.

Livengood, R. S., and Reger, R. K. 2010. "That's Our Turf! Identity Domains and Competitive Dynamics," *Academy of Management Review* (35:1), pp. 48-66.

Lyytinen, K., Yoo, Y., and Boland Jr., R. J. 2016. "Digital Product Innovation within Four Classes of Innovation Networks," *Information Systems Journal* (26:1), pp. 47-75.

Mengis, J., Nicolini, D., and Gorli, M. (2018). "The Video Production of Space: How Different Recording Practices Matter," *Organizational Research Methods* (21:2), pp. 288-315.

Miller, K. D., Zhao, M., and Calantone, R. J. 2006. "Adding Interpersonal Learning and Tacit Knowledge to March's Exploration-Exploitation Model," *Academy of Management Journal* (49:4), pp. 709-722.

Mittleman, D. D. 2009. "Planning and Design Considerations for Computer Supported Collaboration Spaces," *Journal of the Association for Information Systems* (10:3), Article 1.

Nambisan, S., Lyytinen, K., Majchrzak, A., and Song, M. 2017. "Digital Innovation Management: Reinventing Innovation Management Research in Digital World," *MIS Quarterly* (41:1), pp. 223-238.

O'Leary, M. B., and Mortensen, M. 2010. "Go (Con)figure: Subgroups, Imbalance, and Isolates in Geographically Dispersed Teams," *Organization Science* (21:1), pp. 115-131.

Ollier-Malaterre, A., Rothbard, N. P., and Berg, J. M. 2013. "When Worlds Collide in Cyberspace: How Boundary Work in Online Social Networks Impacts Professional Relationships," *Academy of Management Review* (38:4), pp. 645-669.

Paré, G., Tate, M., Johnstone, D., and Kitsiou, S. 2016. "Contextualizing the Twin Concepts of Sytematicity and Transparency in Information Systems Literature Reviews," *European Journal of Information Systems* (25:6), pp. 493-508.

Pauleen, D. and Yoong, P. 2001. "Relationship Building and the Use of ICT in Boundary-Crossing Virtual Teams: A Facilitator's Perspective," *Journal of Information Technology* (16:4), pp. 205-220.

Perkmann, M., McKelvey, M., and Phillips, N. 2019. "Protecting Scientists from Gordon Gekko: How Organizations Use Hybrid Spaces to Engage with Multiple Institutional Logics," *Organization Science*, https://doi.org/10.1287/orsc.2018.1228.

Phene, A., Fladmoe-Lindquist, K., and Marsh, L. 2006. "Breakthrough Innovations in the U.S. Biotechnology Industry: The Effects of Technological Space and Geographic Origin," *Strategic Management Journal* (27:4), pp. 369-388.

Popielarz, P. A. and Neal, Z. P. 2007. "The Niche as a Theoretical Tool," *Annual Review of Sociology* (33:1), pp. 65-84.

Puranam, P., Singh, H., and Zollo, M. 2006. "Organizing for Innovation: Managing the Coordination-Autonomy Dilemma in Technology Acquisitions," *Academy of Management Journal* (49:2), pp. 263-280.

Ramarajan, L. and Reid, E. 2013. "Shattering the Myth of Separate Worlds: Negotiating Nonwork Identities at Work," *Academy of Management Review* (38:4), pp. 621-644.

Rowe, F. 2014. "What Literature Review Is Not: Diversity, Boundaries and Recommendations," *European Journal on Information Systems* (23:3), pp. 241-255.

Sarker, S. and Sahay, S. 2004. "Implications of Space and Time for Distributed Work: An Interpretive Study of US–Norwegian Systems Development Teams," *European Journal of Information Systems* (13:1), pp. 3-20.

Sarker, S., Ahuja, M., and Sarker, S. 2018. "Work-Life Conflict of Globally Distributed Software Development Personnel: An Empirical Investigation Using Border Theory," *Information Systems Research* (29:1), pp. 103-126.

Saunders, C., Rutkowski, A. F., van Genuchten, M., Vogel, D., and Orrego, J. M. 2011. "Virtual Space and Place: Theory and Test," *MIS Quarterly* (35:3), pp. 1079-1098.

Schmeil, A., Eppler, M. J., and de Freitas, S. 2012. "A Structured Approach for Designing Collaboration Experiences for Virtual Worlds," *Journal of the Association for Information Systems* (13:10), Article 2.

