RESEARCH NOTE

Processes, antecedents and outcomes of dynamic capabilities

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Dynamic capabilities; Literature review; Meta-synthesis

Summary This study addresses the following research question: what do we know about dynamic capabilities based on existing empirical research? The paper is based on a systematic synthesising review of 142 articles. The analysis focuses on three areas: the processes of dynamic capability, its antecedents, and consequences. Through its detailed analysis of factors within each of the three aforementioned domains, the study provides researchers with a stronger basis on which to explicitly position their contributions in the DC literature. With regard to the processes of dynamic capabilities, empirical studies appear to employ a continuum of conceptualisations ranging from the very specific and identifiable to a generic set of knowledge-related processes. Additionally, the antecedents were found to be either internal or external to the firm, whereas the mechanisms by which dynamic capabilities lead to performance outcomes were found to be an unresolved issue in empirical research. The study identifies numerous avenues for further research concerning each of the three focus areas.

Introduction

Companies in changing environments need to anticipate changes and to react to them (Medina-Garrido, Ruiz-Navarro, & Bruque-Camara, 2005). The ability to do this systematically has been referred to as dynamic capability (DC) (Teece, Pisano, & Shuen, 1997). The ultimate aim of the DC approach is to explain the competitive advantage of firms over time (Teece & Pisano, 1994). The origins of the concept lie in strategic management, but it has been applied in areas as diverse as marketing, entrepreneurship (Barreto, 2010), risk management (Colarelli O’Connor, Ravichandran, et al., 2008), innovation management (Lawson & Samson, 2001) and logistics (Glenn, Genchev, & Daugherty, 2005). Although this indicates the versatility of the approach, it also highlights the lack of established tradition in its use.

The literature on DC could be more rigorous and more explicit (see Arend & Bromiley, 2009; Schreyögg & Kliesch-Eberl, 2007). Future development in the field requires reviewing the use and content of the concept, and three recent reviews (Ambrosini & Bowman, 2009; Barreto, 2010; Wang & Ahmed, 2007) have started that work. However, they all have a narrow focus in terms of both the topic and the number of publications analysed. Wang and Ahmed (2007) examine the commonalities between different organisations; Ambrosini and Bowman (2009) focus on how dynamic capabilities develop, and discuss the performance implications; and Barreto (2010) develops his own conceptualisation of the construct based on previous literature and the identification of the various dimensions presented in the studies. Additionally, Di Stefano, Peteraf, and Verona (2010) examine the structure of the DC research domain through the 40 most influential articles dedicated to it. Notably, all four studies...
end up with rather different conclusions. In order to shed further light on the phenomenon, this study addresses the following question: **What do we know about dynamic capabilities based on existing empirical research?**

This paper builds on previous reviews and deepens our understanding of the empirical research on DCs. In systematically reviewing 142 empirical articles on DCs the study synthesises the evidence-informed knowledge (Tranfield, Denyer, & Smart, 2003) thus far accumulated, distinguishing between the very concept, its antecedents and outcomes (see Zahra, Sapienza, & Davidson, 2006) and offering one viable way of structuring the discussion. Through its detailed analysis of factors within each of the three aforementioned domains, the study provides researchers with a stronger basis on which to explicitly position their contributions in the DC literature. This is very important in terms of developing the approach because most existing studies are not very clear on this point and hence knowledge is not being accumulated effectively. Furthermore, reviewing empirical studies gives the opportunity to assess the similarities and differences between qualitative and quantitative research on DC, which has not been discussed previously. In focusing on empirical studies, this review also sheds some light on the operationalization of the concept, which is not discussed in earlier reviews either. Moreover, it highlights which areas have been neglected in the empirical research (cf. Needelman, 2002; Pettigrew, 2001). All in all, the aim in this study is to offer a better basis on which to conduct future empirical research.

The following section gives a brief overview of the conceptual discussion on DCs, and the third section introduces the methods used in this systematic review. The fourth section discusses the findings in terms of the processes, the antecedents and the outcomes. Finally, the last section draws the conclusions, suggests avenues for future research, and discusses the limitations of the study.

**The dynamic capabilities approach**

The DC literature has its roots in the resource-based view of the firm (RBV), going all the way back to the works of Penrose (1959). However, other streams of literature have also influenced the discussion, specifically the evolutionary theory of economic change (Nelson & Winter, 1982), Schumpeter’s views on creative destruction, the behavioural aspects of the firm (Cyert & March, 1963), and Williamson’s (1975) views on markets and hierarchies (Ambrosini & Bowman, 2009; Teece, 2007). The conceptual discussion is therefore very rich.

Many authors perceive DCs as higher-order capabilities that influence the development of operational capabilities (Cepeda & Vera, 2007; Collins, 1994; Winter, 2003). They are often combinations of simpler capabilities and the routines related to them (Eisenhardt & Martin, 2000). Thus, DC is defined here as the capacity of the organisation to purposefully create, extend, or modify its resource and capability bases to address changes in its environment (Eisenhardt & Martin, 2000; Helfat et al., 2007; Teece & Pisano, 1994; Winter, 2003).

DCs are described as processes (Ambrosini & Bowman, 2009), or as comprising processes (Teece et al., 1997; Verona & Ravasi, 2003). Thus, they are dynamic by implication as they operate in time and develop over time. Although scarce, there is some conceptual discussion related to these constituent processes: they are assumed to include both organisational and managerial processes aimed at identifying needs or opportunities for change, and at accomplishing that change (Helfat et al., 2007). Processes therefore constitute the elements of DC. It is argued on the one hand that DC is a function of three generic learning processes: experience accumulation, knowledge articulation and knowledge codification (Zollo & Winter, 2002). Other authors, on the other hand (Eisenhardt & Martin, 2000), refer to specific and identifiable processes that may integrate or reconfigure resources, or focus on their acquisition and release. Product development and aligning are mentioned as examples. According to the former approach, DCs may be unique and hence difficult to imitate (Teece et al., 1997), whereas the latter viewpoint implies commonalities among organisations, meaning that only the resource and capability configurations DCs create can be unique (Eisenhardt & Martin, 2000). This remains an on-going conceptual debate.

