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Dynamic Capabilities in Information Systems Research – A Literature Review

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Abstract. Information systems (IS) and digital business strategies are increasingly focal to companies navigating the changing modes of working, collaborating and operating in various networked business settings. Dynamic capabilities (DCs) are often asserted as a key for companies' attaining sustainable competitive advantage in turbulent and uncertain environments. However, the construct of DCs is utilized in multifarious ways and often researched primarily from a managerial perspective. This makes comprehensive, empirical study of DC development in organizations amorphous and difficult. To address this issue, based on a semi-structured literature review, this paper investigates how DCs are conceptualized in strategic IS literature. Further, the aim is to understand to what extent they have been studied empirically with a multilevel perspective. Firstly, the findings suggest terminology used in defining and explaining DCs is interlaced and tangled. Secondly, the findings point that the suspected gap in multilevel research on DCs within the IS field exists.

Keywords: Dynamic Capabilities, Strategic Information Systems, Digital Business Strategy, Literature Review, Conceptualization, Multilevel Research.

1 Background

It is well known that diverse and profound changes have taken and do take place in organizations' operational environments. The continued evolution and disruption driven by technological advancements create digital business infrastructures and novel connections "among products, processes and services". Traditional business strategies are increasingly pushed towards "modular, distributed, cross-functional, and global" forms exposed to global competition. [1, pp. 471-472] Therefore, the motivation and background for this literature review lie in the aspiration to understand how organizations can develop their capabilities for more nimble and competitive business strategies in the digital age (cf. [1]).

The "ways of working, communicating" and collaborating transform (cf. [2, p. 149]), as knowledge intensive work is conducted over temporal, physical and functional

boundaries within dynamic partnerships and sourcing strategies [3] [4] [5] [6]. Capabilities are no longer utilized and developed within company boundaries but across inter-firm networks [1] [7] [4]. These changes create new organizational capability requirements for information systems (IS) strategizing and utilization to attain sustainable competitive advantage (cf. [8] [9]). New demands for agility and performance unfold involving the management of critical capabilities, resources and relationships for both setting strategic directions and implementing actions to align with a moving target [6] [10]. The dynamic capabilities (DCs) approach together with an IS strategy perspective seems particularly appropriate a lens to investigate this problem domain [11] [1] in the intersection of IS, organization and strategic management research. In this review, the main contribution is aimed at the IS literature.

Today IS and digital operations are pervasive in organizations. Organizational capabilities and capability requirements, such as realizing changing customer needs and responding with new services, are influenced by and shape IS strategizing and utilization, central to sustainable competitive advantage. [8] [9] In this light, it is essential to understand organizational capability development processes [12] across multiple organizational levels, such as operational/strategic, team/organization or across units, to support competitive digital business/IS strategy work. [1] [13]

The existing IS strategy and competitive advantage research are distinguished. However, based on initial literature scoping, four premises emerged. Firstly, capabilities are overall “messy” to study [9, p. 5]. Secondly, they thus far comprise relatively little empirical research [9]. Thirdly, DCs in pursuit of competitive advantage, performance and agility are conceptualized in multifarious ways (e.g. [11] [14] [15]). Lastly, DCs are commonly examined from the managerial perspective. [10] [9] [6] Based on these premises, the following primary and secondary research questions we set:

- 1) How are DCs conceptualized in strategic IS research?
- 2) To what extent have DCs been examined a) empirically, and b) with multilevel perspective within the IS field?

The dual-goal of the review is to provide a view to the current state of DC research within the IS field, and help to conceptualize DCs for an upcoming empirical research on organizational capability development processes in the context of digital business strategies [16]. The review was conducted in a semi-structured way aiming at a systematic process (cf. [17] [16] [18]) by utilizing the Scopus database. As findings, two dimensions of conceptualization are firstly presented: *Dynamic Capabilities Relative to Organizations' State and Environment* and *Dynamic Capabilities as Organizations' Attributes and Actions*. Secondly, the perceptible scarcity of empirical multilevel studies will be discussed.

Section 2 elaborates on the concepts of *IS strategy* and *DCs* as well as the claimed need for multilevel research. Section 3 describes the method and analysis process. Section 4 presents the findings as tables and figures. Section 5 discusses the findings, and finally, Section 6 concludes with contributions, implications, limitations and further research.

