Dynamic Capabilities in Information Systems Research: A Critical Review, Synthesis of Current Knowledge, and Recommendations for Future Research

Article *in* Journal of the Association for Information Systems · March 2022

DOI: 10.17705/1jais.00736

CITATIONS
56

READS
4,864

4 authors:

Dennis M. Steininger
RPTU - Rheinland-Pfälzische Technische Universität Kaiserslautern Landau
42 PUBLICATIONS **654** CITATIONS
SEE PROFILE

Patrick Mikalef
Norwegian University of Science and Technology
174 PUBLICATIONS **7,765** CITATIONS
SEE PROFILE

Adamantia Pateli
Ionian University
74 PUBLICATIONS **3,069** CITATIONS
SEE PROFILE

Ana Ortiz de Guinea
HEC Montréal - École des Hautes Études commerciales
63 PUBLICATIONS **2,126** CITATIONS
SEE PROFILE

This paper is forthcoming (accepted for publication on the 22nd of June 2021) in the *Journal of the Association for Information Systems*. The Association for Information Systems owns the copyright and use for profit is prohibited. Version date: 7th of July 2021.

Please cite as: Steininger, D. M., Mikalef, P., Pateli, A. G., & Ortiz de Guinea, A. (2021). Dynamic Capabilities in Information Systems Research: A Critical Review, Synthesis of Current Knowledge, and Recommendations for Future Research. *Journal of the Association for Information Systems*, forthcoming.

Dynamic Capabilities in Information Systems Research: A Critical Review, Synthesis of Current Knowledge, and Recommendations for Future Research

Dennis M. Steininger[1], Patrick Mikalef[2], Adamantia Pateli[3], Ana Ortiz de Guinea[4]

[1]Technical University of Kaiserslautern, Germany, dennis.steininger@wiwi.uni-kl.de
[2] Norwegian University of Science and Technology, Norway, patrick.mikalef@ntnu.no
[3] Ionian University, Greece, pateli@ionio.gr
[4] HEC Montréal, Canada, ana.ortiz-de-guinea@hec.ca; University of Exeter, United Kingdom, A.Ortiz-De-Guinea@exeter.ac.uk

Abstract: Over the past twenty years the dynamic capabilities view (DCV) has gained prominence in the IS field as a theoretical perspective from which to explain competitive advantage in turbulent environments. While there are quite a few review studies of DCs in the strategic management domain, research on DCs in the IS area has not been synthesized nor critically analyzed. The result is that the role which IT plays in the DCV remains largely ambiguous and the way we think and conduct IS research on DCs unquestioned. Addressing this, we conducted a critical review of DCs in IS research based on 136 papers. Our review provides a synthesis of contemporary knowledge on DCs emphasizing the role of IT in this research, and a critical analysis of the assumptions underlying this literature. In addition, we develop a minimum DC definition for future research as a solution to the conceptual issues that we uncovered via the critical analysis. We further leverage the remaining findings of our critical review by providing a detailed research agenda for future investigations on DCs by IS scholars.

Keywords: Literature review, critical review, dynamic capabilities, DCV, nomological net, role of IT, performance, IT value, construct definition, IT artifact.

1. INTRODUCTION

In their seminal article, Teece et al. (1997) outlined how the dynamic capability view (DCV) might be useful to study the competitive advantage of organizations in increasingly demanding environments. Since then, dynamic capabilities (DCs) have been a vibrant research area, maturing and establishing itself as one of the most influential theoretical lenses in contemporary management scholarship (Di Stefano, Peteraf, & Verona, 2014; Schilke, Hu, & Helfat, 2018). Following this movement, the interest of information systems (IS) scholars in the DCV as a theoretical perspective has grown steadily over the last 20 years. Nevertheless, even though the DCV has been extensively used in the IS domain, there is no comprehensive evaluation about whether the DCV is a useful theoretical perspective in the IS field, and how it can contribute to the discourse of IT-business value research (Kohli & Grover, 2008; Melville, Kraemer, & Gurbaxani, 2004; Schryen, 2013).

Within the strategic management domain, there have been several literature reviews addressing different aspects of the DCV. The earliest of these reviews focused on resolving definitional issues of DCs and how the theory relates to other concepts and perspectives, particularly the resource-based view of the firm (RBV) (Ambrosini & Bowman, 2009; Cepeda & Vera, 2007; Zahra, Sapienza, & Davidsson, 2006). Later reviews have built on these theoretical reflections and looked at the network space of the theory, highlighting its antecedents, mechanisms, and consequences (Eriksson, 2014; Schilke et al., 2018), while others have emphasized on the role of managers as catalysts of DCs (Helfat & Martin, 2015; Helfat & Peteraf, 2015). Subsequently, several reviews have examined the application of the theory in specific contexts or in relation to distinct organizational activities (e.g., public organizations, large firms, knowledge management, innovation) (Beske, Land, & Seuring, 2014; Piening, 2013; Teece, 2016).

Despite the considerable breadth in reviews on the DCV (for an overview see Appendix A), there have been very few review papers touching upon information technology (IT) within their research

scope. These papers acknowledge IT only as a part of the broader context in which DCs are developed (i.e., Konlechner, Müller, & Güttel, 2018; Murschetz, Omidi, Oliver, Kamali Saraji, & Javed, 2020), are mostly bibliometric and center just on IT in the form of big data (i.e., Rialti, Marzi, Ciappei, & Busso, 2019), or develop a DC conceptualization focused on the capability of the IT business unit for digital platforms, IT management, and IT knowledge management (i.e., Li & Chan, 2019). Although these reviews help in providing detail in specific and particular aspects of DCs in relation to IT, what is lacking is an analysis of the varying ways in which DCs in IS have been conceptualized, including whether IT is enmeshed in such conceptualizations, and of the nomological net of DCs with particular attention to the different roles that IT plays in it. In this sense, we also depart from previous reviews, by applying a broad and inclusive understanding of IT, acknowledging that IT artifact conceptualizations vary widely from technical platforms and specific software based on computational views of technology to ensemble views that recognize the complex and dynamic context in which IT is inherently enmeshed in its development and use (Orlikowski & Iacono, 2001).

Most importantly, our review takes a critical form by problematizing IS research on DCs to uncover issues and underlying assumptions (Alvesson and Sandberg, 2011). Thus, besides a synthesis of what is known as a 'building' exercise, we provide a critical analysis as an 'opening up' exercise to rethink existing literature in ways that generate new avenues for future IS research on DCs (Alvesson and Sandberg, 2020). In other words, the critical challenging of current thinking about DCs and IT in IS research also serves to point to future research directions beyond mere gap-spotting. Besides these, synthesizing and critically analyzing the interplay of IT and DCs is also important for three additional pragmatic reasons. First, a growing number of business activities are now being developed on the affordances of digital technologies (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). As a result, the pursuit of strategic objectives by organizations is inextricably connected to the dynamic organizational and socio-economic contexts that leverage

IT to attain a wide range of business objectives (Lo & Leidner, 2018). Second, the DCV introduces some concepts and ideas that are potentially fruitful in the discourse of IT-business value research. Specifically, the DCV can help explain how organizations can develop and renew their value-generating mechanisms by the means of IT (Schryen, 2013). Doing so can complement existing knowledge on IT-business value by highlighting specific abilities (i.e., the ability to sense customers' demands) or processes (i.e., sensing processes to detect fraud) that are enabled by the deployment, use, and mobilization of IT, as well as the types of performance outcomes that derive from them (Melville et al., 2004; Schryen, 2013). Third, the DCV with its evolutionary orientation places emphasis on how organizations adapt and transform in the face of continuously changing business conditions. Thus, the DCV appears to be in a privileged position to help explain how IT can be leveraged as a strategic driver of change in dynamic and high velocity environments, which remains an open research question in the IS field (Galliers, Jarvenpaa, Chan, & Lyytinen, 2012).

As a result, we provide a critical review (Paré, Trudel, Jaana, & Kitsiou, 2015) of DCs in IS research based on 136 papers that employ the DCV. More specifically, our review pursuits three interrelated objectives: (1) Synthesis of prior knowledge on DCs in the IS field (2) Critical assessment of the extant literature to uncover problematic assumptions and issues, and (3) Identification of new research avenues. In doing so, we pay particular attention to the interplay between IT and DCs, and the role of IT within the DCV.

2. LITERATURE REVIEW APPROACH

Following our objectives of synthesizing and critically assessing existing knowledge of DCs in IS research, we selected a critical review approach (Paré et al., 2015). We therefore adapted the process of Paré et al. (2016) and combined it with the ideas of problematization (Alvesson & Sandberg, 2011).

This allowed us to reveal weaknesses, inconsistencies, and gaps which we then leveraged to propose alternative assumptions and directions for future research (Schryen et al. 2020). Supporting repeatability and transparency we explain the steps of Table 1 below.

Table 1
Review Approach (adapted from: Paré et al., 2016)

STEP	DESCRIPTION
1) Review plan	Based on the objectives outlined in the introduction, we selected the critical review type and developed an initial coding framework and criteria for inclusion and exclusion of articles. Our plan and the framework were iteratively further developed as we moved on and identified subsequent important issues.
2) Literature Identification	*Search:* We selected IS journals as well as management journals matching our objectives and identified relevant papers via carefully crafted keywords into a longlist. *Selection:* Each paper of the longlist was manually screened by two authors using our decision tree for inclusion or exclusion (see Figure 1). We applied forward and backward search to the resulting initial shortlist and thereby built our final shortlist. *Quality assessment:* Since we only included renowned journals, we infer that the published papers are at an acceptable quality for inclusion. We also deemed this sufficient due to the critical nature of our review (Paré et al., 2016).
3) Data Extraction and Categorization	We started reviewing and categorizing shortlisted papers via our concept matrix. This was tailored to our objectives and allowed us to be systematic in our data extraction. Extraction was done individually and overlapping. We then further iteratively abstracted the results to identify patterns, antecedents, and consequences in the existing literature. Ambiguity was resolved via discussions of all authors (Paré et al., 2016).
4) Critical Analysis	We followed a criticizing approach (Schryen, Wagner, Benlian, & Paré, 2020) by coding and analyzing underlying assumptions and critical issues. We thereby also leverage the suggestions of problematization provided by Alvesson and Sandberg (2011).

2.1 Review Plan

Following our defined objectives, we prepared a decision tree with criteria for inclusion and exclusion of articles as well as a concept matrix (Webster & Watson, 2002) to collect and code relevant data (e.g., operationalization of underlying capacities of DCs, used view of the IT artifact (Orlikowski & Iacono, 2001)).

2.2 Literature Identification

For gathering the final review sample of 136 papers we followed several steps (Figure 1). Our review aims to synthesize and critically assess the use of DCs and their nomological net in IS research. Hence, we mainly used journals that are in the center of the discipline. To do so, we selected all journals of the ‘Senior Scholars' Basket’ and added further IS-specific journals (Currie,

Dennis, Nickerson, Niederman, & Vogel, 2017). Following other reviews in IS (e.g., Piccoli & Ives, 2005; Shen, Lyytinen, & Yoo, 2015), we also included management journals that are known to publish IS-associated DCs' papers (see Appendix B).

We first conducted a full-text search with the keywords "dynamic capabilities" and "dynamic capability" (Lim, Jarvenpaa, & Lanham, 2015). To do so, we queried the search engines on the website of the journals. If not available, we additionally consulted databases covering the specific journal (e.g., EBSCO Business Source Premier) (Xiao, Califf, Sarker, & Sarker, 2013). This resulted in a longlist of 1799 papers.

We continued by screening titles, abstracts, introductions, theoretical sections, and results of the longlisted papers for inclusion or exclusion via our decision tree. We excluded papers whose main conceptual basis or focus is not DCs (e.g., DCs mentioned on the front end only briefly) and papers that are not IS-related (mainly from management journals). We included all conceptual and empirical papers that explicitly talk about DCs in relation with IS, build upon the construct, or conceptualize it (see Figure 1, p. 7). The screening for exclusion or inclusion was done for each paper independently by two authors. If screening resulted in contradictory views, we included articles to not miss them.

We thereby reduced the papers to an initial shortlist of 163 to which we applied forward and backward search. This led to a final shortlist of 165 papers that we fully reviewed. While reviewing, we had to exclude further papers due to missing fit to our objectives. This is rooted in being rather inclusive than exclusive in earlier steps. Our further classifications and analyses were done based on the resulting final sample of 136 papers (Okoli, 2015).

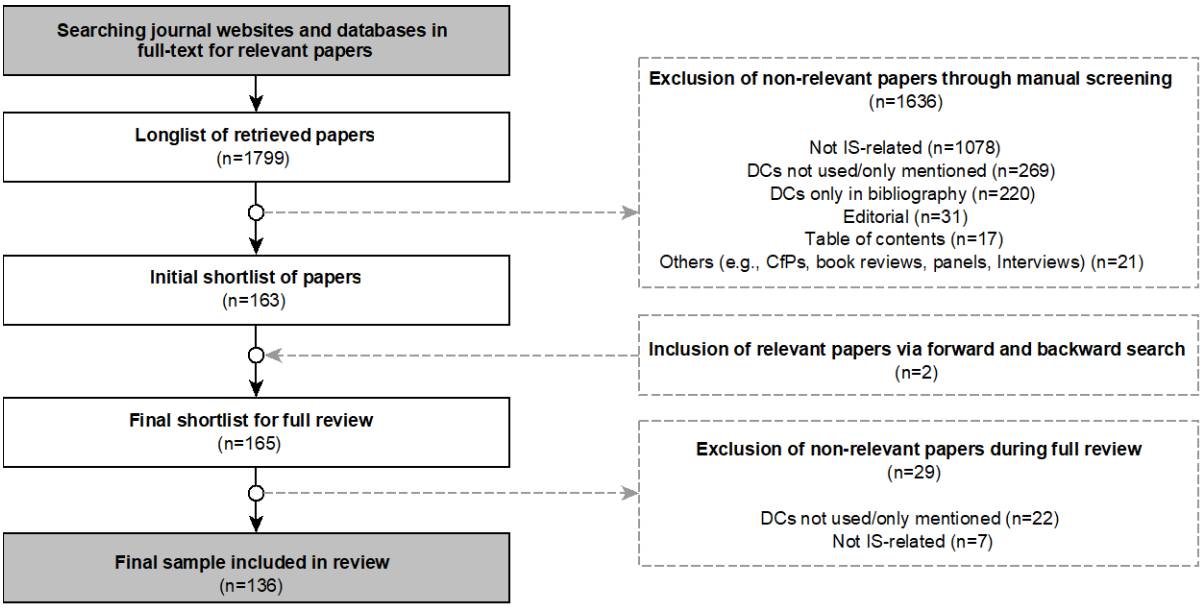

Figure 1 Paper Screening and Selection.

2.3 Data Extraction and Categorization

Our main review process included carefully analyzing and classifying all papers of the final sample. In the first step, classification was done using our concept matrix to gather standardized insights related to our objectives from each paper (Schryen, 2015). For instance, within the matrix, we included categories to collect variables, samples, as well as levels of analysis, which helped us to depict the nomological net. In several extraction and analysis rounds, we stayed open for new insights and patterns that could potentially extend our framework accounting for the specifics of DC-based research in IS (Aksulu & Wade, 2010; Wolfswinkel, Furtmueller, & Wilderom, 2011). We thereby used qualitative techniques (e.g., thematic mapping), which enabled us to iteratively identify emerging patterns such as the roles that we abstracted from the operationalizations of the IT artifact, its relation to the DC construct, and the outcome variables of a study. Albeit we are more on the interpretive side of the continuum of literature reviews (Paré et al., 2016), we also used more quantitative techniques (e.g., frequency tables), to better understand dominating methods of the reviewed papers (Roberts, Galluch, Dinger, & Grover, 2012; Xiao et al., 2013).

2.4 Critical Analysis

To further assess the extracted data, we followed a criticizing approach (Schryen et al., 2020). We therefore systematically analyzed the articles of the DC domain and the patterns that emerged during our mapping to identify three main types of issues: critical assumptions, conceptual/logic problems, and methodological problems (Schryen et al., 2020). Critical assumptions were categorized into the different types (in-house, root metaphor, paradigmatic, ideology, field) proposed by Alvesson and Sandberg (2011). This was initially done by all authors individually. We then jointly discussed differences, grouped similar issues, and added concrete main examples for each (Paré et al., 2016). Further following the six iterative problematization steps (Alvesson & Sandberg, 2011), we continued by discussing the relevance of each issue, arising problems or impacts of critical assumptions, and arguments why an issue is critical to be resolved. We then contrasted the issues with existing trends and general developments in IS research to come up with resolutions and potential advancements for updating or replacing existing assumptions in the field. Resulting elements built the foundation for our future research suggestions.

3. SYNTHESIS OF DYNAMIC CAPABILITIES RESEARCH IN INFORMATION SYSTEMS

The DCV of the firm (Teece et al., 1997) emerged as one of the most influential theoretical perspectives in contemporary management scholarship (Peteraf, Di Stefano, & Verona, 2013; Schilke et al., 2018). Although originally developed to overcome the limitations set by the static orientation of the RBV, the DCV is now widely regarded as an extension of the RBV (Barreto, 2010; Schilke et al., 2018). While the RBV supports that firms may achieve a competitive advantage based on their bundles of resources and capabilities, the DCV argues that firms have to evolve their resource and capability base in order to ensure a sustained competitive advantage (Peteraf et al., 2013). One of the core premises of the DCV is that DCs govern the change of other organizational capabilities (Teece, 2014). To understand this idea, it is important to note that organizational capabilities can be broadly divided into two types: (1) ordinary (or operational)

capabilities, which allow firms to survive in the present by supporting existing products or services to be made, sold, and serviced to existing customer segments, and (2), DCs which are directed towards strategic change of ordinary capabilities and resources (Helfat et al., 2009). In essence, the DCV attempts to explain how firms can effect change on their existing mode of doing business, by modifying their resources, in order to ensure long-term growth and survival (Teece, 2014).

In the last few years, there has been convergence in the management domain over the main activities that DCs encompass, which can be thought of as belonging into three clusters of capacities: (1) to identify and assess opportunities and threats (*sensing*), (2) to mobilize resources addressing opportunities or threats and capturing value from doing so (*seizing*), and (3) continued renewal (*transforming*) (Teece, 2007, 2012). Engaging in continuous or semi-continuous sensing, seizing, and transforming is essential if a firm wants to sustain itself as customers, competitors, and technologies change (Teece, 2007). Sensing, seizing, and transforming involve higher-level activities that enable a firm to change its resources in order to achieve organizational survival and growth (Protogerou, Caloghirou, & Lioukas, 2011). This organizational change prompted by DCs is what leads to organizational performance. The DCV, therefore, seeks to explain how resources get deployed and how profit streams are extended and renewed (Easterby-Smith, Lyles, & Peteraf, 2009). Doing so requires the aid of a good strategy, so that strategy, capabilities, and the business environment co-evolve (Wilden, Gudergan, Nielsen, & Lings, 2013). As such, capabilities, resources, and strategy jointly determine the competitiveness of a firm (Teece, 2018b).

3.1 The Construct Space of Dynamic Capabilities

Given that IS research has conceptualized DCs in many different ways, we analyzed such conceptualizations to gain a better understanding of the construct space of DCs in terms of: (1) conceptual base and underlying nature of DCs, (2) their coverage of the three capacities of DCs, (3) whether IT is embedded in the DC construct, and (4) operationalizations.

3.1.1 Conceptual Base and Underlying Nature of Dynamic Capabilities

Since the DCV originated in the strategic management field, it is not surprising that IS research draws upon this literature to conceptualize the DC construct. While almost half of the reviewed papers (65) rely upon one of the main definitions found in the strategic field (see Appendix C), a considerable amount of papers (44) draw upon and combine two or more of such definitions, either to introduce the DCV or to provide conceptualizations of the DC construct under investigation. The majority of papers that combine definitions, do so based mainly upon the definitions by Teece et al. (1997) and Eisenhardt and Martin (2000) (e.g., Agarwal & Selen, 2009; Li & Huang, 2013), while others combine even more definitions (Singh, Mathiassen, Stachura, & Astapova, 2011). However, it is important to note that some of those definitions highlight the underlying nature of DCs as an ability (e.g., Helfat et al., 2009; Teece et al., 1997; Zahra et al., 2006), while others denote DCs as processes that can be more or less repeatable, identifiable, and routine or stable (e.g., Eisenhardt & Martin, 2000; Zollo & Winter, 2002). In this regard, IS research appears to favor the 'ability' over the 'process' perspective, and thus conceptualizes DCs as encompassing abilities (see Table 2). For some papers, however, it is not clear whether they see the nature of DCs as encompassing either an ability or a process, because there is no explicit mention when DCs are discussed and/or no conceptualization is given.

3.1.2 The Three Capacities of Dynamic Capabilities

Conceptualizations of DCs in IS vary greatly in the way they are labelled and approached. On the one hand the IS literature uses labels of "dynamic capabilities" to conceptualize generic forms of DCs based on the aforementioned definitions (e.g., Hsu & Sabherwal, 2012 investigate the impact of DCs following Eisenhardt & Martin's 2000 definition). On the other hand, IS research also conceptualizes specific forms of DCs, such as absorptive capacity (e.g., Iyengar, Sweeney, & Montealegre, 2015), agility (e.g., Trinh, Molla, & Peszynski, 2012), or ambidexterity (e.g., Li &

Huang, 2013), that can touch upon the realm of the three capacities (sensing, seizing, and transforming).

Looking at the evaluation of the specific capacities that conceptualizations of DCs encompass, either in generic or specific forms, it is worrisome to see that in a considerable number of papers no capacity is covered or the definition lacks clarity in this regard, despite the fact that sometimes the DCV is introduced with strategic management explanations of DCs that cover such capacities (see Appendix C). Thus, some papers do actually cover all three capacities, while others only focus on one or two. For example, in terms of the capacity to sense, papers highlight not only sensing (e.g., Pavlou & El Sawy, 2006) but also the capacity to monitor the environment (e.g., Sambamurthy, Bharadwaj, & Grover, 2003) and to recognize the value of external information (e.g., Montazemi, Pittaway, Qahri Saremi, & Wei, 2012). For seizing, papers focus, for example, on knowledge assimilation (e.g., Cooper & Molla, 2017), knowledge application (e.g., Iyengar et al., 2015), and resource allocation (e.g., Sambamurthy et al., 2003). Other related concepts such as responding and reacting quickly to the environment (e.g., Sher & Lee, 2004) in terms of suppliers (Liu, Ke, Wei, & Hua, 2013), competitors (e.g., Côrte-Real, Oliveira, & Ruivo, 2017), and customers (e.g., Roberts & Grover, 2012), appear to cover seizing but also aspects of transforming. With respect to this latter capacity, IS papers focus on notions of change such as re-structuring or transforming resources (e.g., Mikalef & Pateli, 2017; Wu, 2006) and knowledge transformation with IT (e.g., Cooper & Molla, 2017). In summary, although some IS research has touched upon the three capacities forming DCs, there is conceptual fuzziness regarding the DC construct and its capacities as it will be further explained in the critical analysis and future research section.