In an attempt to enhance conceptual coherence and clarity, Zahra et al. (2006) suggest separating DCs from their antecedents and outcomes. Considering antecedents as inputs and outcomes as outputs is a good starting point from which to analyse the accumulated knowledge.1

Teece (2007) offers a focal contribution with respect to the antecedents of DCs in writing about the micro-foundations that are contributory factors. For the sake of analytical clarity, he distinguishes between the micro-foundations for each of the three dimensions: sensing, seizing and reconfiguration. Sensing capability builds on individuals’ capacities and organisational processes linked to discovering opportunities, whereas the antecedents of seizing capability reflect the selection of product architectures and business models, organisational boundaries, decision-making protocols, and the building of loyalty among employees. Lastly, the factors contributing to reconfiguration capability concern decentralisation, co-specialisation, governance and knowledge management. Although the antecedents of each dimension differ, Teece (2007) argues that they all include an entrepreneurial and “right brain” component. However, all of the ones mentioned above are internal to the organisation, and it is argued that external factors may also act as enablers (or inhibitors) of DCs: the pace of industry changes, for example (Ambrosini & Bowman, 2009; Winter, 2003).

Finally, in terms of outcomes there is agreement that DCs are linked to the competitive advantage of the firm, or to its performance (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; Winter, 2003), although there is some debate about the mechanisms of this linkage (Ambrosini & Bowman, 2009). Early on it was suggested to be direct (e.g., Teece & Pisano, 1994), but more recently it has been described as indirect, meaning that DCs influence performance through the unique resource and capability configurations they develop (Helfat & Peteraf, 2003; e.g., Zollo & Winter, 2002).

DCs thus comprise various processes, arguably influenced by many different factors called antecedents. All in all, the

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1 Ambrosini and Bowman (2009) utilise a similar division in their review of the usefulness of the DC construct. See also Keupp and Gassmann’s (2009) review in the field of international entrepreneurship.
need for them stems from the need for companies to maintain and enhance their competitiveness in a changing environment. Fig. 1 draws together the above discussion.

Methods

Systematic reviews have emerged in response to the need to improve rigour and reproducibility, given the accelerating output of scientific studies (Tranfield et al., 2003). The review process is made transparent through the reporting of each step in the search and analysis, as well as the criteria used. The coverage of systematic reviews is wider than that of traditional narrative reviews in that they tend to compare, contrast and link findings from a number of (sub)fields utilising a variety of research methods (Thorpe, Holt, Macpherson, & Pittaway, 2005). This, in fact, distinguishes the review at hand from earlier DC reviews. Moreover, the sheer volume of studies allowed more systematic analysis than has been achieved earlier. The present review was conducted in the spirit of critical realism. The focal features of this thinking are that an entity can exist without having any identification, but there is no theory-neutral observation or interpretation (Fleetwood, 2005; Fleetwood & Ackroyd, 2004).

The review process

The present review was conducted in three phases, as illustrated in Fig. 2.

The author discussed the preliminary outline of the study with other scholars, and having absorbed their comments went on to prepare a review protocol. The protocol, which was based on the conceptual discussion among established researchers as well as on information gleaned from the literature, contained guidelines covering the search and analysis process. Numerous articles on how to conduct systematic literature reviews were consulted, and systematic reviews from areas other than business science served as benchmarks in the review process.

The second stage was to conduct the review. As journal articles seem to be the most respected and most efficient way of disseminating research findings, they were chosen as the source material (cf. Podsakoff, MacKenzie, Bachrach, & Podsakoff, 2005). The search criteria drawn up from the review protocol specified that the term dynamic capability or dynamic capabilities should occur in at least one of the following parts of the article: the title, the abstract or the key words. Using these strictly defined search criteria ensured a comprehensive and unbiased search, and this is considered one of the fundamental differences between a traditional narrative review and a systematic review (Tranfield et al., 2003). The search covered two databases, the ProQuest’s ABI/Inform and EBSCO’s Business Source Complete, both of which have a comprehensive coverage of management journals and thus suit this purpose. The search was conducted in December 2009—January 2010, and therefore included articles published up to the end of 2009. It was limited to peer-reviewed journal articles.

Following their identification as DC-related, a number of the articles were excluded from the review. First, given the focus of this study on evidence-based knowledge, conceptual articles were left out. Second, the articles were evaluated in terms of relevance and quality. The relevance criterion was that, in addition to meeting the search conditions, the articles discussed DCs in the findings and conclusions section(s). Quality was evaluated against methodological fit (Edmondson & McManus, 2007): studies that appeared to suffer from methodological discrepancies were excluded.

The review culminated in an analysis of the articles. The first step was to code them according to their focus, be it on processes, antecedents and/or outcomes. This coding is not exclusive, as one article may deal with more than one of these areas. Second, a content analysis was conducted within each of the three groups. The sampling unit in the analysis was one article, and the coding unit was a theme, a finding or

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Figure 1 The dynamic capabilities frame.
an argument within the findings and conclusions sections (cf. Berg, 2004; Krippendorff, 2004). The approach to coding in this review was mainly deductive (Elo & Kyngäs, 2008), meaning that the codes were primarily concept-driven, yet a few data-driven codes emerged (Schreier, 2012). The categorisation (see Table 1) was kept simple due to the conceptual fragmentation of the field.

Because content analysis is inherently reductive, it was necessary to combine it with thematic analysis that better preserves the diversity of data. Thus, more detailed thematic analysis was conducted within each of the categories (cf. Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005), for which the quantitative data was transformed into a qualitative form in order to enable synthesis (cf. Dixon-Woods et al., 2005). The data-driven thematic analysis was carried out chronologically starting from the oldest article. The compilation of this report concluded the review process.

### Table 1 Coding scheme for content analysis.

<table>
<thead>
<tr>
<th>Processes</th>
<th>Antecedents</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Generic knowledge processes</td>
<td>Internal</td>
<td>Performance</td>
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<tr>
<td>Experience accumulation</td>
<td>Individual level</td>
<td>Direct linkage</td>
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<tr>
<td>Knowledge articulation</td>
<td>Project level</td>
<td>Indirect linkage</td>
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<tr>
<td>Knowledge codification</td>
<td>Organisational level</td>
<td>Other outcomes</td>
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<tr>
<td>Other knowledge processes</td>
<td>External</td>
<td></td>
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<tr>
<td>Specific processes</td>
<td>Inter-organisational</td>
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### The data set

The searches yielded 373 journal articles altogether, the earliest one being from 1991. The majority were published after 2005, indicating that larger-scale interest in the concept is quite recent. Fig. 3 shows the number of articles published per year. The column "All" also includes the papers that were excluded from the actual analyses.

