QUO VADIS, DYNAMIC CAPABILITIES? A CONTENT-ANALYTIC REVIEW OF THE CURRENT STATE OF KNOWLEDGE AND RECOMMENDATIONS FOR FUTURE RESEARCH

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Although the dynamic capabilities perspective has become one of the most frequently used theoretical lenses in management research, critics have repeatedly voiced their frustration with this literature, particularly bemoaning the lack of empirical knowledge and the underspecification of the construct of dynamic capabilities. But research on dynamic capabilities has advanced considerably since its early years, in which most contributions to this literature were purely conceptual. A plethora of empirical studies as well as further theoretical elaborations have shed substantial light on a variety of specific, measurable factors connected to dynamic capabilities. Our article starts out by analyzing these studies to develop a meta-framework that specifies antecedents, dimensions, mechanisms, moderators, and outcomes of dynamic capabilities identified in the literature to date. This framework provides a comprehensive and systematic synthesis of the dynamic capabilities perspective that reflects the richness of the research while at the same time unifying it into a cohesive, overarching model. Such an analysis has not vet been undertaken; no comprehensive framework with this level of detail has previously been presented for dynamic capabilities. Our analysis shows where research has made the most progress and where gaps and unresolved tensions remain. Based on this analysis, we propose a forward-looking research agenda that outlines directions for future research.

INTRODUCTION

A steadily increasing number of management scholars have become interested in dynamic capabilities (see Figure 1). While originating in the field of strategy (Eisenhardt & Martin, 2000; Teece, Pisano, & Shuen, 1997), the study of dynamic capabilities now represents a vibrant research area in other management fields as well, including entrepreneurship (e.g.,

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Townsend & Busenitz, 2015), technology and innovation management (e.g., Cai & Tylecote, 2008), international management (e.g., Vahlne & Ivarsson, 2013), operations management (e.g., Anand, Ward, Tatikonda, & Schilling, 2009), management information systems (e.g., Pavlou & El Sawy, 2010), marketing management (e.g., Fang & Zou, 2009), and human resources (e.g., Festing & Eidems, 2011), among other areas. Overall, we think it is fair to say that the dynamic capabilities perspective has firmly established itself as one of the most influential theoretical lenses in contemporary management scholarship (see Amburgey, Dacin, & Singh, 2000; Cepeda & Vera, 2007; Di Stefano, Peteraf, & Verona, 2014, for similar assessments).

However, no systematic literature review has appeared since *empirical* research on dynamic

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FIGURE 1 Google Scholar Search for the Term "dynamic capabilities"

Note: Search performed on June 24, 2017

capabilities started to take off in recent years. Most of the earlier reviews that we identified (Ambrosini & Bowman, 2009; Arend & Bromiley, 2009; Barreto, 2010; Di Stefano, Peteraf, & Verona, 2010; Easterby-Smith, Lyles, & Peteraf, 2009; Helfat et al., 2007; Helfat & Peteraf, 2009; O'Reilly & Tushman, 2008; Wang & Ahmed, 2007; Zahra, Sapienza, & Davidsson, 2006) cover only the initial years of dynamic capabilities research. As a result, these reviews are unable to assess the degree to which repeated criticisms of underspecification of the concept and a lack of empirical knowledge (Arend & Bromiley, 2009; Kraatz & Zajac, 2001; O'Reilly & Tushman, 2008; Williamson, 1999) have been successfully addressed by more recent research and to what extent these recent investigations have broadened the nomological network in which dynamic capabilities are embedded. Some relatively recent survey pieces have examined the disciplinary foundations of dynamic capabilities research (Peteraf, Di Stefano, & Verona, 2013) or focused on selected aspects of dynamic capabilities (Helfat & Martin, 2015; Wilden, Devinney, & Dowling, 2016), but they have

not provided a comprehensive framework for understanding the antecedents, dimensions, mechanisms, moderators, and outcomes of dynamic capabilities.²

In the current article, we aim to fill this gap by pursuing two objectives. First, we aim to synthesize the insights in the vast amount of prior research and to bring greater coherence to the extant body of knowledge. To this end, we offer a systematic review of the current state of the dynamic capabilities perspective in terms of its fundamental building blocks. As part of this review, we clarify aspects of research on dynamic capabilities about which there has been confusion in the literature. This review culminates in a comprehensive framework summarizing the most frequently studied constructs and their interrelationships. The framework is general and flexible enough to accommodate different approaches for

² A prominent book on dynamic capabilities by Teece (2009) is largely a compendium of prior published articles by Teece, plus some new chapters by the author on selected topics, and does not contain a review of the literature.

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studying dynamic capabilities without suppressing critical differences. In addition, our review of the current state of knowledge covers important foundational issues, such as a discussion of frequently employed definitions, theoretical assumptions, and theory-integration efforts. This portion of the analysis also incorporates a discussion of process-based approaches to theory development and an overview of the methods that have been employed in the recent study of dynamic capabilities. Throughout this section, we juxtapose the progress that has been made with earlier critiques of the dynamic capabilities research stream. Overall, our integrative review of the current state of knowledge directly addresses prior calls for continued efforts to unify the field of dynamic capabilities research (Barreto, 2010; Wang & Ahmed, 2007) while at the same time widening the scope and emphasizing the breadth of conceptual resources available to researchers in this area.