3.1.3 IT-Embeddedness in Dynamic Capabilities

We further classified DCs into IT-embedded DCs to refer to conceptualizations of DCs that embed the IT artifact within them, and non-IT embedded DCs to those not including IT. Thus, IT-

embedded DCs encompass generic (i.e., referring to dynamic capabilities; e.g., Hsu & Sabherwal, 2012) and specific forms (e.g., IS development agility; Lyytinen & Rose, 2006) that incrust IT within the DC construct by highlighting the capacities directly enabled by specific technical assets (e.g., IoT data, Côrte-Real, Ruivo, & Oliveira, 2020; enterprise systems, Trinh et al., 2012), data analytics (e.g., Tan, Guo, Cahalane, & Cheng, 2016), or IT in general (e.g., Mikalef & Pateli, 2017). In this regard, half of the papers cover one, two or three of the capacities while about half fail to cover any. For example, Mikalef and Pateli (2017, p. 3) cover all three capacities with their IT-enabled DCs construct as the "ability to mobilize and deploy IT-based resources in support and for the enhancement of business strategies and work processes" encompassing sensing, coordinating, learning, integrating, and reconfiguring. Likewise, Torres et al. (2018) focus on sensing (internally and externally), seizing (through shared understanding, planning and decision-making), and business process change enabled by business intelligence and analytics (BI&A). Other papers focus on one or two capacities with constructs encompassing enterprise systems-enabled sensing capability (e.g., Trinh et al., 2012), externally oriented IT-based capabilities (e.g., Wei & Wang, 2010), IS development agility (e.g., Lyytinen & Rose, 2006), and changes in product and service offering (e.g., Côrte-Real et al., 2017). It is important to note, however, that some papers conceptualize IT-related constructs as DCs but appear not to tap into the DC realm as it will be explained in the critical analysis and future research section.

3.1.4 Operationalizations of Dynamic Capabilities

Given that effective operationalizations of constructs are essential for empirical research (Straub, Boudreau, & Gefen, 2004), we also analyze the various ways in which DCs are operationalized. With respect to the three capacities that form the structure of the construct, the majority of papers, measuring non-IT or IT embedded DCs, do not provide enough information in order to evaluate whether the measures cover any of the three capacities that form the structure of the construct (see Table 2). Some operationalizations of DCs do cover one, two, or all three capacities. For

non-IT DCs, there are some exhaustive operationalizations of the construct (e.g., 2012) (see Appendix D, Table 8), while others partially cover the capacities: for example, Sher and Lee (2004) cover sensing and seizing, while Wu (2006) capture seizing and transforming. Likewise, operationalizations of IT-embedded DCs range from an exhaustive coverage of sensing, seizing, and transforming directly enabled by analytics (e.g., Torres et al., 2018), or measures covering the two capacities of seizing and transforming through IoT data (see Appendix D, Table 9).

Table 2
Conceptualizations of DCs with or without IT artifact

IT artifact within the DC concept	**Non-IT Embedded DCs**					**IT-Embedded DCs**				
Total[1]	81					50				
Nature	**Process**		**Ability**		**Not clear**	**Process**		**Ability**		**Not clear**
Total	17		41		23	16		19		15
Underlying Capacities	**Sensing**	**Seizing**	**Transforming**	**All three**	**None**	**Sensing**	**Seizing**	**Transforming**	**All three**	**None**
Total	32	28	27	19	44	19	17	20	16	27
Operationalization	**Sensing**	**Seizing**	**Transforming**	**All three**	**None**	**Sensing**	**Seizing**	**Transforming**	**All three**	**None**
Total	21	18	18	13	58	13	11	12	10	36

3.2 The Role of IT in Information Systems Research on Dynamic Capabilities

To more deeply elaborate on the relation of IT with the DC construct, we inductively analyzed the role played by IT by identifying the location of IT in the nomological net with respect to DCs in the reviewed papers. This resulted in four distinct roles that IT takes in DC-related research. Furthermore, we coded the reviewed papers by Orlikowski and Iacono's (2001) views of the IT artifact and crossed them with the roles played by IT. This provides additional insight on how we understand IT in IS DCs research.

First, the largest proportion (71) of papers focus on the role of *IT as an enabler* of DCs. Within this role, the IT artifact encompasses assets (e.g., IT infrastructure) or capabilities (e.g., IT-leveraging competence) (e.g., Zardini et al., 2016; Wamba et al., 2017) that support the

[1] There is also a small number of IS studies (5 papers) for which we provide no categorization, since it was not clear to estimate if IT is incorporated or not within their DC construct.

emergence of DCs. DCs can thereby be the final outcome or a mediator towards performance outcomes. Within this role, most papers conceptualize IT as a tool (*tool view*) that serves to achieve DCs (and often, related performance outcomes). Technology is thereby seen as a tool for substituting labor or improving productivity, information processing or social relations (Orlikowski & Iacono, 2001). While the tool view is the most popular when IT is an enabler, some papers defining IT as capabilities take an *ensemble view* of the artifact where the technical artifact is intertwined with other elements (e.g., people or skills) "to apply that technical artifact to some socio-economic activity" (Orlikowski & Iacono, 2001, p. 125). The dominance of the tool view when IT is an enabler of DCs appears to see IT as a relatively unproblematic resource – capabilities or assets – that serve to achieve something else (Orlikowski & Iacono, 2001). Surprisingly, the tool view is common among recent papers even though this appears to contradict the trend placing digital strategy as an integrated part of the firms' core beyond the traditional support functions associated to IT (Bharadwaj et al., 2013).

Second, the role of *IT as embedded* in DCs (40 papers) better reflects the trend to view digital strategy as part of businesses' core since authors fuse IT aspects with DCs as the focal construct of their investigations. IT is thereby embedded in DCs both when DCs take a general (e.g., dynamic organizational IT capability, Lim, Stratopoulos, & Wirjanto, 2011) or a specific form (e.g., technological-oriented absorptive capacity, Cooper & Molla, 2017; IT transformation program ambidexterity, Gregory, Keil, Muntermann, & Mähring, 2015). These IT-embedded DCs are conceptualized within the *tool view,* and also with the *ensemble view* to emphasize the interrelations between people and technology; in either case, IT-embedded DCs are theorized as being antecedents for organizational change or performance outcomes.

Third, in the role of *IT as a context* (9 papers), the DCV is used as the theoretical lens to explain the dynamic nature of IS settings. A majority of these papers therefore approach IT as the context (e.g., software industry) for their investigations but mostly without including IT as a variable. Overall, the papers in this group suggest that the DCV could be used as an alternative or

complementary theoretical approach – to the RBV or the Knowledge-based View (KBV) – to explain evolutionary requirements for firms (i.e., change) in IS-related environments. In general, when IT is the context, the IT artifact is conceptualized within the *nominal view*, with the main focus being on other elements while technology is mentioned but not part of the analysis (Orlikowski & Iacono, 2001).

Fourth, *IT as an outcome/mediator* of DCs (8 papers) refers to papers that place IT as a result of DCs. For simplicity, IT as outcome and IT as mediator of DCs have been aggregated into the same role (IT as an outcome of DCs), since in both instances, DCs are assumed to have a direct impact on IT-related outcomes (e.g., digital transformation, adoption of specific technologies). Hence, DCs are antecedents of IT, while IT-related factors are presented as the outcomes of DCs (e.g., adoption of marketplaces, Koch, 2010) or mediators between DCs and outcomes (e.g., digital platform capabilities, Karimi & Walter, 2015).

Finally, there are a few papers (8) that cannot be related with any specific role due to their special nature and treatment of the IT artifact. These papers, for example, suggest or apply configurational approaches arguing that IT can be in different areas depending on the configuration (e.g., El Sawy, Malhotra, YoungKi Park, & Pavlou, 2010), or they investigate the IT artifact in more than one role, where we refrained from putting them into several roles (e.g., Li, Su, Zhang, & Mao, 2017). In summary, our analysis of the IT artifact views for all the roles that IT takes clearly shows that IT is mainly viewed as a *tool*, with papers also taking the *ensemble* and *nominal* views. Interestingly, the *proxy* view – where authors only use a few key aspects of technology for measuring its entirety – and the *computational* view – where researchers focus on the development of computing artefacts – are mostly absent in IS research on DCs (Orlikowski & Iacono, 2001).

3.3 The Nomological Net of Dynamic Capabilities in Information Systems Research

Beyond conceptual and theoretical considerations, there has been a growing body of empirical research exploring the use of the DCV to explain IS-related phenomena. We abstracted the factors and explain them in the following section as the nomological associations that have been examined in IS literature based on the theoretical understanding of the DCV described above. We therefore develop an organizing framework for DCs in IS research that encompasses the enabling resources, organizational change outcomes, organizational performance outcomes, the effects of the external environment, and the role of strategy. Enabling resources encompass the assets and capabilities that a firm owns, has under its control, or has developed (Piccoli & Ives, 2005). In our synthesis, we summarize the findings of studies that examine the role that resources have in enabling DCs. In sequence, we make a distinction between first-order (i.e., organizational change) and second-order outcomes (i.e., organizational performance) of DCs. First-order outcomes concern the organizational change that DCs result in, which include new or modified ways of operating. Second-order outcomes, on the other hand, reflect organizational performance effects that are a result of the organizational change created by DCs. The role of the external environment is examined throughout the previously described nomological net. Finally, we discuss the role of strategy in conditioning the previously mentioned associations. The nomological net of DCs in IS research is visually summarized in Figure 2, where the roles of IT introduced above are overlaid.

3.3.1 Resources

Identifying the sources of where DCs come from, and the processes through which they emerge, has been one of the core focus areas of the IS literature. We follow the IS tradition that identifies resources as encompassing both assets and capabilities (Piccoli & Ives, 2005). Assets include *“anything tangible and intangible the firm can use in its processes for creating, producing and/or offering its products”* (Wade & Hulland, 2004, p. 109), whereas capabilities are *”a firm’s capacity*

to deploy [assets,]… in combination [with other] organizational processes, to effect a desired end" (Amit & Schoemaker, 1993, p. 35; cite adapted based on Wade & Hulland, 2004). Based on our clustering, we find that enabling resources of DCs can be subdivided into technological as well as organizational and managerial ones.

Technological Resources. Technological resources have received the most attention in this stream of research, yet there has been considerable variation in how they have been examined and captured within IS studies. Aligned with the tool view of technology taken by papers where IT is an enabler, IS research has examined the effect of key properties of tangible IT assets (i.e., hardware, software and networks) on DCs (Chakravarty, Grewal, & Sambamurthy, 2013; Schwarz, Kalika, Kefi, & Schwarz, 2010). Specifically, IT flexibility, a property of a firms IT infrastructure, has consistently been found to be an important aspect for the emergence of DCs (Liu et al., 2013; Mikalef, Pateli, & Wetering, 2020b). IT flexibility allows for scalability as demand grows and can facilitate operational adjustments by enabling rapid build, test, and deploy cycles based on changing demands (Cenamor, Parida, & Wincent, 2019).

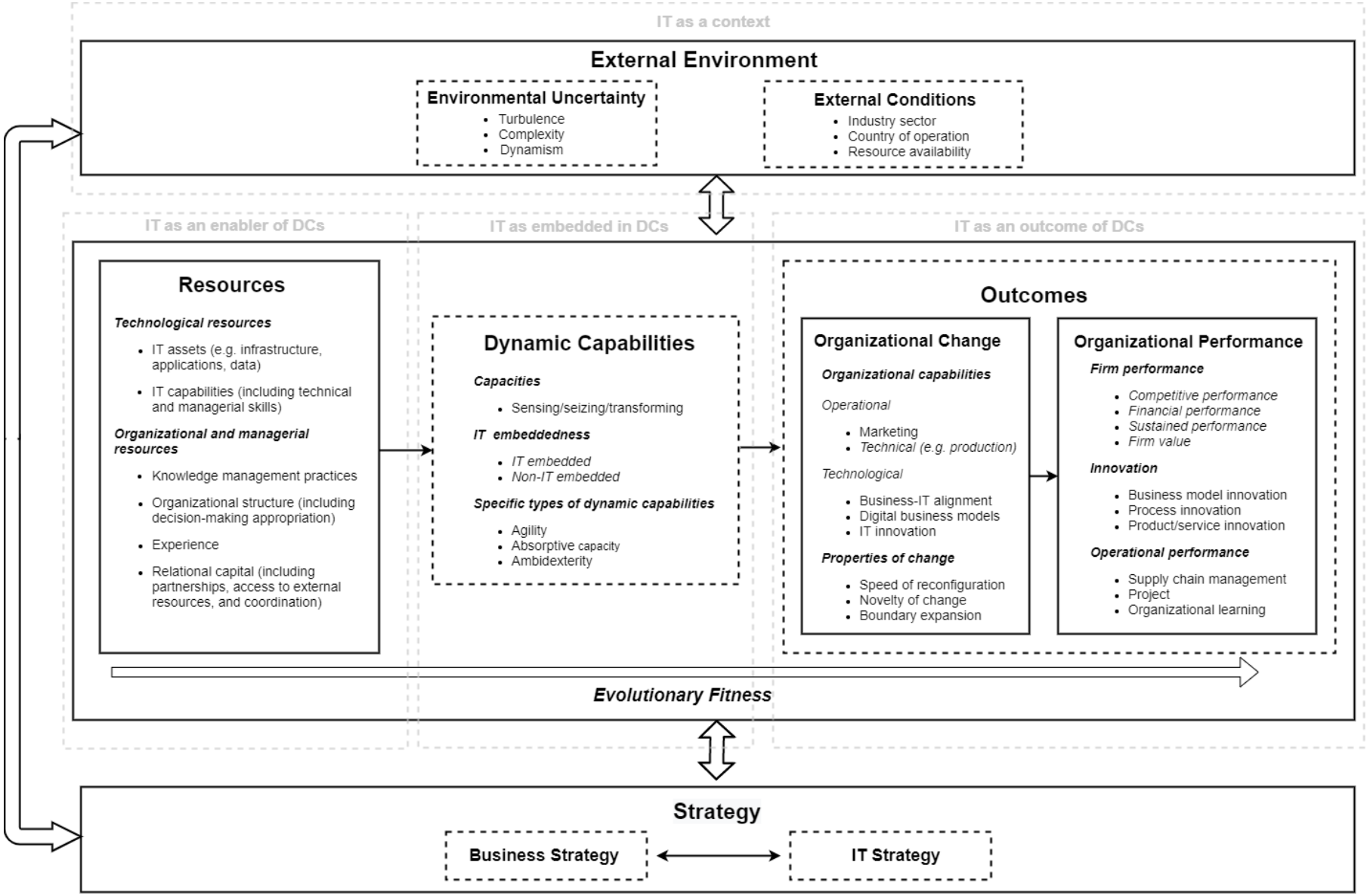

Figure 2 Nomological Net of Dynamic Capabilities in IS Research

Similarly, the degree of integration and standardization of the IT infrastructure has been noted as being important in facilitating fluidity and access to a common set of data and software applications (Braojos, Benitez, Llorens, & Ruiz, 2020; Roberts & Grover, 2012). For example, Zardinim, Rossignoli, and Ricciardi (2016) capture properties such as IT flexibility, standardization and reliability under the umbrella term IT infrastructure quality which jointly act as enablers of DCs. These core attributes allow organizations to quickly and seamlessly adapt the IT infrastructure upon which organizational processes are developed, thereby enabling the capacities of sensing, seizing and transforming (Benitez, Ray, & Henseler, 2018; Lee, Sambamurthy, Lim, & Wei, 2015).

The literature, however, also recognizes that while IT assets may have an important role in the emergence of DCs, so does the way they are orchestrated and leveraged. Specifically, there is considerable evidence that a firm's IT capabilities play an instrumental role in the development of DCs (Chakravarty et al., 2013). An IT capability has been broadly defined as the *"ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities"* (Bharadwaj, 2000, p. 171), which again aligns with the tool view (Orlikowski & Iacono, 2001). This stream of research builds on the idea that while the IT infrastructure is a necessary component, it is not a sufficient condition to enhance the underlying capacities that comprise a firms DCs. The key point of these studies is that investing in IT assets alone does not lead to any significant improvements, rather, it is the skillful orchestrating of complementary resources that synergistically strengthen a given firm's DCs (Kim, Shin, Kim, & Lee, 2011). These IT assets can be tangible (e.g., data, IT infrastructure), human skills (e.g., technical or managerial skills and knowledge), or intangible (e.g., business-IT partnerships) (Mikalef, Krogstie, Pappas, & Pavlou, 2020a; Schwarz et al., 2010). Benitez-Amado and Walczuch (2012) empirically show that IT capabilities lead to the emergence of key underlying capacities of DCs such as sensing and seizing market opportunities, which enable firms to pursue strategic objectives. The main

argument in this and other studies is that by developing an IT capability, firms can leverage the affordances of novel IT solutions in combination with other key assets towards important organizational activities (Neirotti & Raguseo, 2017; Pavlou & El Sawy, 2006).

At a more granular level, several studies have examined how leveraging specific types of IT applications can enable important underlying capacities of DCs. For instance, Dong and Wu (2015) as well as Orlandi, Zardini, and Rossignoli (2020) describe the strategic leveraging of social media platforms for customer sensing, while Erevelles et al. (2016) and Mikalef et al. (2020a) highlight the role of big data analytics for gaining deeper insights. Leveraging these types of IT applications can enhance the identification of emerging opportunities and threats, since these processes can be performed much faster with IT, and with a greater depth and breadth of information processing (Ghasemaghaei, Hassanein, & Turel, 2017; Roberts, Campbell, & Vijayasarathy, 2016). Inter-organizational interlinked processes enabled through IT applications can also allow supply chain partners to obtain much more detailed and real-time information, allowing them to acquire, assimilate, transform and exploit market knowledge and information, thus repositioning themselves rapidly (Iyengar et al., 2015; Liu et al., 2013; Newell & Edelman, 2008). These findings show that leveraging IT can facilitate an expanded knowledge reach and assimilation of important resources to seize opportunities. Finally, we know that developing digitized processes in inter- and intra-organizational work activities can significantly reduce the required time, cost and efforts in reconfiguring the organizational capabilities they support (Chakravarty et al., 2013; Sambamurthy et al., 2003).

Nevertheless, the link between IT capabilities and DCs has been argued to be more intricate, since their relationship is highly contingent upon the context of examination (Chen, Wang, Nevo, Benitez, & Kou, 2017). For instance, Cui and Pan (2015) argue that the predominant competitive environment gives rise to specific types of IT capabilities that are developed through resource-focused actions. In practical terms, this means that it is likely that there is heterogeneity in IT

capability configurations that lead to DCs (Lim et al., 2011). Additionally, there is substantial empirical evidence pointing to the fact that the value of IT capabilities – and the underlying IT resource configurations used to develop these – depends partially on the context in which they are deployed. Studies have shown that IT capabilities are of higher value under conditions of high informational complexity (Mikalef et al., 2020b), and in fast paced environments (Lee et al., 2015; Pavlou & El Sawy, 2006). Under such circumstances, IT capabilities allow firms to analyze and make sense of the fast-paced environment with more accuracy and speed so capitalizing on emerging opportunities is possible.

Organizational and Managerial Resources. Organizational and managerial resources are concerned with organizational processes and decision-making influence DCs. The motivation of incorporating such aspects lies on their theorized and important synergies in shaping DCs (Hock-Doepgen, Clauss, Kraus, & Cheng, 2020). One of the most researched themes in this direction concerns knowledge management practices. Baptista et al. (2010) show that establishing experience accumulation and knowledge articulation strategies facilitate project learning and DCs. This is because the activities that underpin DCs are knowledge-based, so developing practices of capturing, storing, and transferring knowledge contribute to developing organizational experience (Cooper & Molla, 2017; Côrte-Real et al., 2017). Effectively, IT can complement such organizational approaches by serving as the vehicle on which such practices can be enacted (Iyengar et al., 2015).

Codifying knowledge however, only contributes to a certain extent towards the degree of organizational learning that firms can expect. For example, Newell and Edelman (2008) find that although experience accumulation and sharing from experienced individuals plays an important role in developing organizational learning, such sharing has limits which are imposed by the presence or absence of those individuals. This finding shows that the use of IT can facilitate the codification and sharing of some types of knowledge but cannot completely capture the

experience of key individuals. Consistent with this, Agarwal and Selen (2009) found that that DCs in service value networks are developed as a result of collaboration and education between stakeholders. Within these activities IT can facilitate reduction of information asymmetry among collaborators and provide a communication platform that promotes knowledge exchange and experience accumulation.

With regards to organizational structures that promote the development of DCs, several studies have shown that decentralized decision-making and local autonomy can enable firms to sense and seize emerging opportunities and threats more rapidly and transform operations based on evolving conditions (Busquets, 2015; Gregory et al., 2015). In this regard, IT and its management have been shown to better enable DCs in modular and decentralized arrangements since they allow for better attunement to the different line functions' requirements and greater agility in developing IT-based solutions in response to these (Mikalef et al., 2020b). Such configurations however, appear to be only valuable to the extent that the underlying IT infrastructure is flexible (Kim et al., 2011).

In addition to internal organization knowledge and structures, research has also looked at the social and relational capital of organizations. Studies find that external linkages are vital for firms to create DCs particularly because of the complementary knowledge and assets residing in partners, customers and other stakeholders (Sher & Lee, 2004). For instance, Cooper and Molla (2017) note that the scope of external connections and the know-how and skills accumulated by the IS department promote flows of information and knowledge that are crucial to operations of contemporary firms. Hence, external linkages can be thought of as mechanisms of expanding boundaries of rationality and facilitating evolutionary fitness (Helfat & Winter, 2011). Important information flow enablers include relationship time (Malhotra, Gosain, & El Sawy, 2007), access channels to external knowledge (Mitchell, 2006; Neirotti & Raguseo, 2017), coordination

competencies (Roberts & Grover, 2012), as well as collaborative agility and customer engagement (Agarwal & Selen, 2009).

3.3.2 Outcomes

Outcomes of DCs can be disaggregated into two types according to both the DCV and the IT value literature (Tallon, Queiroz, Coltman, & Sharma, 2019). First-order outcomes concern the observed organizational change in terms of new resources, processes or ways of doing business. Second-order outcomes, on the other hand, have to do with organizational performance effects of DCs or impacts that are a result from the organizational change induced by DCs.