2 Theoretical Basis

Means of attaining sustainable competitive advantage, which is often IS-enabled today, have been of interest and in the center of debate within strategic management field for a long time (e.g. [19]). Sustainable competitive advantage is also chosen as the umbrella perspective for this study, as it covers overarching elements from IS, organization and strategic management in a multidisciplinary way (e.g. [11] [14] [9]).

Within strategic IS research, the related concepts of *IS strategy*, *strategizing* and *aligning* [9] [10] are central to our problem domain. IS strategy is here understood as “the developmental path [...] to achieve the business objectives related to IS”, whereas strategizing refers to the process of strategic planning [8, p. 66.21]. Aligning constitutes organizational (strategic) adjusting “in various dimensions and [...] levels” [10, p. 137]. Ongoing convergence of business and IT strategies is noted by adopting the term *digital business strategy* [1].

Further, *IS capability* is asserted to have a significant impact on organizational performance [20] and defined as the “ability to acquire, deploy, and leverage [a firm’s] IT resources to shape and support its business strategies and value chain activities” [8, p. 66.21]. We appreciate IS capability as pervasive (cf. [1] [8]), and interwoven with other key capabilities shaped of the resources and competencies at the disposal of an organization [20]. Therefore, the decision to adopt a holistic understanding of DCs was taken, instead of limiting the examination to *IS capability* per se.

The resource-based view (RBV) [21] is often seen as a predecessor of the DCs approach [Teece et al., 1997 in [14]; [22]]. Even though vaunted as a driver for sustainable competitive advantage, its empirical investigations have been limited [9, p. 5]. RBV considers organizations’ internal, “firm-owned resources” as the main source of value creation and the key factor of performance and competitive advantage [22], which has evoked critique. The view assumes “relatively stable” industrial set-ups with defined industry boundaries. Therefore, RBV alone seems a limited lens for the current rapidly changing technology-enabled business environment. [22, p. 19]

The DC approach, on the other hand, addresses turbulent environments requiring constant assessing and realigning of strategic direction in order to sustain competitive advantage. Ordinary and dynamic capabilities are distinguished between: Ordinary capabilities consist of operational and administrative processes and practices. DCs are about sensing and seizing new business opportunities and transforming those into sustained competitive advantage. [23] More specifically, in Teece and colleagues’ latest work [11], DCs are said to mold “internal and external competences to address changing business environments”. The *sensing* capability assesses and identifies opportunities and threats in relation to customer needs. *Seizing* mobilizes resources to “address the needs and opportunities and capture value”. Finally, *transforming* refers to “continued renewal”. [11, p. 18]. *Ambidexterity* comes close to DCs. It is defined as a “capability to simultaneously explore knowledge to identify new opportunities, to identify new market opportunities and exploit knowledge, to capitalize on firms’ existing niches” [9, p. 6]. In this light, the aforementioned *IS capability* can represent either ordinary or dynamic type of capabilities.

On the contrary, Eisenhardt and Martin [14] have argued that DCs are actually ‘best practices’ and as such, easily imitable across organizations and incapable of yielding sustainable competitive advantage. The “resource configurations” enabled by DCs may

provide competitive advantage, but not “the capabilities themselves”. Therefore, “dynamic capabilities are necessary, but not sufficient, conditions for competitive advantage”. [14, p. 1106.]

Moving on to the multilevel issue, we draw from IS and organization research asserting organizations as complex systems (e.g. [24]). Organizations can be viewed on a continuum from “static, simple and predictable” to “dynamic and/or complex” (Volberda, 1996 in [25, p. 6]). Organizations are “open, non-linear systems, composed of many [...] partially connected components that interact with each other through a diversity of feedback loops”. Complexity arises from asymmetric temporal and physical interconnectivity and interdependence of entities, such as groups or organizations, within the system. Non-linearity stems from the relationships of the system elements networked in a way that “small changes in one location” may result in large changes within the overall system. [24, p. 133]

These complexity perspectives assume organizations in “a state of constant change”, “organizing [as] mutually interdependent process” and “actions and events non proportional” [26, p. 528]. As organizations are all but a “stable equilibrium” and behaviors in organizations rarely linear, systemic processes conducted by independent, correlating elements, such as organizational units or individuals [26, p. 528], research analyzing one organizational entity at a time may offer skewed results. Therefore, we suggest that studying capability development processes should not be disjointed by organizational sections, and that multilevel approach is endogenously appropriate, albeit challenging [27].