Schultze, U. and Orlikowski, W. J. 2010. "Research Commentary Virtual Worlds: A Performative Perspective on Globally Distributed, Immersive Work," *Information Systems Research* (21:4), pp. 810-821.

Schweitzer, L. and Duxbury, L. 2010. "Conceptualizing and Measuring the Virtuality of Teams," *Information Systems Journal* (20:3), pp. 267-295.

Sewell, G. and Taskin, L. 2015. "Out of Sight, out of Mind in a new World of Work? Autonomy, Control, and Spatiotemporal Scaling in Telework," *Organization Studies* (36:11), pp. 1507-1529.

Shah, R. and Ward, P. T. 2007. "Defining and Developing Measures of Lean Production," *Journal of Operations Management* (25:4), pp. 785-805.

Shin. Y. 2004. "A Person-Environment Fit Model for Virtual Organizations," *Journal of Management* (30:5), pp. 725-743.

Shin, D., Hasse, V. C., and Schotter, A. P. J. 2017. "Multinational Enterprises within Cultural Space and Place: Integrating Cultural Distance and Tightness–Looseness," *Academy of Management Journal* (60:3), pp. 904-921.

Soja, E. W. 1996. *Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places*, Oxford: Blackwell.

Spain, D. 2014. "Gender and Urban Space," *Annual Review of Sociology* (40:1) pp. 581-598.

Thatcher, S. M. B. and Zhu, X. 2006. "Changing Identities in a Changing Workplace: Identification, Identity Enactment, Self-Verification, and Telecommuting," *Academy of Management Review* (31:4), pp. 1076-1088.

Truex, D., Holmström, J., and Keil, M. 2006. "Theorizing in Information Systems Research: A Reflexive Analysis of the Adaptation of Theory in Information Systems Research," *Journal of the Association for Information Systems* (7:12), Article 33.

Tyler, M. and Cohen, L. 2010. "Spaces that Matter: Gender Performativity and Organizational Space," *Organization Studies* (31:2), pp. 175-198.

Uggen, C., and Blackstone, A. 2004. "Sexual Harassment as a Gendered Expression of Power," *American Sociological Review* (69:1), pp. 64-92.

van Alstyne, M. and Brynjolfsson, E. 2005. "Global Village or Cyber-Balkans? Modeling and Measuring the Integration of Electronic Communities," *Management Science* (51:6), pp. 851-868.

van Osch, W. and Steinfield, C. 2016. "Team Boundary Spanning: Strategic Implications for the Implementation and Use of Enterprise Social Media," *Journal of Information Technology* (31:2), pp. 207-225.

van Osch, W. and Steinfield, C. W. 2018. "Strategic Visibility in Enterprise Social Media: Implications for Network Formation and Boundary Spanning," *Journal of Management Information Systems* (35:2), pp. 647-682.

Wagner, E., Newell, S., and Kay, W. 2012. "Enterprise Systems Projects: The Role of Liminal Space in Enterprise Systems Implementation," *Journal of Information Technology* (27:4), pp. 259–269.

Wasserman, V. and Frenkel, M. 2011. "Organizational Aesthetics: Caught between Identity Regulation and Culture Jamming," *Organization Science* (22:2), pp. 503-521.

Watson-Manheim, M. B., Chudoba, K. M., and Crowston, K. 2012. "Perceived Discontinuities and Constructed Continuities in Virtual Work," *Information Systems Journal* (22:1), pp. 29-52.

Wiedner, R., Barrett, M., and Oborn, E. 2017. "The Emergence of Change in Unexpected Places: Resourcing across Organizational Practices in Strategic Change," *Academy of Management Journal* (60:3), pp. 823-854.

Wilson, J., Crisp, C. B., and Mortensen, M. 2013. "Extending Construal-Level Theory to Distributed Groups: Understanding the Effects of Virtuality," *Organization Science* (24:2), pp. 629-644.

Yeow, A., Sia, S. K., Soh, C., and Chua, C. 2018. "Boundary Organization Practices for Collaboration in Enterprise Integration," *Information Systems Research* (29:1), pp. 149-168.

Yin, R. K. 2013. *Case Study Research – Design and Methods*, (5th ed.), Thousand Oaks: SAGE Publications.

Yoo, Y., Boland Jr., R. J., Lyytinen, K., and Majchrzak, A. 2012. "Organizing for Innovation in the Digitized World," *Organization Science* (23:5), pp. 1398-1408.