Organizational Change (first-order outcomes). Although direct associations with performance outcomes have been the predominant means of examining effects of DCs (Kim et al., 2011; Wamba et al., 2017), recent empirical IS research argues that effects of DCs are indirect and mediated through a series of organizational changes (Mikalef et al., 2020a; Wang, Dou, Zhu, & Zhou, 2015). These organizational changes are typically alterations in the firms' resource base which in turn explain variations in performance (Chen, Preston, & Swink, 2015). From these studies we know that DCs have a positive effect on firms' operational (or ordinary) capabilities, thereby changing the way certain core activities within the organization are performed (Mikalef et al., 2020a; Pavlou & El Sawy, 2006). Specifically, DCs can change the way firms perform marketing (Erevelles et al., 2016), as well as how they develop and deliver products and services (Mikalef et al., 2020a; Pavlou & El Sawy, 2006). Another stream of research examines facets of change such as speed in reconfiguration (Côrte-Real et al., 2017), novelty of resource changes (Dong & Wu, 2015), and the ability to balance exploitation with exploration (Lee et al., 2015; Leidner, Lo, & Preston, 2011). These studies do not only indicate what types of capabilities are affected by DCs but also explain the ways in which operational capabilities are enhanced. Findings highlight that DCs can expand organizational boundaries by incorporating novel key

resources (Li & Huang, 2013), and can accelerate the speed at which organizations react (Queiroz, Tallon, Sharma, & Coltman, 2018; Wei & Wang, 2010).

A significant body of research has also investigated the ways in which DCs change IT-related resources and lead to specific IT-related outcomes (corresponding to the IT as an outcome role). DCs can lead to enhanced IT capabilities (Karimi & Walter, 2015) and enable organizations to successfully move to digital business models (Bharadwaj, Keil, & Mähring, 2009; Koch, 2010). In other words, DCs can enable new IT resource configurations which allow firms to pursue a broadened set of strategic objectives. Karimi and Walter (2015) show that DCs produce effects by attuning IT investments and deployments with strategy and the external environment, hence, enabling a better fit with strategic priorities (Street, Gallupe, & Baker, 2017). These effects include not only adaptations at the IT infrastructure level, but also the attraction and maintenance of appropriate human IS skills as well as the effective synchronization of priorities between the business and IS (Bhatt & Grover, 2005). The key take from this body of knowledge is that DCs can promote a better fit between IT resources and external conditions.

Organizational Performance (second-order outcomes). Empirical work within the IS domain has employed the DCV primarily to explain organizational performance outcomes as a result of IT deployment and use (Vial, 2019). These organizational performance measures act as yardsticks of how well the changes induced by DCs fit the environment to which they are deployed. Specifically, IS studies have shown that DCs have an overall positive effect on key organizational outcomes including firm performance (Chakravarty et al., 2013; Cooper & Molla, 2017), relative and competitive performance (Pavlou & El Sawy, 2006; Zardini et al., 2016), financial performance (Neirotti & Raguseo, 2017; Teo, Nishant, & Koh, 2016), business model innovation (Hackbarth & Kettinger, 2004; Kranz, Hanelt, & Kolbe, 2016), and firm value (Dong & Wu, 2015). A few studies have also looked at the extent to which DCs can deliver sustained value,

examining outcomes such as sustained competitive advantage and long-term performance gains (Erevelles et al., 2016; Hallin, Andersen, & Tveterås, 2017).

Some studies have shifted the focus from broad organizational-level outcomes to domain- or function-specific outcomes arising from DCs. This research has found positive effects of DCs on core operations like supply chain management performance (Banker, Bardhan, Hsihui Chang, & Shu Lin, 2006; Chen et al., 2015) and product and service innovation (Limaj, Bernroider, & Choudrie, 2016; Yu, Dong, Shen, Khalifa, & Hao, 2013). A sub-set of this stream of research has also documented positive effects of DCs at lower levels, such as project efficiency (Li & Huang, 2013), cross-project learning (Newell & Edelman, 2008), project portfolio management (Daniel, Ward, & Franken, 2014), and project performance (Li & Huang, 2013). Other studies have examined outcome effects at the individual level. For instance, Wu and Hu (2012) investigate employee expertise enhancement in the hospital sector. These findings show that effects of DCs can be identified at disparate levels throughout and beyond the organization.

3.3.3 *External Environment*

The external environment is a key element of the DC view and IS research has examined its role as an antecedent of DCs and as a moderator of the relations in which DCs participate.

The External Environment as an Antecedent of Dynamic Capabilities. A considerable body of IS research has focused on the role that the external environment has on influencing the development of DCs. Specifically, several studies showcase that competitive pressures and turbulent environments act as strong influencers for the development of DCs (Chen et al., 2015; Wolf, Beck, & Pahlke, 2012). The argument is that turbulence in the environment and competitive market conditions drive firms to develop DCs for survival (Lavie, 2006; Pavlou & El Sawy, 2010), so firms unable to develop DCs eventually lose their competitive position and become obsolete. As such, the environment acts as a motivator for DC development.

The External Environment as a Moderator. Research in the IS domain has examined the role of the external environment as a moderator of the relations between resources and DCs as well as those between DCs and outcomes. When it comes to resources, the external environment appears to amplify the effect that IT has on DCs. Specifically, Mikalef et al. (2020b) find that flexible IT infrastructures coupled with decentralized IT decision-making schemes are of increased importance towards DCs in highly heterogeneous environments. This is explained by the fact that these combinations of IT flexibility and IT governance decentralization allow for localized adaptations and a better response to the informational complexity of the environment.

When examining the moderating impact of the external environment on the effects of DCs, IS research has examined attributes such as uncertainty, turbulence, and fast-paced change (Chakravarty et al., 2013; Chen et al., 2015). These studies support the idea that DCs' effects on performance outcomes are strengthened in uncertain conditions (Drnevich and Kriauciunas, (2011). Similar findings are noted in several other studies which examine different facets of the environment such as turbulence (Pavlou & El Sawy, 2006), market uncertainty (Leidner et al., 2011), and complexity (Neirotti & Raguseo, 2017).

Adopting a different approach, several studies examine whether effects of DCs are more pronounced in specific domains or industries (Banker et al., 2006), or conduct their investigations in specific countries (Cui & Pan, 2015; Lee et al., 2015) or contents (Kranz et al., 2016). The common underlying rationale is that in rapidly changing and unpredictable environmental conditions, DCs have an enhanced effect on performance and therefore are more relevant.

3.3.4 Strategy

IS-related DC research has also considered the role of business strategy and IT strategy. This body of work investigates IT strategy either as an antecedent of DCs or as their outcome.

IT Strategy as an Antecedent of DCs. Under the premise that IT strategy is the focal point of actions taken towards achieving organizational performance (Leidner et al., 2011), this view argues that the choice of an IT strategy has an important role in shaping organizational change. Thus, this research has found that firms which select an innovative IT strategy will be more likely to develop unique capabilities over time through experience or tinkering with multifarious technologies, which in turn will enable organization to develop DCs (Leidner et al., 2011). Additionally, longitudinal studies show that capability development in support to an IT strategy is a gradual process that is cumulative, expansive, and very dependent on the way difficult-to-imitate resources and actions are combined (Montealegre, 2002).

IT Strategy as an Outcome of Dynamic Capabilities. Within the second view, several studies argue that DCs enable firms to achieve IT and business strategy alignment (Baker, Jones, Qing Cao, & Jaeki Song, 2011). These studies conceive IT strategy as subordinate to business strategy, so the role of DCs lies in facilitating internal alignment of IT resources to business strategy. Thus, DCs facilitate firms' adjustments of their IT strategy and resources so that it supports the overall strategic objective of maintaining and sustaining competitive advantage (Schwarz et al., 2010).

4. CRITICAL ANALYSIS OF CURRENT KNOWLEDGE AND FUTURE RESEARCH AGENDA

In contrast to the previous section's synthesis of 'what' is known of IS research in DCs, this section centers on questioning and problematizing 'how' we think and investigate about it (Alvesson & Sandberg, 2011, 2020). More specifically, we take a critical stance by uncovering methodological, logical or conceptual issues (Schryen, 2013; Schryen et al., 2020) and re-evaluating the existing understanding of IS research on DCs to challenge current ways of thinking and explore limitations of the DCV (Alvesson & Sandberg, 2011, 2020; Collis & Anand, 2021). We summarize the issues uncovered through such dialectical interrogation into three main themes in Table 3. For the first theme, we propose a solution in the form of a minimum DC construct definition that addresses the uncovered issues with conceptualizations of DCs and of IT. Additionally, for all three themes and in contrast to merely pointing gaps on the reviewed literature, we use disruptive modes and secondarily track-bound modes to formulate novel research questions derived from the uncovered issues; we then frame them in terms of their practical relevance and knowledge gaining potential (Alvesson & Sandberg, 2011, 2020) providing specific and actionable research paths (Rowe, 2014; Schryen et al., 2020).

Table 3
Issues, Proposed Solution, and Recommendations for Future IS research on Dynamic Capabilities

Research Theme	Issues	*Challenge*	*Proposed Solution*
Conceptualizations of DCs and of IT	1. Ambiguity and fuzziness of the DC construct 2. Misconceptualizations of IT as DCs 3. Neglected disaggregation of DCs 4. Narrow views of IT in relation to DCs	*Challenge.* How can we yield a comprehensive, consistent and pragmatic understanding of the multifaceted construct of DCs in IS research?	• ***Minimum DC construct definition*** in the form of a family resemblance construct with logical, structural, and IT-embeddedness rules, and separation of cause and effect of DCs to avoid tautologies; and that can accommodate theoretical and practical progress with extensions to the attribute structure • Alignment of conceptualization of DC constructs with their operationalizations and measurements • Use of accepted best practices from conceptualization to measurement
		Research Questions	***Research Paths***
		RQ1. How can we incorporate complementary views of IT (e.g., computational view for data analytics and/or broader conceptualizations of the ensemble view) in relation to capacities of DCs?	• Conceptualizations of data analytics within the computational view in relation to DCs hold promise in advancing theory and practice in meaningful ways • Design science could be used to develop practical algorithm-based solutions (computational view) and evaluating them in relation with DCs in context • An ensemble view of IT can help understand the development and emergence of IT-embedded DCs • Conceptualizations of IT-embedded DCs within the ensemble view can help understanding the emergence of IT-embedded DCs as they are dynamically formed and evolve over time • Examination of how successful IT-embedded DCs lead to mimetic isomorphism in specific industries
Impacts of IT and of DCs	5. Exclusive positive-laden view of the impacts of IT and of DCs 6. IT has mainly efficient, unifinal, and symmetrical effects 7. Lack of attention to the possibility of endogeneity in relating IT to DCs 8. Lack of consideration of the relevance of DCs in stable environments	RQ2. How can specific and distinct IT resources relate differently to each of the underlying capacities of DCs?	• Exploration of affordances enabled by different technologies concerning the different activities that relate to underlying capacities of DCs • Case studies in firms to understand how similar technologies are leveraged towards idiosyncratic capacities of DCs
		RQ3. How can IT resources be orchestrated and leveraged to effectively enable DCs?	• Identification of resource orchestration resources including how firms acquire, bundle, and leverage IT resources to develop DCs • Exploration of contingency elements that lead to successful IT resource leveraging towards the emergence of DCs • Use of sociomateriality perspective to understand how IT resources are entangled and embedded in work routines that lead to the emergence of DCs • Ethnographic studies to trace the development of DCs based on the evolution of IT resources • Examination of practices of leveraging IT resources towards DC development through control theory
		RQ4. What are the negative or unintended consequences of IT on in relation to DCs and their outcomes?	• Adoption of dark side perspectives to examine unanticipated consequences of IT use towards enabling DCs and in relation to their outcomes. • Incorporating organizational theories that adopt a dark side view at the individual, group, firm, and industry and societal levels • Use of objective vs perceptual measures to determine if perceptions reflect reality

		RQ5. Through which distinct sets of configurations of IT and complementary resources can specific capacities of DCs and their outcomes be realized?	• Application of configuration theory allowing equifinality and causal asymmetry • Examination of outliers or cases of negative outcomes and their causes • Exploration of evolutions of patterns through panel configuration analyses to understand how IT deployments change over time towards their outcome • A shift of thinking from linearity to non-linearity, from unifinality to equifinality, and from causal symmetry to causal asymmetry for IS research in DCs • fsQCA methods are especially suited for uncovering complex patterns of equally performing combinations of IT and complementary resources in relation to DCs
		RQ6. How do DCs influence a firm's IT resource portfolio?	• Exploration of endogeneity biases in studies through methodological approaches (e.g., use of Instrumental Variable (IV) estimation, Control Function, Gaussian Copula Approach) • Theorizing and empirically examining reverse causality • Using case study methods along with the tracing technique of fsQCA methods (identification and conceptualization of sequences of events in time)
		RQ7. How do IT and DCs co-evolve and/or diverge in relation with different periods of stability and dynamicity in the environment?	• Identification of effects of IT deployments on DCs in different environmental conditions (e.g., political, economic, competitive, informational) • Future work needs to understand what the role of IT in relation to DCs is and how mechanisms of action change based on conditions of the environment • Identification of cost/benefit analysis of developing IT-based DCs in stable environments • Examining the dynamics between the environmental context and the use of IT and development of DCs (e.g., resource dependency theory) • Identification on how external limitations are overcome in resource IT development and accumulation • Comparative case studies in firms based on resource scarcity in their environments
Stagnant view of DCs	9. Firms are the main focal units 10. Static view of DCs	RQ8. How does IT relate to specific capacities of DCs occurring at lower levels?	• Examination of role of IT in expanding bounded rationality of key decision-makers • Design of IT should incorporate both affective and cognitive features in relation to DCs • Examination of micro-level phenomena of how IT and DCs are inter-related and how the manifest in the macro-level • Identification on the role of IT in affecting informational asymmetries and coordination mechanisms
		RQ9. How are DC capacities synchronized in relation to each other and in relation with cycles in the external environment, and how do they evolve over time?	• Incorporation of temporal perspective in the study of DCs in IS research • Examining the role of IT for intra-entrainment and extra-entrainment of DCs • Investigate how internally misaligned rhythms may cause temporally uncoordinated actions • Understanding of different stages of DCs lifecycle through longitudinal studies and adopting process theory approaches • Incorporation of management theories that discern different levels of capabilities and particularly higher-order capabilities. • Future work needs to examine the role IT plays in relation to speed and synchronization of DCs
		RQ10. What is the evolutionary relationship between IT, DCs and performance outcomes?	• Need to understand how digital eco-dynamic evolve over time and result in outcomes

			• Trigger and response events are likely to have time-lags between them so the value and impact of IT in this relationship needs to take into account lag-effects • Need to explore the difference between having DCs and utilizing them when the situation or need arises
		RQ11. How can IT and DCs produce transformations (e.g., industry disruptions) that span organizational boundaries?	• Identification of how IT has been used to enable DCs or as an outcome of those to cope with massive disruptions and to create digital resilience • Novel technologies such as AI may be critical in “black swan” events, so it is important to understand what types of capabilities are developed based on such technologies • Examination of DCs in a broader industry perspective and identification of disruptions they introduce

4.1 Theme 1: Conceptualizations of Dynamic Capabilities and IT

4.1.1. Uncovered Issues and Assumptions regarding Conceptualizations of Dynamic Capabilities and IT

While the multifaceted reality of the IS literature on DCs revealed in the previous section points to efforts in cumulating knowledge, what makes it extremely challenging to capture DCs in IS comprehensively is the ***ambiguity and fuzziness of the conceptualizations of the DC construct (#1),*** both when IT is embedded within the concept or not. This conceptual issue is reflected in several ways. First, the DCs concept is often not defined or conceptualized even when the majority of papers start by citing or mentioning others' definitions of DCs (e.g., Luftman, Lyytinen, & Zvi, 2017; Sambamurthy et al., 2003). In this case as well as sometimes when definitions of DCs are given, conceptualizations of DCs with conflicting underlying theoretical assumptions are jointly employed (e.g., Li & Huang, 2013; Wu, 2010). For example, the two definitions more often used jointly, Teece et al.'s (1997) and Eisenhardt and Martin's (2000), differ substantially in terms of the relevant environment to which they apply (i.e., dynamic vs. stable as well), their heterogeneity among firms (unique to a given firm vs. commonalities across firms), and the locus of their direct effects (i.e., firm's performance vs. resource change). Second, it is also common that DCs conceptualizations fail to specify and capture any capacity reflecting sensing, seizing, and transforming, despite introducing the DCV by emphasizing one, two, or the three capacities as essential for the DCs construct (e.g., Foltean, Trif, & Tuleu, 2019; Tan et al., 2016). In fact, papers often introduce the DCV by emphasizing one, two, or the three capacities as essential for the DCs construct when introducing the theory, but fail to actually reflect such capacities in their definition of the DCs under investigation. Thus, sometimes the transforming capacity of DCs is highlighted when introducing the theory, but the specific DCs under study ignore it, for example, because it is focused on unrelated capabilities such as the ability to organize, standardize, and manipulate data (e.g., Tan et al., 2016), or as use of social media and

CRM to establish and manage relations with customers (e.g., Foltean et al., 2019). Finally, some conceptualizations fall in a tautology trap by including outcomes, like DCs defined and measured in terms of, for example, decision quality enhancement and vendors' trust improvement (e.g., Sher & Lee, 2004). This is worrisome because when the conceptualization of the construct (i.e., capability) includes the proposition (i.e., DCs enhance decision quality), the proposition is true by definition and thus, immune to any falsifiability, refutability, or testability attempts (Popper, 1963).

Related to the issue of conceptual fuzziness around DCs, it is not surprising that the IS literature on DCs also reflects ***misconceptualizations of IT as DCs (#2)*** stemming from two types of inconsistencies. First, just like before there are inconsistencies between the IT aspect claimed to be embedded in the DC concept and the DC concept itself, such as when the transforming capacity of DCs is highlighted while introducing the concept but the IT embedded DC under study is defined as the implementation extent of just in time manufacturing capabilities and customer supplier participation (e.g., Banker et al., 2006). Second, there are inconsistencies between the conceptualizations of IT embedded DCs and their operationalizations. For instance, when the IT embedded DC is defined as the ability to integrate and reconfigure IT with organizational resources but measured as whether being recognized by the InformationWeek (IW) 500 annual listing which attempts to identify the most innovative users of IT in the U.S. (e.g., Lim et al., 2011).

Another issue underlying the conceptualization of DCs is the ***neglected disaggregation of DCs in IS research (#3)***. Treating DCs exclusively as an aggregate reduces the potential for gaining specificity about the IT artifact in relation to each of DCs' concrete capacities and about each DCs' capacity and the outcome, and thus, improving the practical relevancy of this literature and its contributions. In addition, this lack of disaggregation implicitly assumes that any IT resource acts uniformly: a) in facilitating each of the capacities covered by the non-IT embedded DC when IT is an enabler, and b) by implying that any of the capacities covered by the IT embedded in the DC construct influences the outcome similarly.

A final issue are the ***narrow views of IT conceptualizations in relation to DCs (#4)***. As it was previously explained, the IT artifact has been conceptualized mainly as a tool (i.e., IT as a means to another end), and as an ensemble (i.e., IT as including dynamic and complex interactions between people and technology during its development, deployment, or use) (Orlikowski & Iacono, 2001). However, the ensemble view has been applied quite narrowly in quantitative studies that include general or specific organizational capabilities along with the IT construct without even theorizing nor empirically testing the potential interactions between them (e.g., Shanks, Gloet, Asadi Someh, Frampton, & Tamm, 2018; Yasmin, Tatoglu, Kilic, Zaim, & Delen, 2020). Additionally, the computational view is absent from conceptualizations of IT embedded DCs and when IT is an enabler, which is surprising given the importance of big data analytics and related technologies (e.g., platforms, cloud services, apps, sensors) in today's businesses.

4.1.2. Solution for Conceptualizing DCs: Minimum DC Definition

The conceptualization issues around the focal DC construct point towards a major challenge:

> **Challenge:** *How can we yield a comprehensive, consistent, and pragmatic understanding of the multifaceted construct of DCs?*

Solution. To address this challenge, we need to conceptualize, disaggregate, and operationalize the multifaceted construct of DCs, which in our field has the additional hurdle of distinguishing between DCs that have IT embedded in them and those that do not. In doing so, and in line with problematization, we take a pragmatic stance: we see IS as an applied and practical discipline (Ågerfalk, 2010; Constantinides, Chiasson, & Introna, 2012). Consistently, we conceive constructs as cognitive symbols (or abstract terms) that specify the features, attributes, or characteristics of a phenomenon in the real world that they are meant to represent and distinguish them from other related phenomena (Goertz, 2012; Podsakoff, MacKenzie, & Podsakoff, 2016). In that sense, we understand DCs as encompassing (1) sensing or the capacity to scan the environment, to spot new developments, and to identify both opportunities and threats, (2) seizing

or the capacity to act upon newly sensed opportunities by making decisions, and (3) transforming or the capacity to change (i.e., acquire, recombine, eliminate) resources in relation to the pursued identified opportunities. The three attributes purposely exclude both causes and effects of DCs in order to avoid tautologies (issue #1) (Barreto, 2010; Burisch & Wohlgemuth, 2016; Laaksonen & Peltoniemi, 2018). However, from a pragmatic lens, we do not see DCs taking a necessary and sufficient construct structure in which sensing, seizing, and transforming are collectively necessary and sufficient, as the classical view of constructs assumes (Komatsu, 1992; Podsakoff et al., 2016). Instead, consistent with pragmatism's idea that the meaning of a construct is dependent on its practical consequences (Goldkuhl, 2004), we propose a ***minimum DC construct definition*** *or qualifier* as a family resemblance construct that uses a logical disjunction (OR) of the three attributes (or capacities) and follows the structural rule that an object qualifies for membership into the DC construct space if at least one of the three capacities is present (see Table 4) (Podsakoff et al., 2016). Such approach is conceptually and empirically better from a pragmatic viewpoint: there is research value even if one (or two) capacities are absent (Kehoe & Wright, 2013; Youndt, Snell, Dean Jr, & Lepak, 1996) as well as addresses the disaggregation issue (issue #3).

In addition, given misconceptualizations of IT as DCs (issue #2), our minimum DC definition also distinguishes between IT-embedded DCs and non-IT embedded DCs: cases qualify as IT-embedded DCs if the specified DC capacity (or capacities) are exercised directly through an explicit mobilization and/or deployment of IT resources, while cases exercising the specified DC capacity (or capacities) through other (non-IT) resources qualify as non-IT embedded DCs. For example, Mikalef and Pateli's (2017) conceptualization of IT-enabled capability includes sensing, seizing, and transforming exercised directly through the use of IT, thus, it qualifies as an IT-embedded DC, while also including other capacities (see Table 4). In contrast, Zhu and Kraemer's (2002) e-commerce capability focuses on website features not employed for sensing the

environment, seizing opportunities nor transforming resources, and thus, the construct falls outside the DC realm. In addition, non-IT embedded DCs can also be specified when IT is not the means through which any of the three capacities is directly exercised. For example, Montealegre et al. (2019) describe in detail sensing, seizing, and transforming for resolving tensions during the development and evolution of digital platforms thus fully tapping into the DC construct; however, because IT (i.e., digital platforms) is not the means through which the capacities are exercised but the object on which such capacities operate, their DC qualifies as non-IT embedded.