Finally, Figure 1 from the field of network research within manufacturing industry brings clarity to the relationship between resources, routines and capabilities of a company [Vuorinen, 2005 in [28]]. Even though the figure presents solidity in company boundaries as is typical of RBV, it effectively depicts a hierarchy between resource and capability related concepts. This presentation was found helpful and it will be referred back to when discussing the findings.

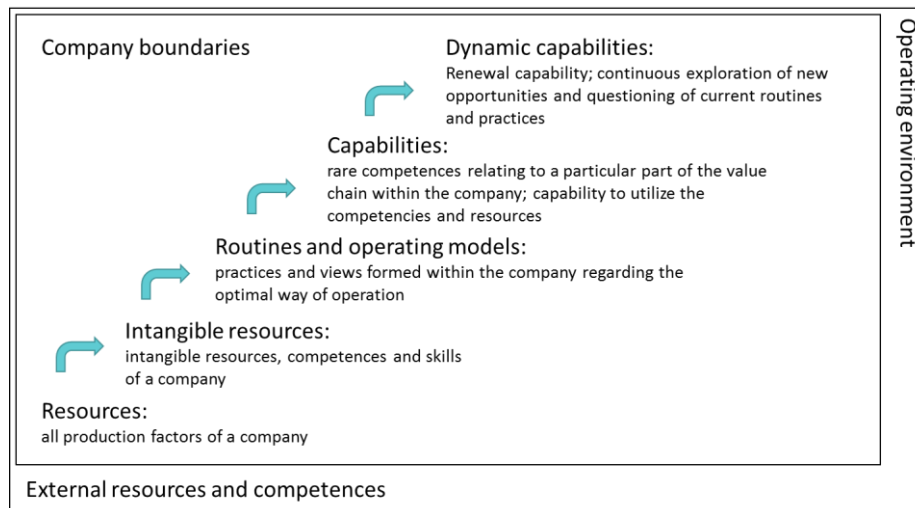


Fig. 1. Hierarchy between resource and capability attributes in organizations according to RBV [Adapted from Vuorinen, 2005 in [28]]

3 Method and Analysis

Even though a full-fledged systematic literature review [18] was beyond our limited scope, a systematic method, which is here called semi-structured, was aimed at. As guiding principles, the literature searches were constructed carefully and iteratively and each action was recorded in a search log (Appendix 1) in order to support repeatability and validity of the study. [29] [16] [17]

To achieve a viable enough result in balance with the resources available, the well-established Scopus abstract and reference database was chosen as the primary source. The initial plan was examine the 10 highest cited studies resulting from the following search:

```
TITLE-ABS-KEY ("information system* strategy" AND  
"dynamic capabilities" AND "multi-level")
```

The supposition was that this would provide a view to solid and most utilized prior research in the problem domain (cf. [30]). Instead, the search failed to return adequate results. Consequently, a more thorough scanning of appropriate search terms was executed. After several iterations, the central search string proved to be:

```
TITLE-ABS-KEY (("information system*" OR technolog*  
OR digital*) AND strateg* AND ("dynamic capabilit*"  
OR ambidext* OR "absorptive capacity"))
```

The search yielded 819 results by 30 March 2018. Alternative terms of *technology*, *digital*, *ambidexterity* and *absorptive capacity* were included to ensure articles from neighboring studies to IS, such as technology intensive production research or supply chain management, were accounted for. The terms *multi* and *multi-level* were considered unsuitable, as the latter failed to give relevant results and the first was too broad. After pre-scanning the above-described set and results from similar searches, the findings started to saturate. Articles in the same special issues, by the same authors and articles previously read began to appear.

The search results were first skimmed based on titles and abstracts. Depending on the size of a particular result set, either the most relevant ones of all, or the most relevant ones of the top 100 cited and most relevant of the newest records were imported for further analysis in Mendeley reference library. After removing duplicate hits from Mendeley, 69 articles were left in total. Finally, those were studied more closely to identify the most relevant ones for deeper analysis containing the aspects of 1) information systems or related areas, such as technology implementation, 2) strategy and 3) dynamic capabilities or related areas, such as ambidexterity.

The number of articles to be selected for deeper analysis in this review was set at a minimum of 10, but in the end, 13 were included based on relevance. The judgement of whether to include an article or not, was based on the title and abstract, or, in case of uncertainty, the overall quality of the publication and journal. Articles previously utilized in the Background and Theoretical Basis sections were omitted, as the aim was specifically to provide further insights on the topic from the IS perspective.