Over a third of the 373 articles were conceptual, and were therefore excluded from the content analysis. Another five were based on simulation data, which is very different from empirical data, and were thus also excluded. It is clear from the remaining 232 empirical articles that DC has become a buzzword in many fields. In fact, 42 of the articles only mention it in the abstract, and do not discuss it anywhere else. Another 12 use the concept in contexts other than business (e.g., robotics). As a result of this screening 54 studies were considered non-relevant for this review, and hence excluded from the analyses. Finally, 36 articles appeared to have some problems in terms of research design and methodology, and were therefore excluded, resulting in 142 articles. Fig. 4 depicts the selection process for the analysis, and Appendix A lists the 142 reviewed articles.

Fig. 4 also shows the extent to which different research approaches were applied in the 142 articles. Both quantitative and qualitative methods are strongly represented. The sample sizes in the studies are shown in Fig. 5.

It is noteworthy that quantitative studies with the smallest sample sizes used longitudinal panel data. Moreover, studies based on both qualitative and quantitative methods (i.e., mixed methods) were classified according to the largest sample they utilised.

Because the search was not limited to particular journals, the articles represent a wide variety. Appendix B lists the
journals from which three or more articles were included. The Strategic Management Journal is clearly in first place, but there are also strongly technologically oriented journals among the top few, illustrating the importance of the concept in the area of innovation and technology development.

The results of the analyses

The following synthesis of the research findings on DCs is divided into three parts: processes, antecedents and outcomes (cf. Zahra et al., 2006). All three areas are well represented in the 142 articles: processes are discussed in 64, antecedents in 67, and outcomes in 45. It was interesting to see that processes and antecedents were discussed throughout the time period when DCs were studied empirically, but interest in outcomes is more recent.

Processes of dynamic capabilities

There is a tendency to use qualitative research methods in investigations of the processes of DCs: of the studies reviewed, almost two thirds are qualitative, slightly less than one third are quantitative and the remaining 10% employ mixed methods. A probable reason for this is the complexity of the processes, which makes them challenging to operationalise with quantitative measures.

It could be concluded from the conceptual discussion that there are two different approaches here: focusing on specific processes, or on generic knowledge-related processes. Both are indeed strongly present in the empirical literature. Most of the studies conceptualising DCs as specific processes focus on product or technology development and transfer (Cetindamar, Phaal, & Probert, 2009; Griffith, Kiesling, & Dabic, 2005; Helfat, 1997; Lawson & Samson, 2001; Mathiassen & Vainio, 2007; Petroni, 1998; Tripsas, 1997), although some emphasise inter-organisational collaboration and capability acquisition (Capron & Mitchell, 2009; Jarratt, 2008; Vassolo & Anand, 2007), organisational restructuring (Forrant & Flynn, 1999; Karim, 2006, 2009; Rindova & Kotha, 2001; Skilton, 2009) or business-model adaptation (Andren, Magnusson, & Sjolander, 2003; Lampel & Shamsie, 2003; Newbert, 2005; Wilson & Daniel, 2007). However, a larger number of studies conceptualise DCs through generic-knowledge-related processes.

The search for themes in the articles identified the following four knowledge processes as focal elements of DCs: accumulation, integration, utilisation and reconfiguration. Given the complex nature of knowledge, these four processes are necessarily somewhat overlapping and ambiguous. However, the following discussion is an attempt to analyse the key features of each one, based on the empirical literature.

Knowledge accumulation

DCs connote renewal, and hence new or enhanced knowledge is a crucial element (Macher & Mowery, 2009). According to Pandza et al. (2003, p. 1028), “The process of how a firm acquires its capabilities cannot be separated from how it acquires its knowledge.” Like DCs overall, knowledge creation in organisations is path-dependent and cumulative (Camuffo & Volpato, 1996; Forrant & Flynn, 1999): knowledge accumulates through experience (Macher & Mowery, 2009; Miyake & Nakano, 2007; Pandza, Horsburgh, Gorton, & Polajnar, 2003). Knowledge accumulation can, in fact, serve two different objectives: the replication of existing knowledge or its renewal (Lichtenhaler, 2009; Soosay & Hyland, 2008). Balancing these two is a challenge (Shamsie, Martin, & Miller, 2009), and yet a DC prerequisite.

The empirical studies confirm that both internal and external sources of knowledge are vital for DCs: experiential internal learning is identified as an important source, as is inter-organisational cooperation (Gerard, 2005; Kale &
Knowledge integration

Knowledge integration entails combining various resources, typically connecting new knowledge with the existing knowledge base. It rests on systematically pulling together knowledge developed internally and that acquired from external sources, and combining the new with what is known from earlier experience. It is an important element of DC because it facilitates the maintenance of the change that knowledge accumulation initiates (Verona & Ravasi, 2003). Furthermore, knowledge only becomes relevant to the firm through integration (Ayuso, Rodríguez, & Ricart, 2006; cf. Verona & Ravasi, 2003).

Firms use various knowledge-integration strategies, many of which rely on organisational interaction and collaboration routines (Macpherson et al., 2004). It is suggested that the integration of diverse knowledge bases happens primarily through problem-solving activities (Iansiti & Clark, 1994). Problem solving is thus another key aspect of DCs, yet ad hoc problem solving is insufficient (Ambrosini & Bowman, 2009). Although integration is a complex process, there are various information systems with the capacity to enhance knowledge integration, total quality management being one (Benner, 2009; López-Mielgo, Montes-Peón, & Vázquez-Ordáis, 2009).