Our minimum DC definition has scientific and practical value. It should be used for conceptualizing DCs, including IT-embedded and non-IT embedded DCs, along with accepted best practices for the operationalization of constructs (MacKenzie, Podsakoff, & Podsakoff, 2011). Furthermore, our minimum DC definition can accommodate theoretical and practical progress since extensions in the attribute structure are possible (Podsakoff et al., 2016), so it can evolve as scientific progress materializes, management practices change, and technological innovation takes place.

Table 4
Minimum DC Construct Definition

Rules	**Realm of DCs**						**Other Realm**			
	IT-Embedded DCs			**Non-IT embedded DCs**						
Logical rule	*OR*									
Structural rule	*At least 1 of 3 capacities – sensing, seizing, and transforming – are present*									
IT embeddedness rule	*Specified capacity/ies is/are exercised directly by an explicit mobilization and/or deployment of IT resources*			*Specified capacity/ies is/are exercised through other (non-IT) resources*						
Examples of Application	***Capacities (Attribute Structure)***			***Capacities (Attribute Structure)***			***(Other) Attributes***			
Qualifying Cases	**IT-Sensing**	**IT-Seizing**	**IT-Transforming**	**Sensing**	**Seizing**	**Transforming**	Integrating	Coordinating	…	…
(Mikalef & Pateli, 2017)	X	X	X				X	X		
(Battleson, West, Kim, Ramesh, & Robinson, 2016)	X	X	X							
(Liu, Ke, Wei, & Hua, 2013)				X	X					
(Montealegre et al., 2019)				X	X	X				
Non-Qualifying Cases										
(Zhu & Kraemer, 2002)									X	

4.1.3. Research Agenda regarding Conceptualizations of Dynamic Capabilities and IT

Besides offering a solution for the lack of conceptual clarity of the DC construct, our critical examination of the literature also pointed to narrow views of the IT artifact in relation to DCs (issue # 4). As a result, we formulate the following research question:

> **Research Question 1:** *How can we incorporate complementary views of IT (e.g., computational view for data analytics and/or broader conceptualizations of the ensemble view) in relation to specific capacities of DCs?*

Several specific research paths could contribute to answer this question. One of those paths is through design science and its various genres (Baskerville, Kaul, & Storey, 2015; Peffers, Tuunanen, & Niehaves, 2018) to incorporate computational views of the IT artifact in relation to DCs and each specific underlying capacity (issue # 4), including the design and development of algorithmic-based applications. For example, design science has been employed for the development of algorithmic solutions to detect financial fraud and improve the decision-making that comes with it (Abbasi, Albrecht, Vance, & Hansen, 2012), which has clear links with the sensing and seizing capacities of DCs. Similarly, design science has developed artifacts based on supervised machine learning models, that change and transform complementary service offerings in the form of personalized recommendations when the customers' preferences change over time (Sahoo, Singh, & Mukhopadhyay, 2012).

Real world examples that show clear links between computational views of the IT artifact with the sensing, seizing, and transforming capacities of DCs also support the idea that design science could be a novel perspective from which to investigate the relation between specific IT and DC capacities. For example, ING developed an Early Warning System (EWS) that scans and analyzes real time financial and nonfinancial information to detect overly negative media coverage and the drop of their shares below a preset percentage (ING, 2018), while Allstate enhances transforming with a system that expands in real time its knowledge base regarding customer inquiries supporting representatives interacting with customers (Lee & Shin, 2020). In addition, given that evaluation is a fundamental part of design science efforts (Baskerville et al., 2015; Venable, Pries-Heje, & Baskerville, 2016), we

believe design science is in a unique position to not only develop, but also to assess how computational views of the IT artifact are exercised in context with respect to each and all the capacities of DCs.

In addition, researchers can adopt a materiality perspective to expand the ensemble view of IT in and understand how social organizing and technology coalesce (Faraj & Azad, 2012). Since ensemble conceptualizations of IT artifacts reflect what Sein et al. (2011) refer to as "technology as structure", whereby structures of the organizational domain are inscribed into the artifact during its development and use, socio-materiality can show how capacities and different use of systems do or do not emerge through a variety of organizational, cultural, and social factors (Gregor & Jones, 2007; Orlikowski & Scott, 2008). Future research could also employ the ensemble view to explore how successful IT-embedded DCs lead to mimetic isomorphism in specific industries (Gosain, 2004), which can uncover explanations for contextual deviations across industries (Glynn & Abzug, 2002).

4.2 Theme 2: Impacts of IT and Dynamic Capabilities

4.2.1. Uncovered Issues and Assumptions regarding Impacts of IT and Dynamic Capabilities

The critical analysis of the relations portrayed in the nomological net point to several issues regarding the relations and effects of IT and DCs. First, the literature portrays an ***exclusive positive-laden view of the impacts of IT and DCs (#5).*** In fact, IT, whether it is embedded in DCs, an enabler, or a mediator is exclusively portrayed as having positive effects on DCs and organizational outcomes. Additionally, just as IT embedded DCs are portrayed as positive, so are non-IT embedded DCs. The only and rare exception to this positive-laden view is the investigation by Lavie (2006) suggesting that technological change might inhibit capability reconfiguration by pointing to associated costs, different mechanisms of change, and the capability gap between starting and ending positions. As a result, it is unclear under which conditions IT might have negative effects or act as an inhibiter for DC development as well as the risks and costs associated with organizational change efforts of DCs – whether IT is embedded or not. All in all, IT is viewed as unproblematic, assuming that it always and unequivocally facilitates or directly enables sensing, evaluating, change, and performance.

A related issue is the implicit assumption that ***IT has mainly efficient, unifinal, and symmetrical effects on DCs (#6)***. By 'efficient' we mean IT being treated as necessary and usually sufficient factor for DCs, as it is mostly done within variance approaches (Ortiz de Guinea & Webster, 2017). Additionally, IT effects are also seen in the IS literature on DCs as 'unifinal': a single factor (i.e., IT) or a set of independent factors (i.e., IT and other resources) that lead to DCs, taking a traditional universalistic or 'best practices' approach assuming there is only one way (i.e., through the identified factors) to achieve DCs (Delery & Doty, 1996; Doty, Glick, & Huber, 1993). Finally, the literature also assumes causal 'symmetry' of IT effects on DCs: if IT relates positively to DCs, the absence of DCs (i.e., the inverse of high level of DCs) is due to low levels or absence of IT (Fiss, 2011). In other words, causal symmetry assumes that the causes leading to DCs, in this case IT, are also the ones leading to its absence (Fiss, 2011). This way of thinking and conducting IS research on DCs fails to capture complexity of IT and prevents alternative approaches for relating IT and DCs (Wilden, Devinney, & Dowling, 2016; Woodside, 2013).

An additional issue is the ***lack of attention to the possibility of endogeneity in relating IT to DCs* (#7)**. While endogeneity occurs when a predictor in a regression correlates with the error term of the model[2] (Ketokivi & McIntosh, 2017b; Sande & Ghosh, 2018), if framed broadly, endogeneity simply embodies the possibility of alternative explanations, which is essentially a theoretical issue. In this sense, IS research in DCs lacks attention to two alternative explanations for relating IT with DCs. First, for many firms there could be a feedback loop between DC realization and further IT use, development, or investment pointing to simultaneous (or reverse) causality (Markus & Rowe, 2020). Second, endogeneity issues can also arise from failing to theorize and analyze complementarities between IT and non-IT resources in relation to DCs. Thus, papers that include IT as the only resource enabling DCs (e.g., Lee et al., 2015; Neirotti & Raguseo, 2017) and those that do include both IT and non-IT antecedents of DCs but fail to theorize and test possible interactions among them (e.g.,

[2] Endogeneity usually occurs due to simultaneity (i.e., when the outcome variable is the predictor of the antecedent and not simply its outcome) or omitted variable bias (i.e., when the outcome variable is the predictor of the antecedent and not simply its outcome) (Ketokivi & McIntosh, 2017a; Sande & Ghosh, 2018).

Agarwal & Selen, 2009; Fink & Neumann, 2009; Wang, Hu, & Hu, 2013) point to potential endogeneity issues and contradict the central notion of orchestration of resources in the DCV. All in all, endogeneity results in biased estimates of the relations pertaining to IT and DCs and, more critically, in erroneous conclusions about theoretical propositions (Hamilton & Nickerson, 2003).

Finally, there is a ***lack of consideration of the relevance of DCs in stable environments (#8).*** Most of the empirical work in the IS domain has built on the assumption that DCs are of relevance and value only in dynamic and turbulent environments (Pavlou & El Sawy, 2006). Such assumption, stemming in part from the motivation of applying the DCV to address the limitation of RBV as static (Pan, Pan, & Lim, 2015), has been embedded in research designs either through concrete hypotheses arguing that effects of DCs will be more pronounced in highly uncertain conditions (Mikalef et al., 2020b; Pavlou & El Sawy, 2006), or by situating studies in contexts where the level of environmental uncertainty is presumed to be high (Cui & Pan, 2015). Nevertheless, some studies find contrasting outcomes. For instance, Chakravarty et al. (2013) who suggest that certain DCs are of lesser value in uncertain environments, adding to a long-dated discussion regarding their potential benefits under a diverse set of environmental conditions (Barreto, 2010). Thus, it appears that the DCV might be relevant in environmental with varying degrees of uncertainty since IT-based organizational outcomes resulting from DCs may differ in nature depending on external environment conditions. In summary, the limits and applicability of DCV in the IS domain remains unclear regarding the external conditions.

4.2.2. Research Agenda regarding Impacts of Dynamic Capabilities and of IT

The previous issues including the neglected disaggregation of DCs (issue #4) motivate the following research questions:

> **Research Question 2:** *How can specific and distinct IT resources relate differently to each of the underlying capacities of DCs?*

To explore this question, we have to distinguish different types of IT resources and their specific association with the enhancement of each underlying capacity of DCs. We see promise on differentiating IT resources based on the actions they afford and thus, the underlying capacities of

DCs that they enable. For example, affordance-based approaches (Strong et al., 2014) could help in studying how different IT resources might dissimilarly enable (or inhibit) each DC capacity through lower-level and higher-order IT affordances (Chatterjee, Moody, Lowry, Chakraborty, & Hardin, 2020). This perspective is also supported by Leidner et al. (2018) who argue for a separation between IT affordance, use, and outcome. Since IT affordances are actualized in use (Mesgari, Okoli, & Ortiz de Guinea, 2018), they can result in different types of uses (actualizations) and outcomes; thus, the same IT might be utilized to identify customer clusters and profiles in one organization and to detect suspicious transactions in another. In practice, such a shift in perspective regarding the role of IT resources and their effects on the underlying capacities of DCs would require more fine-grained information on the features of specific IT resources, their affordances, their actualization, and their specific outcomes.

> **Research Question 3:** *How can IT resources be orchestrated and leveraged to effectively enable DCs?*

The fact that IT resources are portrayed exclusively as having positive effects on DCs (issue #5) also reflects the assumption that IT resources are orchestrated and leveraged in an optimal manner in order to generate DCs without investigating such orchestration. Thus, future research could integrate theoretical perspectives that can explain how resources are mobilized into value-adding capabilities. For example, the resource orchestration perspective (Sirmon, Hitt, Ireland, & Gilbert, 2011) suggests that firms must follow a comprehensive process that comprises of *structuring* a firm's resource portfolio, *bundling* the resource to build capabilities, and *leveraging* those capabilities with the purpose of creating and maintaining value (Sirmon, Hitt, & Ireland, 2007). Within each of these processes, there are a number of alternative options that firms can select depending on their context of operation and, further extensions of the perspective the life cycle and breadth of resource orchestration (Sirmon et al., 2011). In terms of IT resources, such perspective can help in gaining granularity and a more process-oriented view on how such resources are mobilized, strategically accounted for, and eventually leveraged to enable DCs. From a methodological point of view, the resource orchestration perspective can enable researchers to explore how IT projects begin from ideation to implementation through longitudinal case study approaches, as well as understand the evolution from IT resources

to DCs. Specifically, certain types of IT resources, such as IT and digital infrastructures have been argued to take longer times to develop and implement, so the process through which they are gradually deployed could help develop knowledge on how they are leveraged to create DCs (Tilson, Lyytinen, & Sørensen, 2010). In addition, approaches such as the policy capturing method, that have not been widely used in the IS field, could help researchers identify optimal combinations of resource orchestration activities (Carnes, Chirico, Hitt, Huh, & Pisano, 2017).

A complementary approach to the above could be to adopt a sociomateriality perspective in the quest of understanding how IT resources are entangled and embedded in work routines that lead to the emergence of DCs (Orlikowski & Scott, 2008). Past research in the IS domain has built on key notions of sociomateriality, such as materiality, inseparability, relationality, performativity and practices, to understand how sociomaterial assemblages emerge in the organizational context (Cecez-Kecmanovic, Galliers, Henfridsson, Newell, & Vidgen, 2014), as well as how past, present and future are inseparable in a trichordal temporal assembly (Venters, Oborn, & Barrett, 2014). In this direction, ethnographic studies have been suggested as a suitable approach in gaining a deeper insight about the human, social, and organizational aspects of IS research (Myers, 1999). Another promising alternative in the quest of how IT resources lead to value by prompting DCs is the integration of control theory to examine IT project settings (Wiener, Mahring, Remus, & Saunders, 2016). Control theory can inform about the control portfolio configurations that lead to successful outcomes depending on the type of technology that is deployed and the outcome of interest. In addition, control enactment can improve our knowledge about the most effective approaches in implementing control modes and mechanisms (Huang Chua & Myers, 2018). Such studies could shed light on important practical aspects of how to plan and actualize deployments of IT resources towards the enablement of DCs while at the same time avoiding any unintended consequences or minimizing divergences from plan to implementation (Goldbach, Benlian, & Buxmann, 2018).

> **Research Question 4:** *What are the negative or unintended consequences of IT in relation to DCs and their outcomes?*

Although the dominant positive-laden perspective on the impacts of IT and DCs (issue #5) may uncover benefits of deploying IT for business value generation, it may also neglect important negative consequences. A growing stream of IS research emphasizes the dark side of IS-related phenomena with the aim of detecting unanticipated consequences of using IT to enhance or replace traditionally human-based activities (Tarafdar, Gupta, & Turel, 2013). For example, racial and gender-based bias, loss of privacy, unethical distribution of data, and centralization of power structures are just some examples of adverse effects of using IT (Obermeyer, Powers, Vogeli, & Mullainathan, 2019; Zuboff, 2015). Including a dark side perspective on the relationship between IT, DCs and their outcomes can help researchers detect disadvantageous consequences at different levels of the organization and develop appropriate strategies to resolve them. Organizational research provides an interesting armory of theoretical lenses through which such effects and consequences can be detected and examined (Linstead, Maréchal, & Griffin, 2014). These studies highlight occurrences of corporate social irresponsibility (Tench, Sun, & Jones, 2014) or even combine sociological and psychological approaches to highlight cases of organizational misbehavior (Karlsson, 2012). In such occurrences, IT can potentially serve as a platform upon which immoral and unethical behavior can be materialized and enacted without proper controls.

The previous point highlights the issue that in the pursuit of gaining a competitive advantage, firms may develop unethical approaches through the unique features of IT. In turn, this raises the question of how ethics are taken into consideration when developing DCs using IT. The IS literature has a long tradition of research concerning ethical issues of IT development and use (Mingers & Walsham, 2010; Stahl, 2012). This stream could be used in future studies to ensure that IT, DCs, and their outcomes follow the different dimensions of ethics that are relevant in the organizational sphere. For example, through stakeholder theory researchers could examine whether managers resolve ethical quandaries relating to IT and DCs by balancing stakeholder interests (Flak & Rose, 2005). Social contract theory, on the other hand, could be employed to examine whether the social responsibilities of the organization shape how IT is used towards enabling DCs, and how such uses are perceived by the general population (Smith & Hasnas, 1999). Another interesting line of inquiry could be to see whether

infusing IT in DCs leads to performance losses. It is likely that firms may be responding to signals generated through IT that are incomplete or highly biased, leading to suboptimal organizational decisions which in turn impair performance. It is, therefore, important that future studies incorporate performance measures that account for such negative effects, or use objective measures to assess the reliability of perceptual ones (Vidgen, Mortenson, & Powell, 2019).

> **Research question 5:** *Through which distinct sets of configurations of IT and non-IT resources can specific capacities of DCs and their outcomes be realized?*

This research question stems from the observation that IS research implicitly assumes that IT has mainly efficient, unifinal, and symmetrical effects on DCs (issue #6). Addressing this question requires a perspective shift acknowledging that there are different ways of effectively leveraging IT and complementary resources depending on multiple contingencies and history of organizations when developing DCs (Bechor, Neumann, Zviran, & Glezer, 2010; Sambamurthy & Zmud, 1999). First, researchers can go beyond the dichotomy of variance versus process theories by applying configurational theory. Configurational theory argues that the whole is better understood from a systemic perspective and should be viewed as a constellation of interconnected elements (Fiss, Marx, & Cambré, 2013). Unlike variance theories, configurational theory allows equifinality and causal asymmetry (Fiss, 2011; Ortiz de Guinea & Raymond, 2020). Equifinality allows for different ways of reaching the same outcome, in this case DCs (Wilden et al., 2016); in other words, there can be multiple and complex combinations of IT and other resources that are equally effective in producing DCs. In addition, causal 'asymmetry' shifts the focus towards nonlinear relations among the configurational elements, thus allowing equifinal configurations to vary across different levels of DC attainment (Fiss, 2011). In this sense**,** equifinality and causal asymmetry can also address the exclusive positive-laden view of IT impacts explained in issue #5.

As a result, it has been argued that configurational theory is more aligned with the complex reality of contemporary organizations (Woodside, 2013) and thus, better suited for research on DCs (Wilden et al., 2016; YoungKi Park, El Sawy, & Fiss, 2017).

Configurational analytical techniques such as fuzzy set qualitative comparative analysis (fsQCA) (Ragin, 2008) allow bringing such perspective shift to the empirical realm. By employing fsQCA researchers are able to identify and understand different sets of equifinal configurations of DCs, IT resources, and environmental conditions across performance levels (e.g., very high vs. high vs. low performance, Ortiz de Guinea & Raymond, 2020; YoungKi Park et al., 2017). Additionally, researchers can explore different configurations that go counter to theorizing whether they present negative or positive outcomes (Park, Fiss, & El Sawy, 2020). Configurational analytical techniques allow notions of fit as gestalts (McLaren, Head, Yuan, & Chan, 2011) and are also better aligned with organizational practices where orchestration and use of IT resources are subject to synergies, complementarities, and substitutions (Misangyi & Acharya, 2014).

Finally, the previously mentioned theoretical and methodological developments also allow for longitudinal analyses with which researchers can explore different patterns of configurations in panel data leading to disparate attainment levels of DCs and their outcomes over time (Beynon, Jones, & Pickernell, 2020), which also addresses concerns about the stagnant view of DCs in IS research discussed in issue #9. Efforts in this direction can also show how effective and ineffective IT (and non-IT) resource configurations for DCs shift as external conditions change over time, helping to address the lack of attention to the relevance of DCs in stable environments in IS research (issue #8).

Research Question 6: *How do DCs influence a firm's IT resource portfolio?*

While most research has examined the role of IT as an enabler of DCs, an interesting avenue for future research is to examine whether such effects are the result of potential endogeneity biases (issue #7). A prominent argument in IT-business value research is that IT effects may be subject to simultaneous or reverse causality. To account for such potential biases, researchers could employ a series of quantitative and non-quantitative approaches from the domains of econometrics, marketing, and IS (Hamilton & Nickerson, 2003). For instance, Hult et al. (2018) propose a systematic approach for studies that employ regression models and partial least squares structural equation modeling (PLS-SEM). For regression analyses the authors argue that research can use the instrumental

variable approach (IV) which can account for issues of reversed causality. Since deciding which instrument variables one can include in the relationship between IT resources and DCs might be quite difficult, Hult et al. (2018) suggest that the Gaussian copula approach could be a good alternative to control for endogeneity by directly modeling the correlation between the endogenous variable and the error term by means of a copula (Park & Gupta, 2012).

While such analyses may validate that IT and other complementary resources do indeed lead to the emergence of DCs, it may also be likely that reverse theorizing is present for a sub-set of organizations. Yet, such effects need to be theorized and empirically examined following robustness checks. Specifically, Markus and Rowe (2020) argue that the use of causal case study methods may be useful in addressing theoretical endogeneity in IT-business value research. They propose that researchers can use process tracing through qualitative comparative analyses (QCA), which consists in the identification and conceptualization of sequences of events in time. A benefit of such approaches is that they can sort out questions related to self-selection and reverse causality (Markus & Rowe, 2020). Such approaches may identify that IT resources come after DCs and are therefore an outcome rather than the cause (Cenfetelli & Bassellier, 2009). An alternative possible explanation is that IT resources and DCs co-evolve with the environment and are characterized by complex interdependencies which cannot be captured accurately by linear associations (Wilden et al., 2016). Such ideas of digital ecodynamics and non-linear effects have been argued for in the IS domain and may lead to a different perspective regarding the causal role of IT resources, DCs, and outcomes (El Sawy et al., 2010; Oh & Pinsonneault, 2007; Ortiz de Guinea & Raymond, 2020).

> **Research Question 7:** *How do IT and DCs co-evolve and/or diverge in relation with different periods of stability and dynamicity in the environment?*

To study this question, it is important to distinguish between different aspects of the external environment. While past research has predominantly examined the external environment through the level of uncertainty and competitive dynamism, recent scholarship opts for a more multifaceted view of conditions pertinent to the context in which firms operate (Donbesuur, Ampong, Owusu-Yirenkyi, & Chu, 2020; Prajogo, 2016). First, certain forms of leveraging strategies of IT resources may prove

to be more or less valuable depending on the set of circumstances under which they are used. For example, specific types of IT applications, such as big data analytics and AI, are of enhanced value under conditions of high informational complexity, but of limited value in information-poor contexts (Mikalef & Krogstie, 2020). Expanding on this idea, a promising research avenue would be to not only examine the technology in isolation but also to explore how it is leveraged in the unique context in which a firm operates. Doing so may reveal that certain IT deployments can enhance DCs and produce value even in relatively stable environments.