The selected 13 articles were analyzed and their central elements, the journal, area of concern, motivation/premise, research problem, type and method, contributions,

conclusions and number of citations, were identified [16]. Additionally, it was confirmed that all the articles had an IS or related focus. Next, the articles' conceptualizations of DCs and possible multilevel focus were extracted. Finally, Atlas.ti-software was utilized to code inductively [31] the extracted conceptualizations of DCs for easier aggregation. Codes were assigned by analyzing each of the extracts, and identifying their central, defining terms. The codes were then categorized in an open manner in the aim to synthesize the analysis. The following section summarizes the findings as tables and figures.

4 Findings

Presentation of the findings begins by summarizing the reference, study context and the number of citations of each article in the sample (Table 1). The number of citations is included to depict the current recognition of the article within the scientific community.

Table 1. Summary of analyzed literature.

No.	Ref.	Study context	Citations
1	[32]	Role of ITs as a platform for organizational (dynamic) capabilities and strategic processes.	1299
2	[33]	How the effective use of IT functionalities by business units helps build competitive advantage.	555
3	[34]	Relationship between IT and firm innovation in the light of absorptive capacity.	143
4	[35]	Review of absorptive capacity literature in IS.	135
5	[36]	Digital ecodynamics as interactions of environmental turbulence, dynamic capabilities, and IT.	122
6	[37]	How IT investments enable dynamic supply chain collaboration capability and influence firm performance.	108
7	[38]	Sources and interrelationships of flexibility and their relation to IT value.	86
8	[39]	IT activities' roles and performance implications in functional- and business-level strategies.	69
9	[40]	How process management practices affect organizational response to technological change through new product development.	52
10	[41]	Alignment between IT and business strategies; intended and implemented strategic IT alignment.	50
11	[42]	Presents an aligning process model viewing organizational aligning actions as dynamic capacities.	0 (recent study)
12	[43]	How IT application orchestration as a dynamic capability impacts firm performance.	0 (recent study)
13	[44]	The role of dynamic capabilities theory and performance measurement approaches in alignment between business and technology strategies and operational routines and practices.	0 (recent study)

The first research question, of how DCs are conceptualized in strategic IS research, is addressed in Table 2 by summarizing the extracted conceptualizations from each article (cf. presentation by [17] and [35]).

Table 2. Conceptualizations of DCs in the sample literature.

#	Conceptualization excerpts (Sources used in an alphabetical order, see Appendix 2)
1	Capability building mechanisms; “[...] firms' ability to integrate, build, and reconfigure internal and external resources in creating the higher-order capabilities [...] embedded in [...] social, structural, and cultural context” (Eisenhardt and Martin, 2000; Grant, 1995; Teece et al., 1997) [32]
2	“[S]trategic processes [...] to shape functional competencies”. “[A]bility to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments”; “strategic options, which allow firms to shape their existing functional competencies [...]”; “reconfiguring ineffective functional competencies and shaping more promising ones that better match the environment, better, faster, and cheaper than the competition.” (Eisenhardt and Martin, 2000; Kogut and Zander, 1996; Teece et al., 1997) [33]
3	An antecedent for absorptive capacity: “[...] organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge can produce dynamic capabilities”. (Cohen and Levinthal, 1990; Mowery and Oxley, 1995; Kim, 1997a, b; Zahra and George 2002) [34]
4	“[T]he capacity of an organization to purposefully create, extend, or modify its resource base.” “When conceptualized as a dynamic capability, a firm’s absorptive capacity affects its ability to reconfigure its existing substantive capabilities.” (Helfat et al., 2007; Lichtenthaler, 2009; Pavlou and El Sawy, 2006) [35]
5	By dimensions of sensemaking, responding and pro-acting, and learning capabilities (in Online Appendix A). (Cohen and Levinthal, 1990; Covin and Slevin, 1990; Ferrier et al., 1999; Grewal and Tansuhaj, 2001; Im and Rai, 2008; Jaworski and Kohli, 1993; Kogut and Zander, 1992; Malhotra et al., 2007; Overby et al., 2006; Pavlou and El Sawy, 2010; Sambamurthy et al., 2003; Sull, 2009; Weick, 1999) [36]
6	An approach within the resource-based view: “[...] emphasizes the need to transform [...] resources into a dynamic capability [...] to achieve superior performance in a rapidly changing environment. [Can support achieving] high levels of competitive advantage.” (Zhu and Kraemer, 2002) [37]
7	An extension of resource based view. “Change-oriented capabilities allow firms to re-configure and redeploy their resources to meet demands. [...] a firm can reallocate its existing capabilities and underlying resources to support a new set of business requirements”. (Teece et al., 1997) [38]
8	“[...] acquiring, integrating, reconfiguring, and/or releasing resources that produce a “first-order change” in the organization to match or create market change.” “[T]he flexibility to focus on rapidly changing opportunities or to abandon losing initiatives [...]”. “[...] act on other existing competences to layer, align, and manage the firm’s abilities to adapt to change in the marketplace”. (Amit and Schoemaker, 1993; Drnevich and Kriauciunas, 2011; Eisenhardt and Martin, 2000; Galunic and Rodan, 1998; Teece et al., 1997; Winter, 2003) [39]
9	“[...] patterned, collective activities systematically focused on improving operating processes and routines”. “A dynamic capability is often defined ex ante as a higher-order systematic organizational practice [to improve] routines and capabilities.” However, asserts that “codification and routinization are not dynamic capabilities” in themselves. (Dosi et al., 2000; Eisenhardt and Martin, 2000; Levinthal, 2000; Teece et al., 1997; Winter, 2003; Zollo and Winter, 2002) [40]