Knowledge that is essential for a firm is not necessarily owned, nor is it useful in isolation (Macpherson et al., 2004). Integration is therefore a key activity in exploiting the knowledge in the organisation and the knowledge it has access to. It is suggested that an organisation’s capacity to integrate knowledge comprises its ability to access new forms of external knowledge and its capacity to flexibly coordinate its knowledge base in various disciplinary areas (Petroni, 1998). Consequently, there are also two sides to the integration: internal and external (cf. Iansiti & Clark, 1994). Synchronising internal and external knowledge has been found to contribute to resource uniqueness (Shang, Lin, & Wu, 2009), and therefore possibly to the competitive advantage of the firm.

Knowledge utilisation

A significant although often neglected aspect of knowledge is its utilisation (see e.g., Narasimhan, Rajiv, & Dutta, 2006). Knowledge does not erode in use, but rather develops (Pandza et al., 2003), and in this it differs from many other resources. Utilisation is, in fact, a key process through which to derive benefits from the accumulated and integrated knowledge, and therefore it is also a key element of DCs. Here again, the role of managers is emphasised in that managerial cognition is argued to be a major factor (Bruni & Verona, 2009). Moreover, political factors such as power play may affect the use of organisational knowledge, and this further highlights the importance of managers (Prieto & Easterby-Smith, 2006).

Knowledge utilisation tends to be tacit and subconscious. In analytical terms it is connected to absorptive capacity in that organisations with such capacity are better able to make use of the knowledge at their disposal (Cohen & Levinthal, 1990). Despite the tacitness however, some explicit means of utilisation have been examined. One of these is knowledge sharing, which entails disseminating individually and organisationally held knowledge. The sharing of tacit knowledge in particular is essential in interaction between individuals (Kale & Singh, 2007). Therefore, overcoming communication barriers is vital for knowledge utilisation (Bergman, Jantunen, & Saksa, 2004).

All in all, it is argued that systematic processes for knowledge sharing are prerequisites of DCs (Bergman et al., 2004). Among such processes, codification has been identified as an important factor (Bruni & Verona, 2009; cf. Swift & Hwang, 2008). It is a deliberate and proactive approach to knowledge utilisation (Kale & Singh, 2007), linking knowledge sharing with proactive knowledge reconfiguration (Bruni & Verona, 2009). This brings us to the final process.

Knowledge reconfiguration

The process of reconfiguration involves generating new combinations of existing knowledge (Grant, 1996), or leveraging existing knowledge for new purposes or in new ways (Jantunen, Puumalainen, Saarenkeno, & Kyläheiko, 2005). The ability to reconfigure knowledge resources directly affects the firm’s ability to sense opportunities (Macpherson et al., 2004). Reconfiguration is thus a crucial element of DCs. Moreover, given that DCs operate through the repeated recombination of existing practices rather than their disruption (Salvato, 2003), knowledge reconfiguration is naturally a key process. Resource management, in terms of both renewal and preservation, is necessary for this repeated recombination (Fleck, 2007; Moliterno & Wiersma, 2007).

Reconfiguration seems to benefit from organisational proactiveness. For example, understanding the needs of potential customers and striving to find unconventional ways of serving them while utilising current resources may be a driver. Furthermore, proactiveness depends very much on managers, given that managerial cognition is the key factor in organisational proactiveness (Bruni & Verona, 2009). Similarly, strategic foresight, which also stems from managers, may be a powerful factor (Järvenpää & Leidner, 1998).

Research has identified certain tools that managers can utilise in order to enhance knowledge reconfiguration, including scenario analysis and competitive benchmarking (Bergman et al., 2004; cf. Bruni & Verona, 2009). Moreover, reconfiguration of the organisational structure is necessary if changing capabilities make old structures obsolete or inefficient.
Moreover, however, the destabilising of organisational routines that have been valuable but will not be in future operations requires the existence of reasonable alternatives (Macpherson et al., 2004).

In sum, firms are indeed "conduits for processes of knowledge deployment and acquisition" (Osgowitsch & Madhok, 2001, p. 238). The need to make the processes firm-specific is also acknowledged, because what works for one firm does not necessarily work for another (Verity, 2005). The knowledge processes discussed above come very close to what Verona and Ravasi (2003) and Prieto, Revilla, and Rodriguez-Prado (2009) propose. It is also clear from other studies that knowledge utilisation is an essential DC process. All of the processes are important, and it is argued that achieving all of them simultaneously constitutes a DC (Prieto et al., 2009). Moreover, both of the two last-mentioned studies are good examples of the operationalization of DC elements. Although, as Verona and Ravasi (2003) note, identifying the processes is very difficult with quantitative measures, Prieto et al. (2009) aptly utilise multiple subjective quantitative measures for each one.

Antecedents of dynamic capabilities

Antecedents refer to the factors that affect the emergence of DCs (cf. Ambrosini & Bowman, 2009; Teece, 2007): they are factors or conditions that enhance or inhibit their development. Of the 67 articles dealing with antecedents, 52% report qualitative studies, 37% quantitative, and 11% mixed-methods studies. The antecedents may be internal or external to the organisation, and are thus divided accordingly in the following discussion.

Internal antecedents

Internal antecedents are many and varied. It appears from the analysis that they may be of a social or more structural nature. To start with the social level, various orientations in an organisation are influential antecedents of DCs. They may be organisational, such as a market orientation, or individual, such as an entrepreneurial orientation (Boccadelli & Magnusson, 2006; Gowrishankar, 2008; Jantunen et al., 2005). It is considered important for organisational orientations to be supported by sufficient resources (in terms of structural antecedents) so that they can drive the development of DCs (Andren et al., 2003; Desai, Sahu, & Sinha, 2007; Menguc & Auh, 2006; Morgan, Vorhies, & Mason, 2009).