Second, the unique external environment in which firms operate may produce distinct patterns of co-evolution of IT and DCs. While there has been some empirical work examining the role of such conditions in IT use patterns in organizations (Montealegre, 1998) and individuals (Ortiz de Guinea & Webster, 2013), there is limited understanding of how they impact a firms DCs and in turn organizational performance. Specifically, there is a lack of exploration of the dynamic co-evolution of IT resources and DCs based on the constraints and coercive forces of the environment. In fact, the environment can operate in a threefold manner: as a prompt for change, as a context that sets boundary conditions, and as a moderator of outcomes. Building on such broad understanding allows to incorporate complementary theoretical perspectives to examine the multi-faceted role of the environment. For example, resource dependence theory can be used to determine how the availability of external resources conditions the structure of internal IT resources and the leverage of DCs (Hillman, Withers, & Collins, 2009). Furthermore, institutional theory could unveil how social, economic, and political factors regulate the actions firms take when leveraging their IT resources and develop their DCs (Saldanha, Mello, Knemeyer, & Vijayaraghavan, 2015). Such factors go beyond identifying uncertainty levels by highlighting the deeper and more resilient aspects of social structures, schemas, rules, norms, and routines within the context of study (Scott, 2005).

Third, there are strong theoretical arguments to suggest that the type of organizational change manifested through DCs may be contingent on the environment in which they are deployed (Schilke et al., 2018). Therefore, the business value of IT should be assessed in relation to the context of application. This point is particularly important when considering the associated costs with deploying

IT and DCs, which in some cases may greatly outweigh realized benefits (Berghout, Nijland, & Powell, 2011). Gauging the value of IT and DCs towards their outcomes is important to consider in light of costs, as piloted initiatives may cause firms to incur devastating financial losses (Irani, Ghoneim, & Love, 2006). Therefore, future research can examine how the organizational change induced by IT and DCs fares in relation to the costs (e.g., physical resources, time, opportunity costs) required to actualize them (which also relates to issue #5).

4.3 Theme 3: Stagnant View of Dynamic Capabilities in IS Research

4.3.1. Uncovered Issues and Assumptions regarding a Stagnant View of Dynamic Capabilities in IS Research

While the DCV has been employed in IS literature to explain how organizational change occurs and how firms can attain and sustain a competitive advantage, there are several underlying critical issues and assumptions that point to a stagnant view of DCs. One issue has to do with the fact that ***firms are the main focal units of IS research on DCs (#9).*** Almost 90% of the papers from our sample examined IT and DCs at the firm level. While a majority of research is expected to be at the firm level due to the nature of the theory, the almost exclusive focus at this level conceals the complexity of the real world. Considering that contemporary firms operate largely beyond their boundaries, being members of ecosystems, extended alliance networks, or by co-creating value with customers and other business partners prompts an examination of the effects of IT and DCs beyond the tight boundaries of a focal firm (Zott & Amit, 2010). Such empirical studies are currently missing from the IS domain and are important given the level of interconnectedness of contemporary firms (e.g., within platform ecosystems). In addition, we know very little about the synergies and collaborative developments between constellations of partners in fostering DCs. Additionally, IS research on DCs lacks an understanding of the cross-level dynamics by which IT and DCs and their effects emerge from lower levels to higher ones and vice versa. For example, there is little empirical knowledge about how managerial cognitions may influence the development of DCs through their decisions regarding IT investments as well as how different types of IT shape cognition and decision-making regarding DCs (Merendino et al., 2018). Furthermore, the IS literature overlooks the development and use of

DCs at the group and business unit levels (Montazemi et al., 2012; Montealegre et al., 2019). In addition, since any particular instance of DCs is context dependent, studying them solely at the firm level limits the practical relevance of findings (Schilke et al., 2018).

Another issue is the ***static view of DCs in the IS literature (#10)*** which is manifested through several assumptions. First, while researchers may be measuring the underlying capacities that comprise the overall notion of DCs, there is an inherent assumption that these capacities are working in synchronization and alignment with each other. In reality, such capacities may be working independently from each other in divergent directions and in an unsynchronized manner. By assuming the synchronization of the underlying capacities of DCs, IS studies may be capturing overall DCs that do not reflect reality (Mikalef & Pateli, 2017; Pavlou & El Sawy, 2006). In other words, firms may be able to sense, seize, and transform, but these capacities could actually be based on misaligned activities and temporally uncoordinated actions. This issue is known as interpretational confounding and occurs when researchers attempt to capture higher-order concepts through quantitative methods (Cenfetelli & Bassellier, 2009). Yet, such interpretational confounding does not result from the absence of an important capacity, but rather through the assumed relations between the underlying capacities.

A second assumption is that the internal capacities that comprise a firm's DCs are in synchronization with the rhythms and tempos of the external environment. Much of IS research captures DCs as a snapshot in time which obscures their ability to operate under shifting tempos of change in the external environment (Kathuria, Mann, Khuntia, Saldanha, & Kauffman, 2018). Since the dynamism of the environment can fluctuate, empirical studies that capture DCs as routinized capacities to sense and respond to events happening on a periodic basis may end up identifying DCs that are "out of tune" with the environment (Côrte-Real et al., 2020; Li & Huang, 2013). Third, while the vast majority of empirical work in the IS domain has strived to identify *what* aspects contribute to the emergence of DCs (Kim et al., 2011; Wei & Wang, 2010), there is a significant lack of attention to *how* DCs are renewed and modified so they continue to remain relevant and of value in shifting conditions. In other words, we know little regarding the lifecycle of DCs. While some empirical studies have attempted to

explore the effects of second order DCs (i.e., higher-order capabilities that change existing DCs), we still lack a comprehensive understanding of the mechanisms that prompt socio-technical change in current DCs.

4.2.3. Research Agenda for addressing the Stagnant View of Dynamic Capabilities in IS Research

The almost exclusive focus on the firm level (issue #9) prompts the following research question:

> **Research Question 8:** *How does IT relate to specific capacities of DCs occurring at lower levels?*

This research question aims to explore the micro-level phenomena through which IT and DCs manifest their effects and start the discussion of how they emerge at higher levels. By focusing on lower-level phenomena, it is possible to gain a better understanding of the complex interdependencies of IT and DCs, and a more detailed perspective on how organizational change is realized. First, while the role of managerial DCs is highlighted in the strategic management field (Helfat & Martin, 2015), within the IS domain there has been limited empirical investigation of how different IT resources exert change in the work routines and tasks of key individuals within organizations. An interesting area of inquiry for future studies is to examine the role of IT in expanding the bounded rationality of decision-makers (Arndt & Pierce, 2018). Such an approach emphasizes the cognitive and affective effects of key decision makers on DCs (Hodgkinson & Healey, 2011). Contemporary IT applications steer managers and decision-makers to base their decisions increasingly on insights from analytics rather than on intuition (Sharma, Mithas, & Kankanhalli, 2014). Such studies could build on the design of IT to engage affective and cognitive features of decision-makers (Dimoka et al., 2012), examine their information processing capacities and how they are affected by black-box insight (Abbasi, Sarker, & Chiang, 2016), or look at the role of trust and transparency of analytics insight in enabling the underlying capacities of managerial DCs (Fainshmidt & Frazier, 2017).

Additionally, studies including different levels are also important in our understanding of cross-level dynamics. Wilden et al. (2016) provide a compelling discussion on how sensing, seizing, and

transforming manifest at different levels within the firm. IS research could follow this approach and distinguish DC phenomena occurring at the individual, business unit, and corporate levels to understand how they diffuse across levels as well as within a given bounded context. Such studies can effectively paint a more detailed picture of how effects of IT and DCs emerge and are diffused through bottom-up or top-down processes. Additionally, a key implication of Wilden et al.'s (2016) framework is that although the basics of structural integrity remain the same, firms will need to be structured differently with respect to DCs depending on their specific needs (Wilden et al., 2016). Thus, such an approach can also account for variations in how IT and DCs develop throughout different levels.

> **Research Question 9:** *How are DC capacities synchronized in relation to each other and in relation with cycles in the external environment, and how do they evolve over time?*

This research question can help address the overwhelming static view of DCs held in most IS research (issue #9) by exploring how sensing, seizing, and transforming interrelate, develop, and gradually erode. First, IS studies can build on the growing research stream that considers temporal aspects in organizational research (Ancona, Goodman, Lawrence, & Tushman, 2001; Prescott, 2016; Reinecke & Ansari, 2014), and introduce concepts such rhythm, entrainment, synchronicity, temporal symmetry, and actors temporal orientation and style. This stream of research considers aspects such as synchronization between the internal capacities that comprise DCs (intraentrainment) and synchronization with external cues or *zeitgeber* (extraentrainment) (Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008; Shi, Sun, & Prescott, 2012). Studies in this direction may highlight internal temporal misalignments that lead to delays in strategic response times, or a lack of synchronization with the tempos of the external environment which may result in organizations only capturing a sub-set of opportunities from external cues (Conboy, Dennehy, & O'Connor, 2020). Such approaches may also examine temporal coordination patterns between different IT and business units including the alignment and synchronization of activities.

Second, given the increasingly embedded role that IT has on the creation of DCs, IS research can take a more in-depth investigation of the different stages of the DC lifecycle (Poeppelbuss, Niehaves,

Simons, & Becker, 2011). For example, longitudinal studies can unravel the complexities around the interpretation and implementation of IT to foster DCs (Pouloudi, Currie, & Whitley, 2016), highlight major inertial forces during development of IT-embedded DCs throughout different stages of maturity (Besson & Rowe, 2012), and identify where such capabilities reach a plateau and start to decline so that sunk costs can be avoided (Polites & Karahanna, 2012). In this direction, incorporating process theory perspectives that can explain the temporal order of key events associated with the lifecycle of DCs could offer valuable insights into how to organize and rollout DCs over time.

Finally, while there is considerable discussion in the management literature regarding lower and higher organizational capabilities (Collis, 1994), such categorization of organizational capabilities remains largely absent from the IS literature. Understanding the role of IT in creating second-order DCs is important because without them, current operating first-order DCs will turn into fixed responses and eventually become core rigidities (Daniel et al., 2014). A starting point could be to draw upon the management literature on second-order DCs (Fainshmidt, Pezeshkan, Lance Frazier, Nair, & Markowski, 2016; Teece, 2018a) to investigate how IT resources and their use fosters or inhibits second-order DCs. Doing so will also allow IS scholars to explore the distinct and contradicting role that IT might have for the relevancy and value of DCs as external conditions change (Warner & Wäger, 2019).

> **Research Question 10:** *What is the evolutionary relationship between IT, DCs and performance outcomes?*

This research question focuses on the temporal lags between IT in relation to the emergence of DCs, their manifestation and the performance gains realized from them, which also relates to issue #9. One way to address this research question is to incorporate the time-lags that exists between the occurrence of an external event that necessitates organizational change, the required adaptation process, and the materialization of performance. Methodologically, this can be done through matched responses surveys, which capture events in discrete intervals throughout time (Ping-Ju Wu, Straub, & Liang, 2015). Such time lags in the digital ecodynamics of IT, DCs, and performance outcomes may be substantial and even span a few years (Schryen, 2013). Ethnographic research is also another

approach that can capture the evolution of events and phenomena as they unfold. Such studies can uncover the nuances and subtle changes that occur in organizations as they leverage their IT and complementary resources to address organizational transformation (Baskerville & Myers, 2015).

Second, it is important for IS research to draw a distinction between the possession of strong underlying capacities of DCs and their utilization. Put differently, firms may be competent in sensing and seizing opportunities and threats and transforming operations accordingly, but external and internal conditions may not require them to do so. Hence, a way forward in this direction is to identify specific triggers that prompt organizational change. Such triggers may come from within the organization (endogenous) or may be a consequence of external events (exogenous) (Montalvo, 2006). While IS research has for the most part gauged such response triggers by measuring the level of uncertainty or turbulence, an alternative approach could be to qualitatively assess which specific occasions precipitate a reconfiguration of existing operations. Such approaches may highlight important ways through which the use of IT helps determine prompts for change or acts as an instigator of change.

> **Research Question 11:** *How can IT and DCs produce transformations (e.g., industry disruptions) that span organizational boundaries?*

This question also addresses the static view of DCs in IS research as well as level issues (#9 and #10) since it sees DCs first, as a mechanism of organizational adaptation to major disruptions, and second, as a generator of broader industry change.

The first issue concerns the boundary conditions and limitations of the DCs theory to explain phenomena in the IS domain. Major disruptive events such as that of the Covid-19 pandemic raise the question about how useful the DC theory is for the discourse of IS research in explaining organizational adaptation and survival. A way forward for IS researchers is to explore the ways in which organizations leverage their IT resources in order to overcome the hurdles wrought by unprecedented events (Ågerfalk, Conboy, & Myers, 2020). Such studies may show that organizations follow the same set of underlying capacities of DCs or might highlight some important deviations that can help generate new theoretical insight (Papadopoulos, Baltas, & Balta, 2020). In addition, the

utilization of novel digital technologies such as AI may indicate some key strengths of leveraging IT resources, allowing organizations to develop a digital resilience of sorts (Salovaara, Lyytinen, & Penttinen, 2019).

Second, while most research perceives the external environment exerting a force on a focal firm (Karimi & Walter, 2015), an interesting alternative angle is to understand how IT and DCs produce disruptions and changes in entire industries. These changes may be in the form of innovative digital business models that emerge as a result a firm's DC activation (e.g., online streaming services, ridesharing) (Song, Lee, & Khanna, 2016), or through the fused potential of IT and DCs in transforming how business activities are performed and instigating competitive and regulatory changes (e.g., automated stock trading agents) (Tokic, 2018; Wall, 2018).

5. CONTRIBUTIONS AND CONCLUSION

A large body of IS research has focused on the strategic role of IT for business value and competitive advantage (Drnevich & Croson, 2013; Melville et al., 2004; Schryen, 2013). Driven by the current hypercompetitive environment, the DCV has been applied as the principal theoretical basis that investigates IT's contribution to organizational performance (Barreto, 2010; Eisenhardt & Martin, 2000; Teece et al., 1997). The IS discipline has been quick to adapt this theory to understand and explain IT's relations with DCs, organizational change, business value, growth, or competitive advantage (e.g., Bhatt & Grover, 2005; El Sawy et al., 2010; Jarvenpaa & Leidner, 1998).

Given the importance of DCs in IS research, we critically reviewed this literature. In doing so, we go beyond existing reviews and critically examine the role of IT within the DCV. This critical review thereby contributes to the literature in several meaningful ways. First, we provide a synthesis of IS research on DCs, which reveals that IS scholars apply the DCV to study IT as a context for DCs (earliest research), as an outcome of DCs or mediator between DCs and outcomes, as an enabler of DCs, and as embedded in the DC construct. Additionally, we synthesize current knowledge into a nomological net and explain the relationships that have been examined. Second, we adopte a critical stance by uncovering methodological, logical or conceptual issues (Schryen 2013; Schryen et al.

2020) and problematizing existing IS research on DCs in order to move the field forward (Alvesson and Sandberg 2011, 2020). The uncovered hidden assumptions and problematic issues deal with conceptualizations of DCs and IT, impacts of IT and DCs, and a stagnant view of DCs in IS research. Third, to address issues regarding conceptualizations of DCs and IT, we develop a minimum DC construct definition for application in future research. Finally, based on the remaining uncovered assumptions and problematic issues, we develop a research agenda with specific and actionable research paths, including suggestions of research design, empirical methods and complementary theories and methods. We hope that this critical review will provide a stimulus for future IS research regarding IT, DCs, and IT-business value.

ACKNOWLEDGMENTS

We are grateful to the senior editor and the review team that guided and supported us throughout the entire review and revision process. This research was supported by a grant from the program “Retos de la Sociedad” of the Ministry of Economy, Industry and Competitiveness of the Government of Spain (ECO2017-88924R) to Ana Ortiz de Guinea, and a Professorship in Strategy and Management Information Systems of HEC Montréal to Ana Ortiz de Guinea. The authors also acknowledge the financial support from the Slovenian Research Agency (research core funding No. P5–0410) to Patrick Mikalef.

All authors contributed equally to this work.

REFERENCES

Abbasi, A., Albrecht, C., Vance, A., & Hansen, J. (2012). Metafraud: A Meta-Learning Framework for Detecting Financial Fraud. *MIS Quarterly*, 1293–1327.

Abbasi, A., Sarker, S., & Chiang, R. (2016). Big Data Research in Information Systems: Toward an Inclusive Research Agenda. *Journal of the Association for Information Systems*, *17*(2). Retrieved from http://aisel.aisnet.org/jais/vol17/iss2/3

Agarwal, R., & Selen, W. (2009). Dynamic Capability Building in Service Value Networks for Achieving Service Innovation. *Decision Sciences*, *40*(3), 431–475. doi:10.1111/j.1540-5915.2009.00236.x

Ågerfalk, P. J. (2010). Getting Pragmatic. *European Journal of Information Systems*, *19*, 251–256. doi:10.1057/ejis.2010.22

Ågerfalk, P. J., Conboy, K., & Myers, M. D. (2020). Information Systems in the Age of Pandemics: Covid-19 and Beyond. *European Journal of Information Systems*, *29*(3), 203–207. doi:10.1080/0960085X.2020.1771968

Aksulu, A., & Wade, M. (2010). A Comprehensive Review and Synthesis of Open Source Research. *Journal of the Association for Information Systems*, *11*(11), 576–656.

Alvesson, M., & Sandberg, J. (2011). Generating Research Questions Through Problematization. *Academy of Management Review*, *36*, 247–271.

Alvesson, M., & Sandberg, J. (2020). The problematizing review: A counterpoint to Elsbach and Van Knippenberg's argument for integrative reviews. *Journal of Management Studies*.

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management? *International Journal of Management Reviews*, *11*(1), 29–49. doi:10.1111/j.1468-2370.2008.00251.x

Amit, R., & Schoemaker, P. J. H. (1993). Strategic Assets and Organizational Rent. *Strategic Management Journal*, *14*(1), 33–46. doi:10.1002/smj.4250140105

Ancona, D. G., Goodman, P. S., Lawrence, B. S., & Tushman, M. L. (2001). Time: A New Research Lens. *Academy of Management Review*, *26*(4), 645–563. doi:10.5465/AMR.2001.5393903

Arndt, F., & Pierce, L. (2018). The Behavioral and Evolutionary Roots of Dynamic Capabilities. *Industrial and Corporate Change*, *27*(2), 413–424. doi:10.1093/icc/dtx042

Baker, J., Jones, D. R., Qing Cao, & Jaeki Song. (2011). Conceptualizing the Dynamic Strategic Alignment Competency. *Journal of the Association for Information Systems*, *12*(4), 299–322.

Banker, R. D., Bardhan, I. R., Hsihui Chang, & Shu Lin. (2006). Plant Information Systems, Manufacturing Capabilities, and Plant Performance. *MIS Quarterly*, *30*(2), 315–337.

Baptista, J., Newell, S., & Currie, W. (2010). Paradoxical Effects of Institutionalisation on the Strategic Awareness of Technology in Organisations. *Journal of Strategic Information Systems*, *19*(3), 171–183.

Barreto, I. (2010). Dynamic Capabilities: A Review of Past Research and an Agenda for the Future. *Journal of Management*, *36*(1), 256–280. doi:10.1177/0149206309350776

Baskerville, R. L., Kaul, M., & Storey, V. C. (2015). Genres of inquiry in design-science research: Justification and evaluation of knowledge production. *Mis Quarterly*, *39*(3), 541–564.

Baskerville, R. L., & Myers, M. D. (2015). Design ethnography in information systems. *Information Systems Journal*, *25*(1), 23–46. doi:10.1111/isj.12055

Battleson, D. A., West, B. C., Kim, J., Ramesh, B., & Robinson, P. S. (2016). Achieving dynamic capabilities with cloud computing: an empirical investigation. *European Journal of Information Systems*, *25*(3), 209–230. doi:http://dx.doi.org/10.1057/ejis.2015.12

Bechor, T., Neumann, S., Zviran, M., & Glezer, C. (2010). A Contingency Model for Estimating Success of Strategic Information Systems Planning. *Information & Management*, *47*(1), 17–29. doi:10.1016/j.im.2009.09.004

Benitez, J., Ray, G., & Henseler, J. (2018). Impact of Information Technology Infrastructure Flexibility on Mergers and Acquisitions. *MIS Quarterly*, *42*(1), 25-A12.

Benitez-amado, J., & Walczuch, R. M. (2012). Information technology, the organizational capability of proactive corporate environmental strategy and firm performance: a resource-based analysis. *European Journal of Information Systems*, *21*(6), 664–679. doi:http://dx.doi.org/10.1057/ejis.2012.14

Berghout, E., Nijland, M., & Powell, P. (2011). Management of Lifecycle Costs and Benefits: Lessons from Information Systems Practice. *Computers in Industry*, *62*(7), 755–764. doi:10.1016/j.compind.2011.05.005

Beske, P., Land, A., & Seuring, S. (2014). Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature. *International Journal of Production Economics*, *152*, 131–143. doi:10.1016/j.ijpe.2013.12.026

Besson, P., & Rowe, F. (2012). Strategizing Information Systems-Enabled Organizational Transformation: A Transdisciplinary Review and New Directions. *The Journal of Strategic Information Systems*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0963868712000170

Beynon, M. J., Jones, P., & Pickernell, D. (2020). Country-Level Entrepreneurial Attitudes and Activity Through the Years: A Panel Data Analysis Using fsQCA. *Journal of Business Research*, *115*, 443–455. doi:10.1016/j.jbusres.2019.11.021

Bharadwaj, A. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. *MIS Quarterly*, *24*(1), 169–196.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly*, *37*(2), 471–482.

Bharadwaj, A., Keil, M., & Mähring, M. (2009). Effects of information technology failures on the market value of firms. *The Journal of Strategic Information Systems*, *18*(2), 66–79. doi:10.1016/j.jsis.2009.04.001

Bhatt, G. D., & Grover, V. (2005). Types of Information Technology Capabilities and Their Role in Competitive Advantage: An Empirical Study. *Journal of Management Information Systems*, *22*(2), 253–277.

Braojos, J., Benitez, J., Llorens, J., & Ruiz, L. (2020). Impact of IT integration on the firm's knowledge absorption and desorption. *Information & Management*, 103290. doi:10.1016/j.im.2020.103290

Bullini Orlandi, L., Zardini, A., & Rossignoli, C. (2020). Organizational technological opportunism and social media: The deployment of social media analytics to sense and respond to technological discontinuities. *Journal of Business Research*, *112*, 385–395. doi:10.1016/j.jbusres.2019.10.070

Burisch, R., & Wohlgemuth, V. (2016). Blind spots of dynamic capabilities: A systems theoretic perspective. *Journal of Innovation & Knowledge*, *1*(2), 109–116.