10	“[...] critical for the creation and strength of IT resources, positively influence the alignment process and its future implementation success”. “[...] limited by a firm’s existing resources and is shaped by its current market position and history of developing past resources.” “[...] emphasizes the capacity to renew competences to achieve congruence with changing environments. [...] further defined as a set of specific and identifiable processes, [...] the antecedent organizational and strategic routines to create, adapt and combine other resources into new sources of competitive advantage.” (Bhatt and Grover, 2005; Eisenhardt and Martin, 2000; Grant, 1996; Montealegre, 2002; Teece et al., 1997; Winter, 2003; Zollo and Winter, 2002) [41]
11	“[...] actions taken by organizations to change their resources [...] to adapt to changing environments”, includes “sensing, seizing, and transforming dynamic capacities [...]”. “[...] concerned with strategic change” and “processes by which organizations [...] change their resources and routines [and] products and services [for] changing environment.” “[...] broad organizational capacities and specific actions that work together [...]” (Daniel et al., 2014; Di Stefano et al. 2014; Eisenhardt and Martin, 2000; Helfat et al., 2007; Helfat and Peteraf, 2009; Koch, 2010; Peteraf et al., 2013; Smith and Lewis, 2011; Teece et al., 1997; Teece, 2007, 2014) [42]
12	Viewed through IT application orchestration dynamic capability. Linked to agility, dexterity, adaptation and renewal. However, the paper refrains from explicitly defining dynamic capabilities. (Sirmon and Hitt, 2009; Sirmon et al., 2007; Teece, 2007; Wang et al., 2012) [43]
13	“[...] is developed from a nexus of the Resource-based View and organizational learning theory [...]”. “[O]rganisational routines” for dynamic alignment, resources reconfiguration to respond to changes. Categories: leveraging, learning, reconfiguration, integration within the dimensions of renewal and incremental. (Ambrosini et al., 2009; Barreto, 2010; Helfat and Winter, 2011; Janssen et al., 2016; Teece et al., 1997) [44]

Further, findings by the analysis conducted with Atlas.ti software are shown in Figures 2-5: Altogether, 37 codes grouped into 18 categories were identified. Each code was assigned to a paper once to avoid skewing the results by duplicate hits, but each code can appear in multiple categories. The high number of categories illustrates that this is still early work, as a more concise categorization would be beneficial for better synthesis (cf. [31] [45]). However, already in this analysis, two dimensions of conceptualizations emerged:

- 1) Dynamic Capabilities as Relative to Organizations’ State and Environment, and
- 2) Dynamic Capabilities as Organizations’ Attributes and Measures.

Figures 2 and 3 summarize the findings in the first dimension, and Figures 4 and 5 in the second.