On the other hand, inherent in organisational capabilities appear to be a couple of key social antecedents of DC. Flexibility, which can also be referred to as a capability for organisational change, determines effectiveness in implementing continuous change, and is suggested to be a prerequisite of all DCs in firms of all sizes (Judge, Naoumova & Douglas, 2009; McGuinness & Robert, 2005; Octoby, McGuinness, & Morgan, 2002). Second, the importance of collaboration capability (Blomqvist, Hara, Koivuniemi, & Aijó, 2004) is being acknowledged more and more as the business world becomes increasingly networked, but also simultaneously increasingly fragmented. These two organisational capabilities—flexibility and collaboration—are the bedrock on which DCs rest. On the analytical level there is an apparent connection between them and the entrepreneurial and "right brain" components of the antecedents suggested by Teece (2007). Additionally, a project capability (Söderlund & Tell, 2009) may be a crucial factor in the current business climate. Given that organisations commonly rely on projects, the knowledge and experiences accumulated on the project level need to be disseminated more widely because only then will the learning benefit other projects (Newell & Edelman, 2008). Nonetheless, only four of the reviewed articles discuss project-related antecedents. It is necessary to establish a strong connection from the project level to the organisational level in order to facilitate the emergence of DCs.

Finally, organisational practices are connected to the social antecedents in that they enhance employee enthusiasm for work, for instance (Wooten & Crane, 2004). However, there are different views concerning the relationship between organisational routines and DCs. Some authors view DCs as routines (see e.g., Eisenhardt & Martin, 2000; Zollo & Winter, 2002), whereas in the view of others routines may inhibit the emergence of DCs because they may turn into rigidities (see e.g., Benner, 2009; Vassolo & Anand, 2007). On the conceptual level, however, routines should not turn into rigidities in a flexible organisation.

Routines, in fact, are at the interface between social and structural antecedents. The most obvious structural antecedent is the organisation. It is noted that flexibility, which is necessary for DCs, is easily lost when the firm grows (Jones & Kraft, 2004). Consequently, the organisational structure exerts a decisive influence on DCs, particularly in larger firms (cf. Karim, 2009). In smaller ones, heterogeneity and the continuous development of human capital are more decisive (Dæving & Gooderham, 2008). Therefore, both organisational structure and flexibility appear to be vital (Colarelli O’Connor & DeMartino, 2006).

Another crucial element of DCs is the organisation’s resource mix. First of all, resource endowments influence DC development, and different types of resources carry different implications (McKelvie & Davidson, 2009; Pan, Pan, & Hsieh, 2006). Second, the dependence of DCs on a coherent resource mix (Verona & Ravasi, 2003) highlights the need to manage and coordinate resource deployments (Kor & Mahoney, 2005; Pan et al., 2006). In fact, resources need to be aligned with the opportunities and threats that emerge, and therefore reconfiguration may be necessary (Ramachandran & Sougata, 2006; Readman & Grantham, 2006). Interestingly, it has also been found that resource scarcity significantly influences DCs in that abundant resources increase the risk of creating business models that do not generate sufficient revenue (Andren et al., 2003; Miyake & Nakano, 2007). Therefore, the impact of internal resources should not be underestimated.

Related to resources are the personnel’s capabilities. Managerial capabilities (e.g., fast response and mental model building (Zhang, 2007)) appear to affect DCs in terms of influencing resource-allocation decisions and organisational path-finding strategies. Managers also have to deal with resistance in the face of change (Narayanan, Colwell, & Douglas, 2009). Moreover, they must be sensitive to the situation, applying different strategies in different capability-development stages and contexts (Branzei & Vertinsky, 2006; Lee & Kelley, 2008), and should be able to build up a stimulating organisational environment that promotes...
employee learning (Gjelsvik, 2002). All in all, managers may have a positive or negative impact on DCs. Although the potentially negative influence of managers on change has long been recognised, Penrose (1959) referring to managers as the biggest constraint regarding the growth of the firm, empirical research on such negative forces is next to non-existent.

Individuals other than managers can influence DCs through their capabilities. Product-development personnel, for instance, may contribute through their personal mastery or input into innovation (Colarelli O’Connor & McDermott, 2004; García-Morales, Llorens-Montes, et al., 2007; Rothaermel & Hess, 2007). Salvato (2009) further found that the day-to-day actions of individuals within and around the organisation to improve and streamline processes were capability enhancing. However, the role of other individuals remains under-researched.

As the above discussion shows, the antecedents — both social and structural — exist on different, but intertwined levels: individuals, projects and the organisation. Academic discussion tends to focus on the organisational level, and individual- and project-level factors have attracted less attention in empirical research. Although the role of individuals in DCs is well recognised in conceptual terms, empirical research remains scarce (see Jones & Kraft, 2004; Harayanan et al., 2009; Schlemmer & Webb, 2008 as rare examples). Slightly less than 30 of the articles examine individual-level factors, and the discussion mainly revolves around how managers positively affect the change (Schlemmer & Webb, 2008).

External antecedents

The external antecedents of DCs comprise environmental factors and factors related to inter-organisational relationships. The former are very often part of the context of the study, but not explicitly addressed. If the environmental factors are explicitly addressed they usually refer to turbulence in the institutional environment (Delmas, 2002; Järvenpää & Leidner, 1998; Yiu & Lau, 2008), the markets (Chung & Beamish, 2005; Koolen, Taminiau, & Faber, 2005) or the technological environment (Benner, 2009; MacCormack & Iansiti, 2009; Song, Droge, Hanvanich, & Calantone, 2005; Tripsas, 1997). Turbulence along any one of these dimensions increases the need for DCs (Harris, Collins, & Hevner, 2009; Macher & Mowery, 2009).

An additional potential driver is an uncertain (Yiu & Lau, 2008) or very rigid (Delmas, 2002) institutional environment.

Inter-organisational relationships and networks also feature as antecedents. Although the concept of DC originated on the organisational level, the world has changed and the role of networks has increased. Indeed, networks have proven to be essential for the development of capabilities (Colarelli O’Connor, Paulson, et al., 2008; Macpherson et al., 2004). Nevertheless, the inter-organisational level has not attracted much attention in the research (Smart, Bessant, & Gupta, 2007).

The importance of complementary resources and capabilities that are accessible through networks is emphasised, and access to complementary assets through partnerships has been found to drive DCs (Chang, 2003; Liao, Kickul, & Ma, 2009). This affects smaller firms in particular, because their internal assets are very limited (Doving & Gooderham, 2008). Partners may also play a major role in terms of sensing opportunities because they can help in identifying unmet needs in the market (Ayuso et al., 2006). Large firms, in turn, appear to be able to trigger the development of DCs in their networks and not just internally (Athreye, Kale, & Ramani, 2009). On the other hand, competition between firms also appears to act as a driver (Fujimoto, 2001).