Busquets, J. (2015). Discovery paths: exploring emergence and IT evolutionary design in cross-border M&As. Analysing Grupo Santander's acquisition of Abbey (2004-2009). *European Journal of Information Systems*, *24*(2), 178–201. doi:http://dx.doi.org/10.1057/ejis.2014.38

Carnes, C. M., Chirico, F., Hitt, M. A., Huh, D. W., & Pisano, V. (2017). Resource Orchestration for Innovation: Structuring and Bundling Resources in Growth- and Maturity-Stage Firms. *Long Range Planning*, *50*(4), 472–486. doi:10.1016/j.lrp.2016.07.003

Cecez-Kecmanovic, D., Galliers, R. D., Henfridsson, O., Newell, S., & Vidgen, R. (2014). The Sociomateriality of Information Systems: Current Status, Future Directions. *MIS Quarterly*, *38*(3), 809–830.

Cenamor, J., Parida, V., & Wincent, J. (2019). How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity. *Journal of Business Research*, *100*, 196–206. doi:10.1016/j.jbusres.2019.03.035

Cenfetelli, R. T., & Bassellier, G. (2009). Interpretation of Formative Measurement in Information Systems Research. *MIS Quarterly*, *33*(4), 689–707.

Cepeda, G., & Vera, D. (2007). Dynamic capabilities and operational capabilities: A knowledge management perspective. *Journal of Business Research*, *60*(5), 426–437. doi:10.1016/j.jbusres.2007.01.013

Chakravarty, A., Grewal, R., & Sambamurthy, V. (2013). Information Technology Competencies, Organizational Agility, and Firm Performance: Enabling and Facilitating Roles. *Information Systems Research*, *24*(4), 976–997. doi:10.1287/isre.2013.0500

Chatterjee, S., Moody, G., Lowry, P. B., Chakraborty, S., & Hardin, A. (2020). Information Technology and organizational innovation: Harmonious information technology affordance and courage-based actualization. *The Journal of Strategic Information Systems*, *29*(1), 101596. doi:10.1016/j.jsis.2020.101596

Chen, D. Q., Preston, D. S., & Swink, M. (2015). How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management. *Journal of Management Information Systems*, *32*(4), 4–39. doi:10.1080/07421222.2015.1138364

Chen, Y., Wang, Y., Nevo, S., Benitez, J., & Kou, G. (2017). Improving strategic flexibility with information technologies: insights for firm performance in an emerging economy. *Journal of Information Technology*, *32*(1), 10–25. doi:http://dx.doi.org/10.1057/jit.2015.26

Collis, D. J. (1994). Research Note: How Valuable are Organizational Capabilities? *Strategic Management Journal*, *15*(1), 143–152. doi:10.1002/smj.4250150910

Collis, D. J., & Anand, B. N. (2021). The Virtues and Limitations of Dynamic Capabilities. *Strategic Management Review*, *2*(1), 47–78. doi:10.1561/111.00000017

Conboy, K., Dennehy, D., & O'Connor, M. (2020). 'Big Time': An Examination of Temporal Complexity and Business Value in Analytics. *Information & Management*, *57*(1), 103077. doi:10.1016/j.im.2018.05.010

Constantinides, P., Chiasson, M. W., & Introna, L. D. (2012). The ends of information systems research: A pragmatic framework. *Mis Quarterly*, 1–20.

Cooper, V., & Molla, A. (2017). Information systems absorptive capacity for environmentally driven IS-enabled transformation. *Information Systems Journal*, *27*(4), 379–425. doi:10.1111/isj.12109

Côrte-Real, N., Oliveira, T., & Ruivo, P. (2017). Assessing business value of Big Data Analytics in European firms. *Journal of Business Research*, *70*(Supplement C), 379–390. doi:10.1016/j.jbusres.2016.08.011

Côrte-Real, N., Ruivo, P., & Oliveira, T. (2020). Leveraging internet of things and big data analytics initiatives in European and American firms: Is data quality a way to extract business value? *Information & Management*, *57*(1), 103141. doi:10.1016/j.im.2019.01.003

Cui, M., & Pan, S. L. (2015). Developing focal capabilities for e-commerce adoption: A resource orchestration perspective. *Information & Management*, *52*(2), 200–209. doi:10.1016/j.im.2014.08.006

Currie, W., Dennis, A., Nickerson, R. C., Niederman, F., & Vogel, D. (2017). Basket of 8 Report. *ICIS 2016 Proceedings*. Retrieved from http://aisel.aisnet.org/icis2016/Proceedings/Senior-Scholars-Forum/1

Daniel, E. M., Ward, J. M., & Franken, A. (2014). A dynamic capabilities perspective of IS project portfolio management. *The Journal of Strategic Information Systems*, *23*(2), 95–111. doi:10.1016/j.jsis.2014.03.001

Delery, J. E., & Doty, D. H. (1996). Modes of theorizing in strategic human resource management: Tests of universalistic, contingency, and configurational performance predictions. *Academy of management Journal*, *39*(4), 802–835.

Di Stefano, G., Peteraf, M., & Verona, G. (2014). The Organizational Drivetrain: A Road To Integration of Dynamic Capabilities Research. *Academy of Management Perspectives*, *28*(4), 307–327. doi:10.5465/amp.2013.0100

Dimoka, A., Davis, F. D., Gupta, A., Pavlou, P. A., Banker, R. D., Dennis, A. R., … Weber, B. (2012). On the Use of Neurophysiological Tools in IS Research: Developing a Research Agenda for NeuroIS. *MIS Quarterly*, *36*(3), 679–702. doi:10.2307/41703475

Donbesuur, F., Ampong, G. O. A., Owusu-Yirenkyi, D., & Chu, I. (2020). Technological Innovation, Organizational Innovation and International Performance of SMEs: The Moderating Role of Domestic Institutional Environment. *Technological Forecasting and Social Change*, *161*, 120252. doi:10.1016/j.techfore.2020.120252

Dong, J. Q., & Wu, W. (2015). Business value of social media technologies: Evidence from online user innovation communities. *The Journal of Strategic Information Systems*, *24*(2), 113–127. doi:10.1016/j.jsis.2015.04.003

Doty, D. H., Glick, W. H., & Huber, G. P. (1993). Fit, equifinality, and organizational effectiveness: A test of two configurational theories. *The Academy of Management Journal*, *36*(6), 1196–1250.

Drnevich, P. L., & Croson, D. C. (2013). Information Technology and Business-Level Strategy: Toward an Integrated Theoretical Perspective. *MIS Quarterly*, *37*(2), 483–509.

Drnevich, P. L., & Kriauciunas, A. P. (2011). Clarifying the conditions and limits of the contributions of ordinary and dynamic capabilities to relative firm performance. *Strategic Management Journal*, *32*(3), 254–279. doi:10.1002/smj.882

Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. (2009). Dynamic Capabilities: Current Debates and Future Directions. *British Journal of Management*, *20*, S1–S8. doi:10.1111/j.1467-8551.2008.00609.x

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic Capabilities: What Are They? *Strategic Management Journal*, *21*(10–11), 1105–1121. doi:10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E

El Sawy, O. A., Malhotra, A., YoungKi Park, & Pavlou, P. A. (2010). Seeking the Configurations of Digital Ecodynamics: It Takes Three to Tango. *Information Systems Research*, *21*(4), 835–848.

Erevelles, S., Fukawa, N., & Swayne, L. (2016). Big Data consumer analytics and the transformation of marketing. *Journal of Business Research*, *69*(2), 897–904. doi:10.1016/j.jbusres.2015.07.001

Eriksson, T. (2014). Processes, antecedents and outcomes of dynamic capabilities. *Scandinavian Journal of Management*, *30*(1), 65–82. doi:10.1016/j.scaman.2013.05.001

Fainshmidt, S., & Frazier, M. L. (2017). What Facilitates Dynamic Capabilities? The Role of Organizational Climate for Trust. *Long Range Planning*, *50*(5), 550–566. doi:10.1016/j.lrp.2016.05.005

Fainshmidt, S., Pezeshkan, A., Lance Frazier, M., Nair, A., & Markowski, E. (2016). Dynamic capabilities and organizational performance: A meta-analytic evaluation and extension. *Journal of Management Studies*, *53*(8), 1348–1380.

Faraj, S., & Azad, B. (2012). The materiality of technology: An affordance perspective. *Materiality and organizing: Social interaction in a technological world*, *237*, 258.

Fink, L., & Neumann, S. (2009). Exploring the perceived business value of the flexibility enabled by information technology infrastructure. *Information & Management*, *46*(2), 90–99. doi:10.1016/j.im.2008.11.007

Fiss, P. (2011). Building better causal theories: A fuzzy set approach to typologies in organization research. *Academy of Management Journal*, *54*(2), 393–420.

Fiss, P. C., Marx, A., & Cambré, B. (2013). Chapter 1 Configurational Theory and Methods in Organizational Research: Introduction. In P. C. Fiss, B. Cambré, & A. Marx (Eds.), *Configurational Theory and Methods in Organizational Research* (Vol. 38, pp. 1–22). Bingley: Emerald Group Publishing Limited. doi:10.1108/S0733-558X(2013)0000038005

Flak, L. S., & Rose, J. (2005). Stakeholder Governance: Adapting Stakeholder Theory to E-Government. *Communications of AIS*, *2005*(16), 642–664.

Foltean, F. S., Trif, S. M., & Tuleu, D. L. (2019). Customer relationship management capabilities and social media technology use: Consequences on firm performance. *Journal of Business Research*, *104*, 563–575. doi:10.1016/j.jbusres.2018.10.047

Galliers, R. D., Jarvenpaa, S. L., Chan, Y. E., & Lyytinen, K. (2012). Strategic Information Systems: Reflections and Prospectives. *Journal of Strategic Information Systems*, *21*(2), 85–90. doi:10.1016/j.jsis.2012.07.001

Ghasemaghaei, M., Hassanein, K., & Turel, O. (2017). Increasing Firm Agility Through the Use of Data Analytics: The Role of Fit. *Decision Support Systems*, *101*, 95–105. doi:10.1016/j.dss.2017.06.004

Glynn, M. A., & Abzug, R. (2002). Institutionalizing Identity: Symbolic Isomorphism and Organizational Names. *The Academy of Management Journal*, *45*(1), 267–280. doi:10.2307/3069296

Goertz, G. (2012). *Social science concepts: A user's guide*. Princeton University Press.

Goldbach, T., Benlian, A., & Buxmann, P. (2018). Differential effects of formal and self-control in mobile platform ecosystems: Multi-method findings on third-party developers' continuance intentions and application quality. *Information & Management*, *55*(3), 271–284. doi:10.1016/j.im.2017.07.003

Goldkuhl, G. (2004). Meanings of Pragmatism: Ways to Conduct Information Systems Research. *Action in Language, Organisations and Information Systems*.

Gosain, S. (2004). Enterprise Information Systems as Objects and Carriers of Institutional Forces: The New Iron Cage? *Journal of the Association for Information Systems*, *5*(4), 151–182.

Gregor, S., & Jones, D. (2007). The anatomy of a design theory. *Journal of the Association for Information Systems*, *8*(5), 312–335.

Gregory, R. W., Keil, M., Muntermann, J., & Mähring, M. (2015). Paradoxes and the Nature of Ambidexterity in IT Transformation Programs. *Information Systems Research*, *26*(1), 57–80. doi:10.1287/isre.2014.0554

Hackbarth, G., & Kettinger, W. J. (2004). Strategic Aspirations for Net-Enabled Business. *European Journal of Information Systems*, *13*(4), 273–285. doi:10.1057/palgrave.ejis.3000511

Hallin, C. A., Andersen, T. J., & Tveterås, S. (2017). Harnessing the frontline employee sensing of capabilities for decision support. *Decision Support Systems*, *97*, 104–112. doi:10.1016/j.dss.2017.03.009

Hamilton, B. H., & Nickerson, J. A. (2003). Correcting for endogeneity in strategic management research. *Strategic organization*, *1*(1), 51–78.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D. J., & Winter, S. G. (2009). *Dynamic Capabilities: Understanding Strategic Change in Organizations*. John Wiley & Sons.

Helfat, C. E., & Martin, J. A. (2015). Dynamic Managerial Capabilities: Review and Assessment of Managerial Impact on Strategic Change. *Journal of Management*, *41*(5), 1281–1312. doi:10.1177/0149206314561301

Helfat, C. E., & Peteraf, M. A. (2015). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, *36*(6), 831–850. doi:10.1002/smj.2247

Helfat, C. E., & Winter, S. G. (2011). Untangling Dynamic and Operational Capabilities: Strategy for the (N)ever-Changing World. *Strategic Management Journal*, *32*(11), 1243–1250. doi:10.1002/smj.955

Hillman, A. J., Withers, M. C., & Collins, B. J. (2009). Resource Dependence Theory: A Review. *Journal of Management*, *35*(6), 1404–1427. doi:10.1177/0149206309343469

Hock-Doepgen, M., Clauss, T., Kraus, S., & Cheng, C.-F. (2020). Knowledge management capabilities and organizational risk-taking for business model innovation in SMEs. *Journal of Business Research*. doi:10.1016/j.jbusres.2019.12.001

Hodgkinson, G. P., & Healey, M. P. (2011). Psychological Foundations of Dynamic Capabilities: Reflexion and Reflection in Strategic Management. *Strategic Management Journal*, *32*(13), 1500–1516. doi:https://doi.org/10.1002/smj.964

Hsu, I.-C., & Sabherwal, R. (2012). Relationship between Intellectual Capital and Knowledge Management: An Empirical Investigation. *Decision Sciences*, *43*(3), 489–524. doi:10.1111/j.1540-5915.2012.00357.x

Huang Chua, C. E., & Myers, M. D. (2018). Social Control in Information Systems Development: A Negotiated Order Perspective. *Journal of Information Technology*, *33*(3), 173–187. doi:10.1057/s41265-017-0048-4

Hult, G. T. M., Hair, J. F., Proksch, D., Sarstedt, M., Pinkwart, A., & Ringle, C. M. (2018). Addressing Endogeneity in International Marketing Applications of Partial Least Squares Structural Equation Modeling. *Journal of International Marketing*, *26*(3), 1–21. doi:10.1509/jim.17.0151

ING. (2018, December). Using AI to assess credit risk. *Newsroom*. Retrieved from https://www.ing.com/Newsroom/News/Using-AI-to-assess-credit-risk.htm

Ing-Long Wu & Ya-Ping Hu. (2012). Examining Knowledge Management Enabled Performance for Hospital Professionals: A Dynamic Capability View and the Mediating Role of Process Capability. *Journal of the Association for Information Systems*, *13*(12), 976–999.

Irani, Z., Ghoneim, A., & Love, P. E. D. (2006). Evaluating Cost Taxonomies for Information Systems Management. *European Journal of Operational Research*, *173*(3), 1103–1122. doi:10.1016/j.ejor.2005.07.007

Iyengar, K., Sweeney, J. R., & Montealegre, R. (2015). Information Technology Use as a Learning Mechanism: The Impact of It Use on Knowledge Transfer Effectiveness, Absorptive Capacity, and Franchisee Performance. *MIS Quarterly*, *39*(3), 615-A5.

Jarvenpaa, S. L., & Leidner, D. E. (1998). An Information Company in Mexico: Extending the Resource-Based View of the Firm to a Developing Country Context. *Information Systems Research*, *9*(4), 342–361. doi:10.1287/isre.9.4.342

Karimi, J., & Walter, Z. (2015). The Role of Dynamic Capabilities in Responding to Digital Disruption: A Factor-Based Study of the Newspaper Industry. *Journal of Management Information Systems*, *32*(1), 39–81. doi:10.1080/07421222.2015.1029380

Karlsson, J. C. (2012). *Organizational Misbehaviour in the Workplace: Narratives of Dignity and Resistance*. London: Palgrave Macmillan UK. doi:10.1057/9780230354630

Kehoe, R. R., & Wright, P. M. (2013). The impact of high-performance human resource practices on employees' attitudes and behaviors. *Journal of management*, *39*(2), 366–391.

Ketokivi, M., & McIntosh, C. N. (2017a). Addressing the endogeneity dilemma in operations management research: Theoretical, empirical, and pragmatic considerations. *Journal of Operations Management*, *52*(1), 1–14. doi:https://doi.org/10.1016/j.jom.2017.05.001

Ketokivi, M., & McIntosh, C. N. (2017b). Addressing the endogeneity dilemma in operations management research: Theoretical, empirical, and pragmatic considerations. *Journal of Operations Management*, *52*(1), 1–14. doi:10.1016/j.jom.2017.05.001

Kim, G., Shin, B., Kim, K. K., & Lee, H. G. (2011). IT Capabilities, Process-Oriented Dynamic Capabilities, and Firm Financial Performance. *Journal of the Association for Information Systems*, *12*(7), 487–517.

Koch, H. (2010). Developing Dynamic Capabilities in Electronic Marketplaces: A Cross-Case Study. *The Journal of Strategic Information Systems*, *19*(1), 28–38.

Kohli, R., & Grover, V. (2008). Business Value of IT: An Essay on Expanding Research Directions to Keep up with the Times. *Journal of the Association for Information Systems*, *9*(1), 23–39.

Komatsu, L. K. (1992). Recent views of conceptual structure. *Psychological bulletin*, *112*(3), 500.

Konlechner, S., Müller, B., & Güttel, W. H. (2018). A Dynamic Capabilities Perspective on Managing Technological Change: A Review, Framework and Research Agenda. *International Journal of Technology Management*, *76*(3–4), 188–213. doi:10.1504/IJTM.2018.091285

Kranz, J. J., Hanelt, A., & Kolbe, L. M. (2016). Understanding the influence of absorptive capacity and ambidexterity on the process of business model change – the case of on-premise and cloud-computing software. *Information Systems Journal*, *26*(5), 477–517. doi:10.1111/isj.12102

Laaksonen, O., & Peltoniemi, M. (2018). The essence of dynamic capabilities and their measurement. *International Journal of Management Reviews*, *20*(2), 184–205.

Lavie, D. (2006). Capability Reconfiguration: An Analysis of Incumbent Responses to Technological Change. *Academy of Management Review*, *31*(1), 153–174. doi:10.5465/AMR.2006.19379629

Lee, I., & Shin, Y. J. (2020). Machine learning for enterprises: Applications, algorithm selection, and challenges. *Business Horizons*, *63*(2), 157–170.

Lee, O.-K. (Daniel), Sambamurthy, V., Lim, K. H., & Wei, K. K. (2015). How Does IT Ambidexterity Impact Organizational Agility? *Information Systems Research*, *26*(2), 398–417. doi:10.1287/isre.2015.0577

Leidner, D. E., Gonzalez, E., & Koch, H. (2018). An Affordance Perspective of Enterprise Social Media and Organizational Socialization. *The Journal of Strategic Information Systems*, *27*(2), 117–138. doi:10.1016/j.jsis.2018.03.003

Leidner, D. E., Lo, J., & Preston, D. (2011). An Empirical Investigation of the Relationship of Is Strategy with Firm Performance. *The Journal of Strategic Information Systems*.

Li, L., Su, F., Zhang, W., & Mao, J.-Y. (2017). Digital transformation by SME entrepreneurs: A capability perspective. *Information Systems Journal*, Forthcoming. doi:10.1111/isj.12153

Li, Y.-H., & Huang, J.-W. (2013). Exploitative and Exploratory Learning in Transactive Memory Systems and Project Performance. *Information & Management*, *50*(6), 304–313. doi:10.1016/j.im.2013.05.003

Lim, J.-H., Stratopoulos, T. C., & Wirjanto, T. S. (2011). Path Dependence of Dynamic Information Technology Capability: An Empirical Investigation. *Journal of Management Information Systems*, *28*(3), 45–84.

Lim, S. Y., Jarvenpaa, S. L., & Lanham, H. J. (2015). Barriers to Interorganizational Knowledge Transfer in Post-Hospital Care Transitions: Review and Directions for Information Systems Research. *Journal of Management Information Systems*, *32*(3), 48–74. doi:10.1080/07421222.2015.1095013

Limaj, E., Bernroider, E. W. N., & Choudrie, J. (2016). The impact of social information system governance, utilization, and capabilities on absorptive capacity and innovation: A case of Austrian SMEs. *Information & Management*, *53*(3), 380–397. doi:10.1016/j.im.2015.12.003

Linstead, S., Maréchal, G., & Griffin, R. W. (2014). Theorizing and Researching the Dark Side of Organization. *Organization Studies*, *35*(2), 165–188. doi:10.1177/0170840613515402

Liu, H., Ke, W., Wei, K. K., & Hua, Z. (2013). The Impact of IT Capabilities on Firm Performance: The Mediating Roles of Absorptive Capacity and Supply Chain Agility. *Decision Support Systems*, *54*(3), 1452–1462. doi:10.1016/j.dss.2012.12.016

Lo, J., & Leidner, D. (2018). Are Dynamic Capabilities the Missing Link Between the IS Strategy and Performance Relationship?: A Model and Exploratory Test at Three Levels of Environmental Dynamism. *SIGMIS Database*, *49*(2), 35–53. doi:10.1145/3229335.3229339

Luftman, J., Lyytinen, K., & Zvi, T. ben. (2017). Enhancing the measurement of information technology (IT) business alignment and its influence on company performance. *Journal of Information Technology*, *32*(1), 26–46. doi:10.1057/jit.2015.23

Lyytinen, K., & Rose, G. M. (2006). Information System Development Agility as Organizational Learning. *European Journal of Information Systems*, *15*(2), 183–199. doi:10.1057/palgrave.ejis.3000604

MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct Measurement and Validation Procedures in MIS and Behavioral Research: Integrating New and Existing Techniques. *MIS Quarterly*, *35*(2), 293–334.

Malhotra, A., Gosain, S., & El Sawy, O. A. (2007). Leveraging Standard Electronic Business Interfaces to Enable Adaptive Supply Chain Partnerships. *Information Systems Research*, *18*(3), 260–279. doi:10.1287/isre.1070.0132

Markus, M. L., & Rowe, F. (2020). Knowing What We Know about IT and Business Value: Cause for Concern about Endogeneity Problems and Potential Solutions. In *Proceedings of the 53rd Hawaii International Conference on System Sciences*.

McLaren, T. S., Head, M. M., Yuan, Y., & Chan, Y. E. (2011). A Multilevel Model for Measuring Fit Between a Firm's Competitive Strategies and Information Systems Capabilities. *MIS Quarterly*, *35*(4), 909-A10.

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Information Technology and Organizational Performance: An Integrative Model of IT Business Value. *MIS Quarterly*, *28*(2), 283–322.

Merendino, A., Dibb, S., Meadows, M., Quinn, L., Wilson, D., Simkin, L., & Canhoto, A. (2018). Big data, big decisions: The impact of big data on board level decision-making. *Journal of Business Research*, *93*, 67–78. doi:10.1016/j.jbusres.2018.08.029

Mesgari, M., Okoli, C., & Ortiz de Guinea, A. (2018). Creating rich and representative personas by discovering affordances. *IEEE Transactions on Software Engineering*, *45*(10), 967–983.