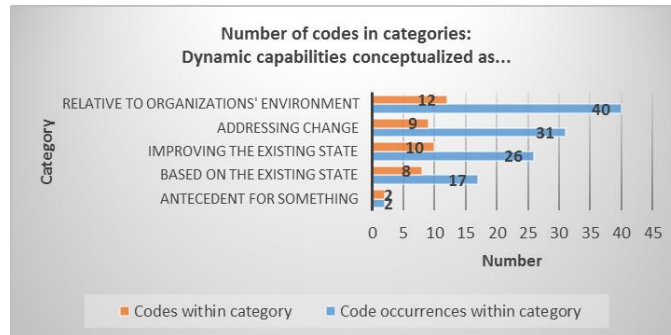


Fig. 2. Number of codes in categories: The dimension of ‘Dynamic Capabilities as Relative to Organizations’ State and Environment’.

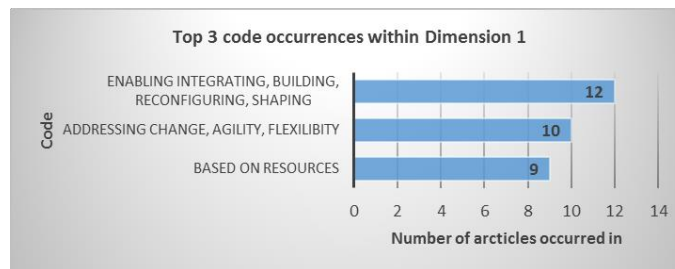


Fig. 3. Top 3 most occurred codes: The dimension of ‘Dynamic Capabilities as Relative to Organizations’ State and Environment’.

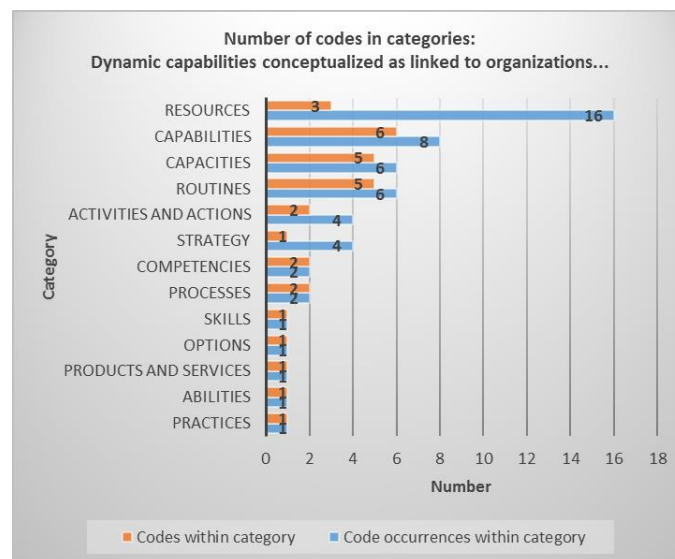


Fig. 4. Number of codes in categories: the dimension of ‘Dynamic Capabilities as Organizations’ Attributes and Measures’.

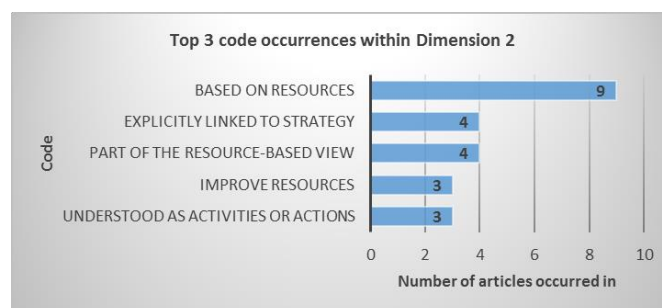


Fig. 5. Top 3 most occurred codes: the dimension of ‘Dynamic capabilities as linked to organizations’ attributes and measures’.

Turning towards our secondary research question, of to what extent DCs have been studied empirically with a multilevel perspective, our sample is in line with the supposition based on the initial literature scoping: Few empirical multilevel studies were identified within the sample. Even though quantitative conclusions cannot be drawn from such a qualitative and limited data, for transparency, some figures are presented to support the claim: Nine (9) out of thirteen (13) papers in the analyzed material represent some form of empirical research (as opposed to theorizing) with collected data, such as case study, survey or field experiment. Of those nine, five (5) acknowledge or discuss their research topic as an issue touching multiple organizational levels, three (3) of which represent the latest research from 2017-2018. However, only one (1) of the papers discusses multiple level issues explicitly within research objectives and design. These findings and their implications will be further discussed next.