Finally, learning in inter-organisational relationships has assumed increasing significance (Kale & Singh, 2007). Although a relationship might start with a cost focus, it may develop into a learning partnership. Such a development adds value and gives rise to new capabilities and resource configurations (Vivek, Richey, & Vivek, 2009) through the exploration and exploitation of knowledge (Cegarra-Navarro, 2005). Fig. 6 draws together the discussion on antecedents.
As the figure shows, numerous factors influence the development of DCs. There is a clear distinction between internal and external factors, and various sub-categories within both. Distinguishing between the different types of antecedents adds rigour to the literature. In the future scholars should examine the external antecedents, but should also take a more comprehensive approach instead of treating internal and external antecedents separately. Finally, the discussion turns to outcomes.

Outcomes of dynamic capabilities

Outcomes have been examined mainly in terms of either the economic performance of the firm or changes in operational capabilities. 2 DCs are likely to have organisational outcomes (economic and human-related) only when they are part of the top-management agenda, and hence nurtured (Narayanan et al., 2009). However, the mechanisms through which they influence performance remain unclear.

The early conceptual discussion posited a direct relationship between DCs and performance. In accordance with this view, several empirical studies report a direct relationship between what the authors conceptualise as DC and performance (García-Morales, Llorens-Montes, et al., 2007; García-Morales, Ruiz-Moreno, et al., 2007; Kor & Mahoney, 2005; Wu, 2007; Zhang, 2007; Zhu & Kraemer, 2002). Researchers have also identified factors that moderate the relationship, such as technological turbulence (Song et al., 2005) and a strategic orientation (Slater, Olson, & Hult, 2006). On the other hand, DC is also seen as a mediating variable between organisational process alignment and performance (Hung, Chung, & Lien, 2007), knowledge resources and performance (Griffith, Noble, & Chen, 2006) or network resources and performance (Yiu & Lau, 2008), thereby implying a direct link with performance. This variation shows that the measurement of DCs is in serious need of development.

All in all, the number of studies positing a direct relationship is surprisingly high, given the promotion of an indirect relationship for quite some time in the conceptual discussion. However, most of these studies are quantitative, and it may be that the quantitative measures drastically simplify the DC phenomenon, and thus a direct relationship is found.

With regard to the performance implications of DCs, it must also be noted that there is considerable variation in what constitutes performance. Many studies focus on economic performance (see Morgan, Vorhies & Mason 2009; Wang, Klein, & Jian 2007; Zhang, 2007), whereas others consider innovative or technology performance (e.g., Ellonen, Wikström, & Jantunen, 2009; Ettlie & Pavlou, 2006; Wu, 2006), environmental performance (Russo, 2009), or international performance (e.g., Chen & Jaw, 2009; Jantunen et al., 2005). Even within the studies focusing on economic performance there is considerable variation, and very few rely only on objective measures (Wu, 2007; Zhang, 2007; Zhu & Kraemer, 2002). Many of them utilise either a combination of the objective and the subjective (Hung et al., 2007; Morgan et al., 2009; Slater et al., 2006) or only subjective measures (García-Morales, Llorens-Montes, et al., 2007; García-Morales, Ruiz-Moreno, et al., 2007; Griffith et al., 2006; Newbert, Gopalakrishnan, & Kirchkoff, 2008; Song et al., 2005; Wang et al., 2007). It is noteworthy that in most of the studies relying on subjective measures the respondents evaluated their firm’s performance in relation to the competitors, which apparently works well in DC research. The time span of the performance measurement in these studies varies from the current situation to the previous three years, which is not very long. Taking a longer period into consideration would be beneficial.

Indeed, the more prominent view currently is that DCs have an indirect impact on performance (e.g., Collis, 1994; Eisenhardt & Martin, 2000). Among the studies that explicitly address organisational performance or competitive advantage the results indicate an indirect connection facilitated by customer value (Readman & Grantham, 2006) or institutionalisation (Fleck, 2007), for example. 3 Other studies examine changes in operational capabilities as outcomes of DCs. These studies focus only on the development of operational capability (Chen, Sun, Helms, & Jih, 2008; Espedal, 2005; Miyake & Nakano, 2007), or more broadly on the impacts of such development in terms of either competitive advantage (Athreye et al., 2009; Hagen & Lodha, 2004; Li, Qian, & Ng, 2006; Newey & Zahra, 2009; Pavlou & El Sawy, 2006) or organisational performance (Lee & Slater, 2007; Ma & Dissel, 2008). Finally, Macpherson et al. (2004) introduce a novel approach linking the outcomes of DCs to firm growth through the mediating factors of opportunity recognition and opportunity exploitation, and thus connecting DC indirectly to performance. The indirect approach appears to dominate slightly in the empirical studies.

The time frame of the studies defending an indirect relationship varies. Although some focus only on the current situation, most of them examine the phenomenon over a longer period. The time span may extend to decades through the use of secondary data (e.g., Lee & Slater, 2007; Newey & Zahra, 2009), or cover nearly ten years of real-time data collection (Chen et al., 2008). Most of the studies extending the analysis over notable time periods are qualitative, suggesting that qualitative methods are more suitable for obtaining longitudinal data that can capture DCs. The need to clearly report the time span of the study and to be explicit as to whether the data was collected in real time or retrospectively is highlighted in this review study. Time is a very important consideration in DC research, given that change is the essence of the phenomenon.

On the whole, the studies positing an indirect relationship between DCs and competitive advantage or performance appear to portray the DC phenomenon in a more fine-grained manner. Fig. 7 illustrates the various perspectives on these relationships. The first three examples depict a direct relationship, and the fourth one an indirect relationship, as discussed above.

2 Although there are studies making somewhat vague connections between DCs and various outcomes such as sustained competitive advantage (Bhutto, 2005; Harrelid et al., 2007), success (Kooi et al., 2005; Verity, 2005) and firm survival (Chung & Beamish, 2005), the majority of them clearly focus on the development of capabilities or of organisational performance.