Mikalef, P., & Krogstie, J. (2020). Examining the Interplay Between Big Data Analytics and Contextual Factors in Driving Process Innovation Capabilities. *European Journal of Information Systems*, *29*(3), 260–287. doi:10.1080/0960085X.2020.1740618

Mikalef, P., Krogstie, J., Pappas, I. O., & Pavlou, P. (2020a). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. *Information & Management*, *57*(2), N.PAG-N.PAG. doi:10.1016/j.im.2019.05.004

Mikalef, P., & Pateli, A. (2017). Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: Findings from PLS-SEM and fsQCA. *Journal of Business Research*, *70*, 1–16. doi:10.1016/j.jbusres.2016.09.004

Mikalef, P., Pateli, A., & Wetering, R. van de. (2020b). IT architecture flexibility and IT governance decentralisation as drivers of IT-enabled dynamic capabilities and competitive performance: The moderating effect of the external environment. *European Journal of Information Systems*, *0*(0), 1–29. doi:10.1080/0960085X.2020.1808541

Mingers, J., & Walsham, G. (2010). Toward Ethical Information Systems: The Contribution of Discourse Ethics. *MIS Quarterly*, *34*(4), 833–854.

Misangyi, V. F., & Acharya, A. G. (2014). Substitutes or Complements? A Configurational Examination of Corporate Governance Mechanisms. *Academy of Management Journal*, *57*(6), 1681–1705. doi:10.5465/amj.2012.0728
Mitchell, V. L. (2006). Knowledge Integration and Information Technology Project Performance. *MIS Quarterly*, *30*(4), 919–939.
Montalvo, C. (2006). What Triggers Change and Innovation? *Technovation*, *26*(3), 312–323. doi:10.1016/j.technovation.2004.09.003
Montazemi, A. R., Pittaway, J. J., Qahri Saremi, H., & Wei, Y. (2012). Factors of stickiness in transfers of know-how between MNC units. *The Journal of Strategic Information Systems*, *21*(1), 31–57. doi:10.1016/j.jsis.2012.01.001
Montealegre, R. (1998). Managing Information Technology in Modernizing `Against the Odds': Lessons from an Organization in a Less-Developed Country. *Information & Management*, *34*(2), 103–116. doi:10.1016/S0378-7206(98)00051-2
Montealegre, R. (2002). A Process Model of Capability Development: Lessons from the Electronic Commerce Strategy at Bolsa de Valores de Guayaquil. *Organization Science*, *13*(5), 514–531. doi:10.1287/orsc.13.5.514.7808
Montealegre, R., Iyengar, K., & Sweeney, J. (2019). Understanding Ambidexterity: Managing Contradictory Tensions Between Exploration and Exploitation in the Evolution of Digital Infrastructure. *Journal of the Association for Information Systems*, *20*(5), 647–680. doi:10.17705/1jais.00547
Murschetz, P. C., Omidi, A., Oliver, J. J., Kamali Saraji, M., & Javed, S. (2020). Dynamic capabilities in media management research. A literature review. *Journal of Strategy and Management*, *13*(2), 278–296. doi:10.1108/JSMA-01-2019-0010
Myers, M. D. (1999). Investigating Information Systems with Ethnographic Research. *Communications of the Association for Information Systems*, *2*(1). doi:10.17705/1CAIS.00223
Neirotti, P., & Raguseo, E. (2017). On the contingent value of IT-based capabilities for the competitive advantage of SMEs: Mechanisms and empirical evidence. *Information & Management*, *54*(2), 139–153. doi:10.1016/j.im.2016.05.004
Newell, S., & Edelman, L. F. (2008). Developing a dynamic project learning and cross-project learning capability: synthesizing two perspectives. *Information Systems Journal*, *18*(6), 567–591. doi:10.1111/j.1365-2575.2007.00242.x
Obermeyer, Z., Powers, B., Vogeli, C., & Mullainathan, S. (2019). Dissecting Racial Bias in an Algorithm Used to Manage the Health of Populations. *Science*, *366*(6464), 447–453. doi:10.1126/science.aax2342
Oh, W., & Pinsonneault, A. (2007). On the Assessment of the Strategic Value of Information Technologies: Conceptual and Analytical Approaches. *MIS Quarterly*, *31*(2), 239–265.
Okoli, C. (2015). A Guide to Conducting a Standalone Systematic Literature Review. *Communications of the Association for Information Systems*, *37*(1). Retrieved from http://aisel.aisnet.org/cais/vol37/iss1/43
Orlikowski, W. J., & Iacono, C. S. (2001). Research commentary: Desperately seeking the 'IT' in IT research: A call to theorizing the IT artifact. *Information Systems Research*, *12*(2), 121–34.
Orlikowski, W. J., & Scott, S. V. (2008). Sociomateriality: Challenging the Separation of Technology, Work and Organization. *Academy of Management Annals*, *2*(1), 433–474. doi:10.5465/19416520802211644
Ortiz de Guinea, A., & Raymond, L. (2020). Enabling innovation in the face of uncertainty through IT ambidexterity: A fuzzy set qualitative comparative analysis of industrial service SMEs. *International Journal of Information Management*, *50*, 244–260.
Ortiz de Guinea, A., & Webster, J. (2013). An Investigation of Information Systems Use Patterns: Technological Events as Triggers, the Effect of Time, and Consequences for Performance. *Mis Quarterly*, *37*(4).
Ortiz de Guinea, A., & Webster, J. (2017). Combining variance and process in information systems research: Hybrid approaches. *Information and Organization*, *27*(3), 144–162.
Pan, G., Pan, S.-L., & Lim, C.-Y. (2015). Examining how firms leverage IT to achieve firm productivity: RBV and dynamic capabilities perspectives. *Information & Management*, *52*(4), 401–412. doi:10.1016/j.im.2015.01.001
Papadopoulos, T., Baltas, K. N., & Balta, M. E. (2020). The Use of Digital Technologies by Small and Medium Enterprises During Covid-19: Implications for Theory and Practice. *International Journal of Information Management*, *55*, 102192. doi:10.1016/j.ijinfomgt.2020.102192
Paré, G., Tate, M., Johnstone, D., & Kitsiou, S. (2016). Contextualizing the Twin Concepts of Systematicity and Transparency in Information Systems Literature Reviews. *European Journal of Information Systems*, *25*(6), 493–508. doi:10.1057/s41303-016-0020-3
Paré, G., Trudel, M.-C., Jaana, M., & Kitsiou, S. (2015). Synthesizing information systems knowledge: A typology of literature reviews. *Information & Management*, *52*(2), 183–199. doi:10.1016/j.im.2014.08.008
Park, S., & Gupta, S. (2012). Handling Endogenous Regressors by Joint Estimation Using Copulas. *Marketing Science*, *31*(4), 567–586. doi:10.1287/mksc.1120.0718
Park, Y., Fiss, P. C., & El Sawy, O. A. (2020). Theorizing the Multiplicity of Digital Phenomena: The Ecology of Configurations, Causal Recipes, and Guidelines for Applying QCA, *44*(4), 1493–1520.
Pavlou, P. A., & El Sawy, O. A. (2006). From IT Leveraging Competence to Competitive Advantage in Turbulent Environments: The Case of New Product Development. *Information Systems Research*, *17*(3), 198–227. doi:10.1287/isre.1060.0094
Pavlou, P. A., & El Sawy, O. A. (2010). The "Third Hand": IT-Enabled Competitive Advantage in Turbulence Through Improvisational Capabilities. *Information Systems Research*, *21*(3), 443–471. doi:10.1287/isre.1100.0280
Peffers, K., Tuunanen, T., & Niehaves, B. (2018). *Design science research genres: introduction to the special issue on exemplars and criteria for applicable design science research*. Taylor & Francis.
Pérez-Nordtvedt, L., Kedia, B. L., Datta, D. K., & Rasheed, A. A. (2008). Effectiveness and Efficiency of Cross-Border Knowledge Transfer: An Empirical Examination. *Journal of Management Studies*, *45*(4), 714–744. doi:https://doi.org/10.1111/j.1467-6486.2008.00767.x
Peteraf, M., Di Stefano, G., & Verona, G. (2013). The Elephant in the Room of Dynamic Capabilities: Bringing Two Diverging Conversations Together. *Strategic Management Journal*, *34*(12), 1389–1410. doi:10.1002/smj.2078
Piccoli, G., & Ives, B. (2005). IT-Dependent Strategic Initiatives and Sustained Competitive Advantage: A Review and Synthesis of the Literature. *MIS Quarterly*, *29*(4), 747–776.
Piening, E. P. (2013). Dynamic Capabilities in Public Organizations: A literature review and research agenda. *Public Management Review*, *15*(2), 209–245. doi:10.1080/14719037.2012.708358
Ping-Ju Wu, S., Straub, D. W., & Liang, T.-P. (2015). How Information Technology Governance Mechanisms and Strategic Alignment Influence Organizational Performance: Insights from a Matched Survey of Business and It Managers. *MIS Quarterly*, *39*(2), 497-A7.
Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2016). Recommendations for creating better concept definitions in the organizational, behavioral, and social sciences. *Organizational Research Methods*, *19*(2), 159–203.
Poeppelbuss, J., Niehaves, B., Simons, A., & Becker, J. (2011). Maturity Models in Information Systems Research: Literature Search and Analysis. *Communications of the Association for Information Systems*, *29*(1). doi:10.17705/1CAIS.02927
Polites, G. L., & Karahanna, E. (2012). Shackled to the Status Quo: The Inhibiting Effects of Incumbent System Habit, Switching Costs, and Inertia on New System Acceptance. *MIS Quarterly*, *36*(1), 21–42.
Popper, K. (1963). *Conjectures and Refutations*. London: Routledge and Keagan Paul.

Pouloudi, N., Currie, W., & Whitley, E. A. (2016). Entangled Stakeholder Roles and Perceptions in Health Information Systems: A Longitudinal Study of the U.K. NHS N3 Network. *Journal of the Association for Information Systems*, *17*(2), 107–161.

Prajogo, D. I. (2016). The Strategic Fit Between Innovation Strategies and Business Environment in Delivering Business Performance. *International Journal of Production Economics*, *171*, 241–249. doi:10.1016/j.ijpe.2015.07.037

Prescott, M. E. (2016). Big Data: Innovation and Competitive Advantage in an Information Media Analytics Company. *Journal of Innovation Management*, *4*(1), 92–113. doi:10.24840/2183-0606_004.001_0007

Protogerou, A., Caloghirou, Y., & Lioukas, S. (2011). Dynamic Capabilities and Their Indirect Impact on Firm Performance. *Industrial and Corporate Change*, *21*(3), 615–647. doi:10.1093/icc/dtr049

Queiroz, M., Tallon, P. P., Sharma, R., & Coltman, T. (2018). The role of IT application orchestration capability in improving agility and performance. *The Journal of Strategic Information Systems*, *27*(1), 4–21.

Ragin, C. C. (2008). *Redesigning social inquiry: Fuzzy sets and beyond*. Chicago, IL: University of Chicago Press.

Reinecke, J., & Ansari, S. (2014). When Times Collide: Temporal Brokerage at the Intersection of Markets and Developments. *Academy of Management Journal*, *58*(2), 618–648. doi:10.5465/amj.2012.1004

Rialti, R., Marzi, G., Ciappei, C., & Busso, D. (2019). Big data and dynamic capabilities: a bibliometric analysis and systematic literature review. *Management Decision*, *57*(8), 2052–2068. doi:10.1108/MD-07-2018-0821

Roberts, N., Campbell, D. E., & Vijayasarathy, L. R. (2016). Using Information Systems to Sense Opportunities for Innovation: Integrating Postadoptive Use Behaviors with the Dynamic Managerial Capability Perspective. *Journal of Management Information Systems*, *33*(1), 45–69. doi:10.1080/07421222.2016.1172452

Roberts, N., Galluch, P. S., Dinger, M., & Grover, V. (2012). Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research. *MIS Quarterly*, *36*(2), 625-A6.

Roberts, N., & Grover, V. (2012). Leveraging Information Technology Infrastructure to Facilitate a Firm's Customer Agility and Competitive Activity: An Empirical Investigation. *Journal of Management Information Systems*, *28*(4), 231–270.

Rowe, F. (2014). What literature review is not: diversity, boundaries and recommendations. *European Journal of Information Systems*, *23*(3), 241–255. doi:http://dx.doi.org/10.1057/ejis.2014.7

Sahoo, N., Singh, P. V., & Mukhopadhyay, T. (2012). A hidden Markov model for collaborative filtering. *Mis Quarterly*, 1329–1356.

Saldanha, J. P., Mello, J. E., Knemeyer, A. M., & Vijayaraghavan, T. a. S. (2015). Implementing Supply Chain Technologies in Emerging Markets: An Institutional Theory Perspective. *Journal of Supply Chain Management*, *51*(1), 5–26. doi:https://doi.org/10.1111/jscm.12065

Salovaara, A., Lyytinen, K., & Penttinen, E. (2019). High Reliability in Digital Organizing: Mindlessness, the Frame Problem, and Digital Operations. *MIS Quarterly*, *43*(2), 555–578. doi:10.25300/MISQ/2019/14577

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping Agility Through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms. *MIS Quarterly*, *27*(2), 237–263.

Sambamurthy, V., & Zmud, R. W. (1999). Arrangements for Information Technology Governance: A Theory of Multiple Contingencies. *MIS Quarterly*, *23*(2), 261–290.

Sande, J. B., & Ghosh, M. (2018). Endogeneity in Survey Research. *International Journal of Research in Marketing*, *35*(2), 185–204. doi:10.1016/j.ijresmar.2018.01.005

Schilke, O., Hu, S., & Helfat, C. E. (2018). Quo Vadis, Dynamic Capabilities? A Content-Analytic Review of the Current State of Knowledge and Recommendations for Future Research. *Academy of Management Annals*, *12*(1), 390–439. doi:10.5465/annals.2016.0014

Schryen, G. (2013). Revisiting IS Business Value Research: What We Already Know, What We Still Need to Know, and How We Can Get There. *European Journal of Information Systems*, *22*(2), 139–169. doi:10.1057/ejis.2012.45

Schryen, G. (2015). Writing Qualitative IS Literature Reviews—Guidelines for Synthesis, Interpretation, and Guidance of Research. *Communications of the Association for Information Systems*, *37*(1). Retrieved from http://aisel.aisnet.org/cais/vol37/iss1/12

Schryen, G., Wagner, G., Benlian, A., & Paré, G. (2020). A Knowledge Development Perspective on Literature Reviews: Validation of a new Typology in the IS Field. *Communications of the Association for Information Systems*, *46*(1). doi:10.17705/1CAIS.04607

Schwarz, A., Kalika, M., Kefi, H., & Schwarz, C. (2010). A Dynamic Capabilities Approach to Understanding the Impact of IT-Enabled Businesses Processes and IT-Business Alignment on the Strategic and Operational Performance of the Firm. *Communications of the Association for Information Systems*, *26*(1). Retrieved from http://aisel.aisnet.org/cais/vol26/iss1/4

Scott, W. R. (2005). Institutional Theory: Contributing to a Theoretical Research Program. *Great Minds in Management: The Process of Theory Development*, 460–484.

Sein, M. K., Henfridsson, O., Purao, S., Rossi, M., & Lindgren, R. (2011). Action design research. *Management Information Systems Quarterly*, *35*(1), 37–56.

Shanks, G., Gloet, M., Asadi Someh, I., Frampton, K., & Tamm, T. (2018). Achieving benefits with enterprise architecture. *The Journal of Strategic Information Systems*, *27*(2), 139–156. doi:10.1016/j.jsis.2018.03.001

Sharma, R., Mithas, S., & Kankanhalli, A. (2014). Transforming decision-making processes: a research agenda for understanding the impact of business analytics on organisations. *European Journal of Information Systems*, *23*(4), 433–441. doi:http://dx.doi.org/10.1057/ejis.2014.17

Shen, Z., Lyytinen, K., & Yoo, Y. (2015). Time and Information Technology in Teams: A Review of Empirical Research and Future Research Directions. *European Journal of Information Systems*, *24*(5), 492–518. doi:10.1057/ejis.2014.8

Sher, P. J., & Lee, V. C. (2004). Information technology as a facilitator for enhancing dynamic capabilities through knowledge management. *Information & Management*, *41*(8), 933–945. doi:10.1016/j.im.2003.06.004

Shi, W. (Stone), Sun, J., & Prescott, J. E. (2012). A Temporal Perspective of Merger and Acquisition and Strategic Alliance Initiatives: Review and Future Direction. *Journal of Management*, *38*(1), 164–209. doi:10.1177/0149206311424942

Singh, R., Mathiassen, L., Stachura, M. E., & Astapova, E. V. (2011). Dynamic Capabilities in Home Health: IT-Enabled Transformation of Post-Acute Care. *Journal of the Association for Information Systems*, *12*(2), 163–188.

Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing Firm Resources in Dynamic Environments to Create Value: Looking Inside the Black Box. *Academy of Management Review*, *32*(1), 273–292. doi:10.5465/AMR.2007.23466005

Sirmon, D. G., Hitt, M. A., Ireland, R. D., & Gilbert, B. A. (2011). Resource Orchestration to Create Competitive Advantage. *Journal of Management*, *37*(5), 1390–1412. doi:10.1177/0149206310385695

Smith, H. J., & Hasnas, J. (1999). Ethics and Information Systems: The Corporate Domain. *MIS Quarterly*, *23*(1), 109–127. doi:10.2307/249412

Song, J., Lee, K., & Khanna, T. (2016). Dynamic Capabilities at Samsung: Optimizing Internal Co-Opetition. *California Management Review*, *58*(4), 118–140. doi:10.1525/cmr.2016.58.4.118

Stahl, B. C. (2012). Morality, Ethics, and Reflection: A Categorization of Normative IS Research. *Journal of the Association for Information Systems*, *13*(8). Retrieved from http://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=15369323&AN=8771749

9&h=KpFCmuGffZ73i%2B1tRtDLptInT8H14udqhg3tQMkV00B5Z0eG2qPGYPCiHjb4pm%2FnfFesAp14EP34lEH6WGw03A%3D%3D&crl=c
Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation Guidelines for IS Positivist Research. *Communications of AIS*, *2004*(13), 380–427.
Street, C., Gallupe, B., & Baker, J. (2017). Strategic Alignment in SMEs: Strengthening Theoretical Foundations. *Communications of the Association for Information Systems*, *40*(1), 239–266.
Strong, D., Volkoff, O., Johnson, S., Pelletier, L., Tulu, B., Bar-On, I., … Garber, L. (2014). A Theory of Organization-EHR Affordance Actualization. *Journal of the Association for Information Systems*, *15*(2), 53–85. doi:10.17705/1jais.00353
Tallon, P. P., Queiroz, M., Coltman, T., & Sharma, R. (2019). Information technology and the search for organizational agility: A systematic review with future research possibilities. *The Journal of Strategic Information Systems*, *28*(2), 218–237. doi:10.1016/j.jsis.2018.12.002
Tan, F. T. C., Guo, Z., Cahalane, M., & Cheng, D. (2016). Developing business analytic capabilities for combating e-commerce identity fraud: A study of Trustev's digital verification solution. *Information & Management*, *53*(7), 878–891. doi:10.1016/j.im.2016.07.002
Tarafdar, M., Gupta, A., & Turel, O. (2013). The dark side of information technology use. *Information Systems Journal*, *23*(3), 269–275. doi:10.1111/isj.12015
Teece, D. J. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of Enterprise Performance. *Strategic Management Journal*, *28*(13), 1319–1350. doi:10.1002/smj.640
Teece, D. J. (2012). Dynamic Capabilities: Routines versus Entrepreneurial Action. *Journal of Management Studies*, *49*(8), 1395–1401. doi:10.1111/j.1467-6486.2012.01080.x
Teece, D. J. (2014). A Dynamic Capabilities-Based Entrepreneurial Theory of the Multinational Enterprise. *Journal of International Business Studies*, *45*(1), 8–37. doi:10.1057/jibs.2013.54
Teece, D. J. (2016). Dynamic capabilities and entrepreneurial management in large organizations: Toward a theory of the (entrepreneurial) firm. *European Economic Review*, *86*, 202–216. doi:10.1016/j.euroecorev.2015.11.006
Teece, D. J. (2018a). Business Models and Dynamic Capabilities. *Long Range Planning*, *51*(1), 40–49. doi:10.1016/j.lrp.2017.06.007
Teece, D. J. (2018b). Dynamic capabilities as (workable) management systems theory. *Journal of Management & Organization*, *24*(3), 359–368. doi:10.1017/jmo.2017.75
Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, *18*(7), 509–533. doi:10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z
Tench, R., Sun, W., & Jones, B. (2014). Introduction: CSR Communication as an Emerging Field of Study. In *Communicating Corporate Social Responsibility: Perspectives and Practice* (Vol. 6, pp. 3–21). Emerald Group Publishing Limited. doi:10.1108/S2043-9059(2014)0000006025
Teo, T. S. H., Nishant, R., & Koh, P. B. L. (2016). Do shareholders favor business analytics announcements? *The Journal of Strategic Information Systems*, *25*(4), 259–276. doi:10.1016/j.jsis.2016.05.001
Tilson, D., Lyytinen, K., & Sørensen, C. (2010). Research Commentary—Digital Infrastructures: The Missing IS Research Agenda. *Information Systems Research*, *21*(4), 748–759. doi:10.1287/isre.1100.0318
Tokic, D. (2018). BlackRock Robo-Advisor 4.0: When artificial intelligence replaces human discretion. *Strategic Change*, *27*(4), 285–290. doi:https://doi.org/10.1002/jsc.2201
Torres, R., Sidorova, A., & Jones, M. C. (2018). Enabling firm performance through business intelligence and analytics: A dynamic capabilities perspective. *Information & Management*, *55*(7), 822–839. doi:10.1016/j.im.2018.03.010
Trinh, T., Molla, A., & Peszynski, K. (2012). Enterprise Systems and Organizational Agility: A Review of the Literature and Conceptual Framework. *Communications of the Association for Information Systems*, *31*(1). Retrieved from http://aisel.aisnet.org/cais/vol31/iss1/8
Venable, J., Pries-Heje, J., & Baskerville, R. (2016). FEDS: a framework for evaluation in design science research. *European journal of information systems*, *25*(1), 77–89.
Venters, W., Oborn, E., & Barrett, M. (2014). A Trichordal Temporal Approach to Digital Coordination: The Sociomaterial Mangling of the Cern Grid. *MIS Quarterly*, *38*(3), 927-A18.
Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118–144. doi:10.1016/j.jsis.2019.01.003
Vidgen, R., Mortenson, M., & Powell, P. (2019). Invited Viewpoint: How well does the Information Systems discipline fare in the Financial Times' top 50 Journal list? *The Journal of Strategic Information Systems*, *28*(4), 101577. doi:10.1016/j.jsis.2019.101577
Wade, M., & Hulland, J. (2004). The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research. *MIS Quarterly*, *28*(1), 107–142.
Wall, L. D. (2018). Some Financial Regulatory Implications of Artificial Intelligence. *Journal of Economics and Business*, *100*, 55–63. doi:10.1016/j.jeconbus.2018.05.003
Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, *70*(Supplement C), 356–365. doi:10.1016/j.jbusres.2016.08.009
Wang, E. T. G., Hu, H., & Hu, P. J.-H. (2013). Examining the role of information technology in cultivating firms' dynamic marketing capabilities. *Information & Management*, *50*(6), 336–343. doi:10.1016/j.im.2013.04.007
Wang, G., Dou, W., Zhu, W., & Zhou, N. (2015). The effects of firm capabilities on external collaboration and performance: The moderating role of market turbulence. *Journal of Business Research*, *68*(9), 1928–1936. doi:10.1016/j.jbusres.2015.01.002
Warner, K. S. R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, *52*(3), 326–349. doi:10.1016/j.lrp.2018.12.001
Webster, J., & Watson, R. T. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, *26*(2), xiii–xxiii.
Wei, H., & Wang, E. T. G. (2010). The Strategic Value of Supply Chain Visibility: Increasing the Ability to Reconfigure. *European Journal of Information Systems*, *19*(2), 238–249. doi:http://dx.doi.org/10.1057/ejis.2010.10
Wiener, M., Mahring, M., Remus, U., & Saunders, C. (2016). Control Configuration and Control Enactment in Information Systems Projects: Review and Expanded Theoretical Framework. *Management Information Systems Quarterly*, *40*(3), 741–774.
Wilden, R., Devinney, T. M., & Dowling, G. R. (2016). The Architecture of Dynamic Capability Research Identifying the Building Blocks of a Configurational Approach. *The Academy of Management Annals*, *10*(1), 997–1076. doi:10.1080/19416520.2016.1161966
Wilden, R., Gudergan, S. P., Nielsen, B. B., & Lings, I. (2013). Dynamic Capabilities and Performance: Strategy, Structure and Environment. *Long Range Planning*, *46*(1), 72–96. doi:10.1016/j.lrp.2012.12.001
Winter, S. G. (2003). Understanding Dynamic Capabilities. *Strategic Management Journal*, *24*(10), 991–995. doi:10.1002/smj.318
Wolf, M., Beck, R., & Pahlke, I. (2012). Mindfully Resisting the Bandwagon: Reconceptualising IT Innovation Assimilation in Highly Turbulent Environments. *Journal of Information Technology*, *27*(3), 213–235. doi:http://dx.doi.org/10.1057/jit.2012.13

Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. M. (2011). Using Grounded Theory as a Method for Rigorously Reviewing Literature. *European Journal of Information Systems*, 1–11. doi:10.1057/ejis.2011.51

Woodside, A. G. (2013). Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory. *Journal of Business Research*, *66*(4), 463–472.