5 Discussion

The findings presented in Figures 2-5 show that the articles fairly unanimously conceptualize dynamic capabilities as based on organizations’ resources and as enabling, integrating, building, reconfiguring or shaping the organization and addressing change. Several further observations are discussed in the following paragraphs.

Addressing the first research question, in defining the construct of DCs authors interlace multiple concepts firstly relating to attributes that a firm *possesses*, such as skills, competencies, abilities, capacities, capabilities and options. These are used both as the basis of DCs and as object of development as a result or by the means of DCs. Secondly, dynamic capabilities are seen as something that a firm *does*: actions and activities, practices, processes and routines. Similarly, these either act a part in forming DCs, or are improved through or with DCs. Most of the analyzed papers (9) took the stance that DCs are based on organizational resources.

Some authors link DCs to the RBV or otherwise firm-specific resources. However, only four (4) papers explicitly linked them to strategy or strategic routines, whereas most analyzed papers (10) did link them to change: the requirement of pro-activity, agility or flexibility of the company to integrate, build, reconfigure, shape or otherwise adjust (12 papers). Even though less than half (6 papers) mentioned the goal of beating

competition, addressing the need of change and readjusting already implies that organizations' environment is a prevalent motivator for the DC approach, which is also perceptible in Figure 2.

Most cited works by the authors in the sample were Teece et al., 1997 [46] (8 papers), Eisenhardt and Martin, 2000 [14] (6 papers) and Winter, 2003 [47] (3 papers). Overall, Teece was cited in 11 instances including his later works from 2007 [19] (2 papers) and 2014 [23] (1 paper) making him the most cited author in the sample. Two interesting points are here to note: First, Teece has continuously published on DCs with the notion of developing the theory. Yet, some authors refer to his older work, which may contain views that have later been updated. For instance, in Teece and colleagues latest work DCs have been defined through sensing, seizing and transforming [11]. In this sample, only one (1) paper explicitly adopts this view. Second, Teece [23] [19] and Eisenhardt and Martin [14] have engaged in a debate about the nature of DCs and whether they in fact create sustainable competitive advantage. On the one hand, it may seem contradictory to include both views in a conceptualization. On the other hand, inclusion of diverging views can make a definition more robust and applicable to multiple perspectives of organizational research.

The main deductions drawn from the analysis deal with the various concepts used to address what companies possess (such as skills, competencies, capacities), and what measures they take (such as actions, activities, routines). Looking back at the repertoire of terms associated with DCs it seems either that the field is unsure about the meaning of the concept, or that the term is so rich in meaning that multiple, overlapping, even conflicting, constructs are required to explain it. In this sense, this analysis fell short in solving the research problem of uncovering how DCs are conceptualized in IS research.

With regard to our secondary question, the limited findings of multilevel research may be interpreted as an indication that explicit multilevel examination is of low relevance in studying DCs in strategic IS. At the same time, based on the discussion in the section Theoretical Basis (organizations as non-linear, complex systems), to understand the mechanisms and processes of capability development across organizational levels and across units seems of significant importance. This angle has recently been promoted theoretically in management studies (e.g. [13]) even though our initial searches failed to provide viable results. Thus, this review suggests that a gap exists in multilevel DC research in the field of strategic IS.

To sum, our discussion confirms that dynamic capabilities are indeed a foggy research area and further work on understanding them is required within strategic IS. For instance, explicating the kinds of relationships presented in Figure 1 seems to be lacking in this sample. Thus, the definition of DCs remains ambiguous. Perhaps it is this kind of hierarchy that we should clarify upon entering empirical data collection also in IS research (cf. [15]), especially as information systems by nature are complex and multilevel constructs within other complex and multilevel constructs, organizations.

6 Conclusions

To address the most common questions posed by reviewers, “what’s new?” and “so what?” [17, p. xxi], we conclude by summarizing two main contributions and their related implications. Firstly, the concepts used for defining dynamic capabilities are manifold, interlinked and interlaced. An implication of this is a need to provide conceptual clarity in further work. For instance, we could examine which kind of conceptualizations are most useful in which type of research, as has been pointed out. Moreover, when designing empirical work, it is vital to be aware of this conceptual multiplicity, even confusion. Secondly, it appears IS field would benefit from further multilevel research in the area of DC development to support strategic IS work in organizations.