3 The Fleck (2007) study is an interesting one in that it retrospectively traces the history of two companies over more than 100 years.
The direct relationship is discussed either in isolation (example 1) or as influenced by mediating factors (example 2). A direct relationship is also implied when DC is examined as a mediating variable between resources and performance, for instance (example 3). Finally, an indirect relationship suggests an influence on operational capabilities, which in turn yields performance implications (example 4).

As implied in the conceptual discussion, DCs are also connected to the firm’s ability to induce change in its environment (Järvenpää & Leidner, 1998; Lamar, 2009; Lee & Slater, 2007). New organisational forms that result from adaptation shape the market, and hence demonstrate the ability of dynamically capable firms to induce change (Lampel & Shamie, 2003). Although it is also recognised that DCs do not always result in positive outcomes, empirical studies appear to neglect this aspect, possibly because most studies identify DCs based on the firm’s past success. There is thus a clear need to develop DC theory in the direction of ex ante identification. All in all, almost two thirds of the studies addressing outcomes are quantitative, and only slightly more than one third are qualitative. This implies that outcomes are easier to quantify than processes or antecedents, in addition to which there are more established measures of performance, for instance.

Conclusions and future research

This review of evidence-informed knowledge about DCs synthesises insights from a significant proportion of the relevant empirical studies. It covers a broader range of issues than earlier reviews because it is not limited to the most prominent journals, and thus better reflects the versatility of the DC discussion. Through its synthesising analysis and distinctions between processes, antecedents and outcomes it brings coherence and structure to the scattered literature. Despite the increasing volumes of research, DCs continues to be an emerging theoretical approach (cf. Edmondson & McManus, 2007). The focus on empirical articles facilitated the contrasting of the accumulated empirical research with the most prominent conceptual views. Furthermore, it is possible to make some conclusions with regard to the operationalisation of the DC concept, and thus contribute to improving the rigour of future empirical studies.

The division of the concept into three domains — DC itself, its antecedents and its outcomes — served this review well, and brought rigour into the analysis. The key findings are synthesised in Fig. 8.

It is evident from the initial conceptual framework that DCs are thought to consist of processes. Rather than making a stark division, the empirical studies appear to employ a continuum of conceptualisations ranging from the very specific and identifiable to a generic set of knowledge-related processes. In terms of operationalization, identifying a particular process within a firm as a DC is simpler than going through various (often vague) knowledge processes. However, both approaches clearly have their merits.

Operationalization through a specific organisational process enhances knowledge with regard to one type of DC. It would be useful in future research to examine these specific processes in more detail so as to produce a more holistic understanding. Comparing and contrasting the different processes could yield valuable knowledge on how DCs operate, for instance. However, it is vital that researchers link their findings to previous research, either on that specific DC or on DCs in general, so that knowledge can truly accumulate. The selection of the process to be studied is also critical because it has to qualify as a DC, the definition of which thus needs to be considered carefully. On the other end of the continuum, operationalization through generic knowledge processes can enhance understanding of the mechanisms through which DCs operate, although it is very challenging and necessitates a

Figure 8 A synthesis of dynamic capabilities research.
Processes, antecedents and outcomes of dynamic capabilities

deep understanding of such processes. Thus far the methods used have been mainly qualitative, and this is likely to continue until quantitative measurement develops considerably. DCs were found to comprise four knowledge processes: accumulation/acquisition, integration, utilisation and reconfiguration/transformation. In operationalising these processes, and in addition to utilising the literature on organisational learning and knowledge management, DC researchers could benefit from insights gained from the writing on entrepreneurship, for instance.

Nonetheless, the most fruitful approaches fall between these two extremes. Such studies make DCs concrete through identifiable organisational processes, and simultaneously link the discussion to knowledge processes. They therefore reduce the ambiguity and generate knowledge that is likely to be useful with regard to other DCs as well. To mention a couple of good examples, Kale and Singh (2007) examine alliance capability and end up discussing learning processes that constitute the specific DC, whereas Bruni and Verona (2009) focus on dynamic marketing capability and identify knowledge creation and release as key factors. This kind of approach to operationalization also has the benefit of offering both academic and managerial contributions, and it is highly recommended for future studies.

Various factors influence the development of DCs. The antecedents are basically either internal or external to the firm. The initial conceptual framework, which draws on Teece’s (2007) ideas on their micro-foundations, focuses on internal antecedents, and especially on managerial actions. According to the empirical studies, such antecedents may be social or structural in nature. They also reside on different levels — of the individual, the project or the organisation. Although the individual level is well acknowledged in the conceptual discussion, empirical research remains thin. Most of the studies focus on organisational-level issues and neglect the role of managers and other individuals. There is certainly a need for more research on how managers explicitly and implicitly influence the development of DCs. In particular, the negative influences need to be examined, because understanding them would enhance the identification of firms that are likely to develop DCs. Other employees and their role constitutes another potentially important topic for future research. Furthermore, project-level factors remain underexplored, given that a significant number of organisations rely on projects nowadays (cf. Söderlund & Tell, 2009). A better understanding of how projects could contribute to DC development would also be very valuable from the managerial perspective. In terms of the internal antecedents, the role of routines, which remains the subject of on-going debate, deserves to be examined empirically. It would be useful to know whether the role is enabling or inhibiting, and under what conditions.

With regard to the external antecedents, environmental factors and inter-organisational relationships are significant. Environmental conditions are widely recognised in the conceptual discussion, whereas knowledge related to inter-organisational factors has mainly emerged from empirical research. In the latter domain, the role of complementary resources and capabilities dominates the scene here, whereas other issues lack attention. Hence, it is an area for further research. For instance, there are very few studies on the significance of the network position in the development of DCs. The environmental conditions are often implicit in the empirical research, being built into the context but not explicitly addressed. There is also some, although very little discussion on the inhibiting external factors. Rigidities are identified as significant, but there is little further empirical evidence on other potential inhibitors. Thus, inhibiting factors are also worthy of future research in the domain of external antecedents. Moreover, the interaction between internal and external antecedents has been given insufficient empirical attention. Both types of factors are clearly very influential, but have been treated mainly in isolation. Given that firms operate in a complex reality in which internal and external factors are bound to interact and possibly have synergistic enabling or inhibiting effects, the need for further research is obvious. In other words, there is a need to examine the antecedents more holistically. All in all, antecedents are a focal area for future research. If the DC approach is to progress and become a robust theory there should be a deeper understanding of why some organisations develop DCs whereas others do not.