Wu, L.-Y. (2006). Resources, dynamic capabilities and performance in a dynamic environment: Perceptions in Taiwanese IT enterprises. *Information & Management*, *43*(4), 447–454. doi:10.1016/j.im.2005.11.001

Wu, L.-Y. (2010). Applicability of the resource-based and dynamic-capability views under environmental volatility. *Journal of Business Research*, *63*(1), 27–31. doi:10.1016/j.jbusres.2009.01.007

Xiao, X., Califf, C. B., Sarker, S., & Sarker, S. (2013). ICT Innovation in Emerging Economies: A Review of the Existing Literature and a Framework for Future Research. *Journal of Information Technology*, *28*(4), 264–278. doi:10.1057/jit.2013.20

Yasmin, M., Tatoglu, E., Kilic, H. S., Zaim, S., & Delen, D. (2020). Big data analytics capabilities and firm performance: An integrated MCDM approach. *Journal of Business Research*, *114*, 1–15. doi:10.1016/j.jbusres.2020.03.028

Youndt, M. A., Snell, S. A., Dean Jr, J. W., & Lepak, D. P. (1996). Human resource management, manufacturing strategy, and firm performance. *Academy of management Journal*, *39*(4), 836–866.

YoungKi Park, El Sawy, O. A., & Fiss, P. C. (2017). The Role of Business Intelligence and Communication Technologies in Organizational Agility: A Configurational Approach. *Journal of the Association for Information Systems*, *18*(9), 648–686.

Yu, Y., Dong, X.-Y., Shen, K. N., Khalifa, M., & Hao, J.-X. (2013). Strategies, technologies, and organizational learning for developing organizational innovativeness in emerging economies. *Journal of Business Research*, *66*(12), 2507–2514. doi:10.1016/j.jbusres.2013.05.042

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda*. *Journal of Management Studies*, *43*(4), 917–955. doi:10.1111/j.1467-6486.2006.00616.x

Zardini, A., Rossignoli, C., & Ricciardi, F. (2016). A bottom-up path for IT management success: From infrastructure quality to competitive excellence. *Journal of Business Research*, *69*(5), 1747–1752. doi:10.1016/j.jbusres.2015.10.049

Zhu, K., & Kraemer, K. L. (2002). E-Commerce Metrics for Net-Enhanced Organizations: Assessing the Value of E-Commerce to Firm Performance in the Manufacturing Sector. *Information Systems Research*, *13*(3), 275–295.

Zollo, M., & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, *13*(3), 339–351. doi:10.1287/orsc.13.3.339.2780

Zott, C., & Amit, R. (2010). Business Model Design: An Activity System Perspective. *Long Range Planning*, *43*(2–3), 216–226. doi:doi: DOI: 10.1016/j.lrp.2009.07.004

Zuboff, S. (2015). Big Other: Surveillance Capitalism and the Prospects of an Information Civilization. *Journal of Information Technology*, *30*(1), 75–89. doi:10.1057/jit.2015.5

APPENDIX A: OTHER REVIEWS OF DYNAMIC CAPABILITIES

Table 5
Comparison to other Reviews of DCs

Review Features / Review Paper Title	Author(s), Year	Journal	Context	Timeframe of Analyzed Articles	#Articles Reviewed	#Articles from Typical IS Outlets	Review Type (Paré et al., 2015; Schryen et al., 2020)	Inclusion of Any IT Aspect
This review			DCs in IS research (focused)	1998-2020	136	106 from IS outlets 30 focused on IS from management outlets	Critical	Yes (in-depth focus on IT artifact and its critical interrelations with DCs)
Dynamic capabilities: A review and research agenda	C.L. Wang, P.K. Ahmed, 2007	International Journal of Management Reviews	DCs in management (general)	1995-2005	32	0	Narrative	No
What are dynamic capabilities and are they a useful construct in strategic management?	V. Ambrosini, C. Bowman, 2009	International Journal of Management Reviews	DCs in management (general)	n/a (must be before 2009)	n/a	0	Critical	No
Dynamic Capabilities: A Review of Past Research and an Agenda for the Future	I. Barreto, 2010	Journal of Management	DCs in management (general)	1997-2007	40	0	Critical	No
Methodological issues in dynamic capabilities research – a critical review	T. Eriksson,2013	Baltic Journal of Management	DCs in management (general)	1991- 2009	142	7	Qualitative Systematic	No
Processes, antecedents and outcomes of dynamic capabilities	T. Eriksson, 2014	Scandinavian Journal of Management	DCs in management (general)	1991-2009	142	6	Qualitative Systematic	No
Dynamic capabilities: a systematic literature review of theory and practice	K.-M. Gremme, V. Wohlgemuth, 2017	European Journal of Management Issues	DCs in management (general)	1997-2014	20	1	Qualitative Systematic	No
Quo Vadis, Dynamic Capabilities? A content-analytic review of the current state of knowledge and recommendations for future research	O. Schilke, S. Hu, C. E. Helfat, 2018	Academy of Management Annals	DCs in management (general)	2008-2016	298	10	Theoretical	No
Identifying and assessing the scales of dynamic capabilities: a systematic literature review	C. C. S. de Araújo, C. D. Pedron, C. Bitencourt, 2018	Revista de Gestão	DCs in management (general)	2005-2016	42	0	Qualitative Systematic	No
Dynamic capabilities and entrepreneurial management: A review of selected works of David J. Teece	H. Karadag, 2019	Journal of Social and Administrative Sciences	DCs in management (general)	1994-2017	7 papers by D.J. Teece	0	Descriptive	No
Understanding dynamic capabilities through knowledge management	A. P. Nielsen, 2006	Journal of Knowledge Management	DCs in knowledge management (focused)	n/a (must be before 2006)	n/a	1	Theoretical	No
Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda	S. A. Zahra, H. J. Sapienza, P. Davidsson, 2006	Journal of Management Studies	DCs in Entrepreneurship (focused)	2002-2006	28	3	Theoretical	No
Managerial processes: an operations management perspective towards dynamic capabilities	U. S. Bititcia, F. Ackermann, A. Atesa, J.D. Daviesc, S. Gibbd, J. MacBrydeb, D. Mackaya, C. Maguirea, R. van der	Production Planning & Control	DCs in business processes (focused)	1990-2008	Approx. 130	1	Qualitative Systematic	No

	Meerb, F. Shaftib, 2010							
Dynamic capabilities and sustainable supply chain management	P. Beske, 2012	International Journal of Physical Distribution & Logistics Management	DCs in supply chain management (focused)	2008-2010	n/a	0	Theoretical	No
Dynamic Capabilities in Public Organizations: A literature review and research agenda	E.P. Piening, 2013	Public Management Review	DCs in Public Management (focused)	2001-2011	16	2	Theoretical	No
Building knowledge: developing a knowledge-based dynamic capabilities typology	J.S. Denford, 2013	Journal of Knowledge Management	DCs in knowledge management (focused)	1997-2011	n/a	1	Theoretical	No
Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature	P. Beske, A. Land, S. Seuring, 2014	International Journal of Production Economics	DCs in supply chain management (focused)	2002-2011	52	0	Critical	No
Dynamic capabilities vs. innovation capability: are they related?	L. Breznik, R.D. Hisrich, 2014	Journal of Small Business & Enterprise Development	DCs in innovation (focused)	1994-2009	n/a	0	Qualitative Systematic	No
Dynamic Managerial Capabilities: Review and Assessment of Managerial Impact on Strategic Change	C.E. Helfat, J.A. Martin, 2015	Journal of Management	DCs in Managerial Capabilities (focused)	1980-2013	104	0	Theoretical	No
Sustainability as a dynamic organizational capability: A systematic review and a future agenda toward a sustainable transition	L.B. Liboni, C.J. Chiappetta Jabbour, A. Jabbour, K. Devika, 2016	Journal of Cleaner Production	DCs in sustainability (focused)	2005-2015	33	1	Systematic	No
Microfoundations of dynamic capabilities for innovation: a review and research agenda	L. Fallon-Byrne, B. Harney, 2017	Irish Journal of Management	DCs in innovation (focused)	no hint	n/a	0	Narrative	No
A dynamic capabilities perspective on managing technological change: a review, framework and research agenda	S. Konlechner, B. Müller, W.H. Güttel, 2018	International Journal of Technology Management	DCs in technological change management (focused)	1990-2014	86	2	Qualitative Systematic	Yes (IT hidden in concept of "technology management")
Dynamic information technology capability: Concept definition and framework development	T.C. Li, Y.E. Chan, 2019	Journal of Strategic Information Systems	DCs in IT resource management (focused)	2000-2018	79	50 Senior Scholars' Basket, 29 practitioner outlets	Theoretical	Yes (develops an IT business unit DC for digital platforms, IT management, and IT knowledge management)
Big data and dynamic capabilities: a bibliometric analysis and systematic literature review	R. Rialti, G. Marzi, C. Ciappei, D. Busso, 2019	Management Decision	DCs enabled by Big Data (focused)	2007-2017	170	3 (in bibliography)	Qualitative Systematic	Yes (mostly bibliometric, narrow focus on big data)
Strategic alliances and dynamic capabilities: a systematic review	D. Mamédio, C. Rocha, D. Szczepanik, H. Kato, 2019	Journal of Strategy and Management	DCs in strategic alliances (focused)	1996-2016	36	1	Qualitative Systematic	No
Dynamic Capabilities in Media Management Research. A Literature Review	P.C. Murschetz, A. Omidi, J.J. Oliver, M.K. Saraji, S. Javed, 2020	Journal of Strategy and Management	DCs in media management (focused)	1997-2019	22	1	Qualitative Systematic	Yes (IT hidden in the concept of "digital disruption")

APPENDIX B: REVIEW APPROACH

Table 6
Searched Journals and Number of Articles Included in Review (adapted from: Currie et al., 2017; Roberts et al., 2012)

INFORMATION SYSTEMS JOURNALS	**#**	**MANAGEMENT JOURNALS**	**#**
The Senior Scholars' Basket Journals:		Academy of Management Journal (AMJ)	0
European Journal of Information Systems (EJIS)	9	Academy of Management Review (AMR)	1
Information Systems Journal (ISJ)	6	Administrative Science Quarterly (ASQ)	0
Information Systems Research (ISR)	12	Decision Sciences (DS)	6
Journal of Information Technology (JIT)	8	Journal of Business Research (JBR)	20
Journal of Management Information Systems (JMIS)	8	Journal of Management (JoM)	0
Journal of Strategic Information Systems (JSIS)	17	Management Science (MS)	0
Journal of the Association for Information Systems (JAIS)	6	Organization Science (OS)	2
MIS Quarterly (MISQ)	6	Strategic Management Journal (SMJ)	1
Additional IS journals:			
Communications of the AIS (CAIS)	5		
Decision Support Systems (DSS)	6		
Information & Management (I&M)	23		
Information and Organization (I&O)	0		
SUM	**106**		**30**

APPENDIX C: DEFINITIONS OF DYNAMIC CAPABILITIES

Table 7

Analysis of DC Definitions Adopted by IS Papers

SOURCE	DEFINITION	NATURE	OUTCOMES	# IS PAPERS
(Teece et al., 1997)	*"[T]he firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities thus reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions."*	Ability	Second-order outcomes (organizational performance) are included	33
(Teece, 2007)	*"[D]ynamic capabilities can be disaggregated into the capacity (a) to sense and shape opportunities and threats, (b) to seize opportunities, and (c) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets."*	Ability & Process	First- and second-order outcomes (organizational change and performance) are included	12
(Eisenhardt & Martin, 2000)	*"The firm's processes that use resources—specifically the processes to integrate, reconfigure, gain, and release resources—to match and even create market change; dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die."*	Process	First-order outcomes (organizational change) are included	8
(Helfat et al., 2009)	*"The capacity of an organization to purposefully create, extend, or modify its resource base."*	Ability	First-order outcomes (organizational change) are included	6
(Winter, 2003)	*"Defining ordinary or 'zero-level' capabilities as those that permit a firm to 'make a living' in the short term, one can define dynamic capabilities as those that operate to extend, modify or create ordinary capabilities."*	Ability	First-order outcomes (organizational change) are included	3
Zahra et al., 2006	*"[T]he abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision maker(s)."*	Ability	First-order outcomes (organizational change) are included	1
(Zollo & Winter, 2002)	*"[A] learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness."*	Process	First- and second-order outcomes (organizational change and performance) are included	1
Wade & Hulland, 2004	*"By acting as a buffer between core resources and the changing business environment, dynamic resources help a firm adjust its resource mix and thereby maintain the sustain-ability of the firm's competitive advantage, which otherwise might be quickly eroded."*	Process	First- and second-order outcomes (organizational change and performance) are included	1

APPENDIX D: OPERATIONALIZATION OF DYNAMIC CAPABILITIES

Table 8
Measures of Non-IT Embedded DCs

Context of Study	DC Underlying Capacities			Sample Items
	Sensing	Seizing	Transforming	
Impact of Intellectual Capital and Knowledge Management on Organizational Performance: The mediating role of **Dynamic Capabilities** (Hsu & Sabherwal, 2012)	X	X	X	(1) My company's employees have developed unique ways of collaboration to improve innovative capabilities of the company, (2) My company's employees are sensitized to environmental changes and respond to them, (3) My company's employees devote to improving the competitive position of the company in the industry, (4) My company's employees proactively participate in organizational change to help the company respond to environmental changes, (5) My company's employees continually innovative to make knowledge and capabilities of the company inimitable, (6) My company's employees continually innovate to rapidly accumulate knowledge assets of the company, (7) My company's employees integrate different areas of knowledge to improve innovations in products/services, (8) My company's employees devote to improving recognition of company name and reputation
Information Technology as a facilitator for enhancing **Dynamic Capabilities** through Knowledge Management (Sher & Lee, 2004)	X	X	-	(1) enhanced learning effectiveness of new knowledge, (2) enhanced decision quality, (3) enhanced capabilities of communication and coordination, (4) enhanced responsiveness, (5) enhanced integration in new product development, (6) enhanced accumulation of knowledge, (7) enhanced capabilities of resource deployment, (8) enhanced customer relationships, (9) enhanced trust with vendors, (10) enhanced unimitability of strategic asset
Resources, **dynamic capabilities** and performance in a dynamic environment (Wu, 2006)		X	X	(1) Resource integration capability (insufficient-sufficient), (2) resource reconfiguration capability (insufficient-sufficient), (3) learning capability (slow-fast), (4) ability to respond to the rapidly changing environment (slow-fast)

Table 9
Measures of IT-Embedded DCs

DC	DC Underlying Capacities			Sample Items
	Sensing	Seizing	Transforming	
IoT Capabilities (Côrte-Real et al., 2020)		X	X	The available IoT data within our organization's business processes … (1) … exposes the problematic aspects of current business processes and makes stakeholders aware of them. (2) … provides valuable input for assessing business processes against standards, for continuous process improvement programs, and for business process change projects. (3) … stimulates innovation in internal business processes and external service delivery. (4) …The IoT data reduce uncertainty in the decision-making process, enhance confidence and improve operational effectiveness. (5) …The IoT data enable us to rapidly react to business events and perform proactive business planning. (6) … We are using the information provided to make changes to corporate strategies and plans, modify existing KPIs, and analyze newer
Business Intelligence and Analytics DC (Torres et al., 2018)	X	X	X	Operationalized as higher-order construct with 3 dimensions: <u>Business Intelligence &Analytics Sensing Capability</u> *Sensing Internal*: Our BI&A capabilities allow our company to… (1) detect opportunities for improved efficiency or effectiveness in the company (2) sense the need to enhance the way our business works (3) be more aware of internal opportunities and threats (4) identify inefficiencies in existing business processes *Sensing External*: Our BI&A capabilities allow our company to… (5) sense opportunities and threats in the environment (6) identify opportunities for organizational change based on market conditions (7) be more aware of our environment (8) foresee a wide range of actionable options based on its surroundings <u>Business Intelligence &Analytics Seizing Capability</u> *Shared Understanding:* When an opportunity or threat is identified using BI&A, our company can… (1) develop agreement among relevant stakeholders about the response (2) have relevant stakeholders agree on a response (3) get relevant stakeholders on the same page regarding the response (4) build consensus among relevant stakeholders for the response *Planning*: When an opportunity or threat is identified using BI&A, our company can… (5) develop a sound response plan (6) formulate an effective plan (7) create a strategy to capitalize on the situation (8) develop a viable action plan *Decision Making:* When an opportunity or threat is identified using BI&A, our company can… (9) be decisive about the course of action (10) make effective decisions about which course of action to pursue (11) quickly decide on the best course of action (12) decide on the appropriate course of action <u>Business Process Change Capability</u> When responding to opportunities and threats, our company can… (1) change its business processes in a timely manner (2) rapidly adapt its business processes to competitive changes (3) quickly reallocate resources among business processes (4) effectively combine existing resources within business processes (5) effectively change business processes (6) effectively reconfigure business processes

ABOUT THE AUTHORS

Dennis M. Steininger is an interim Associate Professor of Entrepreneurship and Digital Transformation at the Technical University of Kaiserlautern. Prior to this position, he was an Assistant Professor in Information Systems and Digital Entrepreneurship at the University of Augsburg. He received his Diploma in Management and his Ph.D. in Management and Information Systems from the University of Mannheim. Moreover, he is a research fellow of the Institute for SME and Entrepreneurship Research at the University of Mannheim. Before entering academia, he worked as an entrepreneur. His research combines these practical and academic interests and focuses on digital entrepreneurship and the digitalization of innovation and business models where he analyzes related impacts of capabilities, learning mechanisms, and success or failure. His work has been published in the *Journal of Management Information Systems, Information Systems Journal, Technological Forecasting and Social Change, Electronic Markets, e-Service Journal*, and others.

Patrick Mikalef is an Associate Professor in Data Science and Information Systems at the Department of Computer Science. He has been a Marie Skłodowska-Curie post-doctoral research fellow working on the research project “Competitive Advantage for the Data-driven Enterprise” (CADENT). He received his B.Sc. in Informatics from the Ionian University, his M.Sc. in Business Informatics for Utrecht University, and his Ph.D. in IT Strategy from the Ionian University. His research interests focus on the strategic use of data science and information systems in turbulent environments. He has published work in international conferences and peer reviewed journals including the *European Journal of Information Systems, British Journal of Management, Information and Management, and the European Journal of Operational Research*.

Adamantia Pateli is an Associate Professor of Management of Information Systems and Innovation at the Department of Informatics of the Ionian University, in Corfu, Greece. She also serves as chair of the recently funded Department of Tourism of the Ionian University.

She has a PhD on strategic technology alliances from the Department of Management Science and Technology of the Athens University of Economics and Business. Dr. Pateli has participated in a number of national and European funded research projects in the areas of Electronic Commerce and Information Systems. She has published her research in leading academic journals, such as *Information & Management, R&D Management, Journal of Business Research, European Journal of Information Systems*, and *Management Decision*. Her current research interests lie in the areas of digital innovation and transformation, crowdsourcing, business ecosystems, multi-sided digital platforms and open innovation.

Ana Ortiz de Guinea is an Associate Professor at HEC Montréal where she holds the Professorship in Strategy and Management of Information Systems, and a Distinguished Research Professor at the University of Exeter Business School. She holds a 5-year BSc in Computer Engineering from the Universidad de Deusto, a MSc in Management from the University of Lethbridge, and a PhD in Management and Information Systems from Queen's University. Before entering academia, she also worked as an information systems consultant for several years. Her research interests include the application of data analytics as well as the adoption, use, and impacts of data analytics and Information Systems in individuals, groups, and organizations. Her research has been published in top tier journals such as *MIS Quarterly*, the *Journal of Management Information Systems*, the *Journal of the Association for Information Systems*, and the *European Journal of Information Systems*.