As for the limitations, this is clearly an early literature review. Therefore, the categorization of the findings would benefit from further work to synthesize the conceptualizations as a more concise entity. The current categorization appears somewhat fragmented to gain a unified view to the findings, and some of the codes appear overlapping. Secondly, the presentation mode should be improved to depict more clearly, which concepts were central in which article. [17] (cf. also [35])

The other noted limitation deals with the methods. Thus far, the findings rely on Scopus, but additional databases, such as ScienceDirect, Web of Science and Business Source Complete, are in scope. Secondly, a single researcher conducted the literature selection and analysis process. To strengthen the validity and reliability [29] of the findings, the choices should be reviewed by another researcher. Finally, backward and forward reviews of citations from the selected articles [17, p. xvi] were omitted due to scope and should be commenced as further work.

As concluding remarks, while acknowledging the limitations, it can be said that the work conducted thus far contributes to understanding DCs within IS research. It provides informed grounds to build an empirical research case, which aims to distinguish between the different capability and resources attributes in an organization, and evaluate their linkages to and the development of DCs on multiple organizational levels. Therefore, while mainly contributing to theory as a pre-empirical paper, this review serves as a tread in pursuit of results of practical relevance [9] for organizations. Alongside empirical work, making sense of DCs within strategic IS will be continued by more advanced reviewing and analysis of literature.

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Appendix 1: Summary of search strings used in Scopus

	Search string	Fields	Limitations set	Records
1	"information system* strategy" AND "dynamic capabilities" AND "multi-level"	T, A, K		0
2	"IS strategy" AND "dynamic capabilities" AND "multi-level"	T, A, K		7
3	"IS strategy" AND "dynamic capability" AND "multi-level"	T, A, K		7
4	"information system strategy" AND "dynamic capability" AND "multi"	T, A, K		0
5	"IS strategy" AND "dynamic capabilities" AND "multi"	T, A, K		7
6	"information system strategy" AND "dynamic capability" AND "multi"	T, A, K		0
7	("information system strategy" OR "IS strategy") AND "dynamic capability" AND "multi level"	All	Exclude "conference reviews"	67
8	("information system strategy" OR "IS strategy") AND "dynamic capability"	T, A, K	Exclude "conference reviews"	9
9	("information system" OR digital) AND strategy AND "dynamic capability"	T, A, K	Exclude "conference reviews"	70
10	("information system" OR digital) AND strateg* AND "dynamic capability"	T, A, K	Exclude "conference reviews"	117
11	("information system" OR digital) AND strateg* AND "dynamic capability" AND multi*	T, A, K	Exclude "conference reviews"	23
12	strateg* AND "dynamic capability" AND multi*	T, A, K	Exclude "conference reviews"	211
13	("information system*" OR technolog* OR digital*) AND strateg* AND "dynamic capabilit*" AND multi*	T, A, K	Exclude "conference reviews"	73
14	("information system*" OR technolog* OR digital*) AND strateg* AND "dynamic capabilit*" AND "multi level"	T, A, K		8
15	("information system*" OR technolog* OR digital*) AND strateg* AND ("dynamic capabilit*" OR ambidext*)	T, A, K	Exclude "conference reviews"; "book chapters"; other languages than English;	507
16	("information system*" OR technolog* OR digital*) AND strateg* AND ("dynamic capabilit*" OR ambidext*)	T, A, K	English reviews only	10
17	("information system*" OR technolog* OR digital*) AND ("dynamic capabilit*" OR ambidext*)	T, A, K	English reviews only	33
18	("information system*" OR technolog* OR digital*) AND strateg* AND ("dynamic capabilit*" OR ambidext* OR "absorptive capacity")	T, A, K	Exclude "conference reviews"; "book chapters"; other languages than English	n/a
19	("information system*" OR technolog* OR digital*) AND strateg* AND ("dynamic capabilit*" OR ambidext* OR "absorptive capacity") AND "multi level"	T, A, K	Exclude "conference reviews"	3
23	("information system*" OR technolog* OR digital*) AND strateg* AND ("dynamic capabilit*" OR ambidext* OR "absorptive capacity")	T, A, K		819
24	("information system*" OR technolog* OR digital*) AND ("dynamic capabilit*" OR ambidext* OR "absorptive capacity")	T, A, K	English reviews only	63

Appendix 2: Full sources in Table 2

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