Finally, the outcomes of DCs are approached from two different, yet possibly complementary perspectives: performance indicators and changes in operational capabilities. The performance indicators utilised in empirical research are many and varied. Researchers using subjective measures tend to ask for an evaluation of the firm’s performance in relation to its competitors, and this has proven suitable for DC research. The most elaborate studies employ a combination of subjective and objective measures (see Hung et al., 2007; Morgan et al., 2009; Slater et al., 2006). However, the mechanisms through which DCs produce performance outcomes remain somewhat unclear, and both direct and indirect relationships are strongly represented in empirical research. The large volume of studies assuming a direct relationship is surprising. Although this is supported in early conceptual contributions, prominent names have promoted an indirect relationship in the more recent discussion (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003). It is, therefore, necessary for future research to examine whether a direct relationship is possible, or if the findings result from oversimplification in the research design.

It is also noteworthy that the empirical studies connect DCs only to positive organisational outcomes. However, as mentioned above, the outcomes are not automatically positive. This is a major gap in the empirical research that needs to be addressed in the future. It is actually linked to the focal issue of DC identification. Empirical studies identify DCs post, mainly through the firm’s success, which predisposes the approach to problems of tautology. There is a serious need to find ways of identifying DCs that are developing and operating. Research on the antecedents and the elements is a key factor in this. Given a solid understanding of the factors that contribute to the emergence of DCs — in general and more specifically — it may be possible to identify organisations that are likely to develop them. Similarly, a common framework setting out the generic elements would help researchers in their efforts to collect real-time data. Ambrosini and Bowman (2009) argue further that there is very little empirical evidence on which to base any suggestions for deliberately developing DCs. Hence, investigation into the antecedents and the development process would also be highly beneficial from a managerial perspective.

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Even though the numerous contributions are rather scattered, a systematic analysis makes it possible to identify trends and some commonalities. These very connections open new avenues for research, as noted in the above discussion. Producing a synthesising review is not a straightforward task in the DC domain. Studies are based on somewhat differing assumptions, and thus not all the findings and arguments are comparable (Leiblein, 2011). This review takes into account the existence of different schools of thought and identifies various approaches that may or may not be complementary. Although some of the differences are fundamental and cannot be reconciled, it would be useful in future DC research to build on previous findings and shared assumptions so that knowledge can accumulate, instead of merely scattering.

It is often claimed that the research on DCs is predominantly qualitative in nature. According to the results of this review, however, quantitative methods are almost as common. There is a need for both types of study in the future. Qualitative methods serve well in longitudinal studies that are critical for the development of the DC approach. Scholars should consider more carefully how to identify DCs, and thus find out how we can know in advance that an organisation is likely to develop them. Moreover, in-depth examination of the mechanisms through which DCs influence performance may resolve the direct–indirect link debate. On the other hand, given that there are fewer quantitative studies on the antecedents and especially the elements of DCs, it would be worth developing measures that could be used in quantifying the phenomenon.

The use of systematic reviews is not yet well established in the field of management, thus a major contribution of this study is to promote a more systematic approach to reviewing literature. Despite the challenges in synthesising findings from very diverse empirical articles, this study shows where the results are consistent, where there are ambiguous findings and where research is lacking.

One must be careful in drawing conclusions based on the findings of this kind of review, however. Evaluating the respective weight of the results of different studies is next to impossible, and hence some issues may be overemphasised and others underemphasised. Moreover, given that the "absence of evidence (non-reporting) could be treated as evidence of absence (not important)" (Tranfield et al., 2003, p. 50) in content analyses, it was necessary to combine both content and thematic analysis. This combination of methods was also helpful in addressing the challenges posed by the diversity of research approaches (Dixon-Woods et al., 2005). The analytical approach in this review was somewhat theory-driven, as the protocol as well as the initial conceptual framework guided the content analysis. The more detailed thematic analysis conducted within each of the three areas was more data-driven. This gave both structure and flexibility to the analysis process. Regular consultation with experienced scholars who commented on both the review protocol and the findings helped in avoiding potential single-researcher bias (cf. Petticrew, 2001).

Given that the review covers a wide variety of studies, and thus also a variety of ways of conceptualising and measuring DCs, incommensurability (see e.g., Jackson & Carter, 1991) poses a potential threat in terms of its quality. Careful consideration is therefore given to the ways in which the DC concept is operationalised: only the studies that operationalise it in a way that meets the definition on which this review relies are included. Thus, the studies that are included agree on the most crucial aspects. Additionally, the quantitative evidence was converted into a qualitative form in the analysis, rather than quantifying qualitative evidence. Thus, the measurement of DCs was not the main point in the synthesising analysis. It is also noted that thematic analysis allows for the integration of qualitative and quantitative data (Dixon-Woods et al., 2005).

Although the differences between quantitative and qualitative research have fuelled criticism of attempts to synthesise findings from both streams, the author of this study considered it important to include both. Particularly in the field of management studies, the integration of qualitative and quantitative data is argued to result in a more comprehensive picture (Rousseau & Denyer, 2008). Moreover, there are proven techniques for synthesising findings from diverse groups of studies (Dixon-Woods et al., 2005; Tranfield et al., 2003), and the existence of numerous published mixed-methods studies attests that there are fruitful ways of combining quantitative and qualitative approaches (Mays, Pope, & Popay, 2005). It is also argued that a critical realist perspective promotes balance in management studies (Rousseau & Denyer, 2008). The inclusion of qualitative case studies in the analysis brings depth to the synthesis. Without them it would not have been possible to connect the findings on elements of DCs in the way it was done in the above discussion, for example. On the other hand, the good number of quantitative studies based on larger samples brings robustness to the findings.

Notwithstanding its limitations, this study is one of the first attempts to systematically map DC research. The analysis of 142 empirical articles contributes to the literature, and the structured way of analysing evidence-informed knowledge offers a solid basis on which to conceptualise DCs in future empirical studies.

Appendix A

See Table A.1.
Table A.1  The articles included in the analysis.

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Appendix B

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References