The second objective of this article is to go beyond current knowledge to identify significant gaps in the literature, unresolved issues, and promising directions to address these, so as to offer a glimpse into the future of dynamic capabilities research. For this purpose, we conducted a systematic content analysis, in which we coded what prior articles identified as important limitations and fruitful avenues for further research on dynamic capabilities, thus providing bottom-up insights into the views of dynamic capabilities researchers about how the field might profitably advance. We use these contentanalytic findings as a springboard for our own assessment and subjective recommendations for further research.

Among other areas for future investigation, we see opportunities for researchers (1) to explore additional mechanisms (i.e., mediators) that explain proposed relationships of dynamic capabilities with other variables, which is an area of weakness in the current literature; (2) to continue to develop and elucidate relevant theoretical assumptions underlying the dynamic capabilities perspective, including more attention to feedback effects involving dynamic capabilities and various antecedents, moderators, mechanisms, and consequences; (3) to increase the integration of the dynamic capabilities perspective with relevant theories that are currently underused or not used at all, in concert with empirical investigation; (4) to deepen and broaden our understanding of the dimensions of dynamic capabilities, including their microfoundations and unresolved tensions with respect to the extent of their routinization; (5) to reorient the analysis of consequences of dynamic capabilities to focus more on proximate outcomes, rather than solely prioritize firm-level performance; (6) to add to recent attempts to translate insights to a practitioner audience interested in implementing dynamic capabilities in their organizations; (7) to pay greater attention to the role of dynamic capabilities in shaping markets and ecosystems, an area that is noticeably underdeveloped; and (8) to make greater use of empirical methodologies beyond qualitative case analyses and analysis of survey data, such as laboratory experiments and econometric analysis of "big" archival data, to further broaden the toolkit used in dynamic capabilities research. By revealing a wealth of exciting research possibilities, we contribute to defining a forward-looking research agenda, which can help scholars to build on prior studies in a cumulative fashion to fill gaps and resolve tensions in the literature, while extending research along new dimensions.

This article proceeds by first briefly discussing the origin and evolution of dynamic capabilities research. We then outline the content-analytic method that provides the starting point for our review. Next, we turn to the current state of knowledge and the findings that recent dynamic capabilities investigations have offered. Finally, we develop an extensive road map of fruitful directions for future dynamic capabilities research.

CONCEPTUAL BACKGROUND

Before delving into a systematic analysis of the dynamic capabilities literature, we offer some background that helps to clarify the scope of this article. The dynamic capabilities perspective is often considered an extension of the resource-based view (RBV) of the firm (Helfat & Peteraf, 2003); however, when Teece et al. (1997) introduced the concept of dynamic capabilities, they sought to differentiate it from the more static orientation of the RBV. Whereas the RBV emphasizes the firm's current resource base, defined as the firm's resources (tangible and intangible assets) and operational capabilities, the dynamic capabilities perspective primarily addresses purposeful modifications of this resource base. Although often underemphasized in the literature on dynamic capabilities, this perspective also encompasses alterations to the firm's external environment (Helfat & Winter, 2011; Teece, 2007).

To appreciate the distinctiveness of the dynamic capabilities perspective (and the scope of the current article), it is important to note that firm capabilities can be divided into two broad categories: (1) operational (or ordinary) capabilities, which are directed toward maintaining and leveraging the status quo in terms of the scale and scope of activities, businesses, product lines, customer segments, and the like; and (2) dynamic capabilities, which are directed toward strategic change (Helfat & Winter, 2011; Winter, 2003; Zahra et al., 2006). As such, dynamic capabilities can be considered a distinct subset of organizational capabilities; specifically, they are those capabilities that can effect change in the firm's existing resource base (and the associated support system such as the firm's organizational and governance structure), its ecosystem and external environment, as well as its strategy. Our review focuses on this capability subset. Over the last 20 years, research on dynamic capabilities has evolved to a degree where it has become an institutionalized field of its own, and although this field frequently draws on related literatures (such as those on absorptive capacity and organizational learning), the scope of this review is confined to studies that have sought to contribute to or draw from the dynamic capabilities perspective.

Dynamic capabilities arguably have captured attention because they may offer a route to competitive advantage under conditions of change, a vexing goal that is the virtual Holy Grail of strategic management (Helfat & Peteraf, 2009). The domain of interest spans multiple levels of analysis within and outside the organization, encompasses strategy content and process, and involves numerous applications such as innovation, acquisitions, alliances, market entry, diversification, and more (Helfat et al., 2007). This broad set of applications, combined with the inherent importance of the topic, has made dynamic capabilities of interest to a wide range of scholars.

A distinguishing feature of dynamic capabilities is the systematic means of strategic change that they provide. All capabilities, including dynamic capabilities, entail the capacity to carry out activities in a practiced and patterned manner. Thus, a dynamic capability enables the repeated and reliable performance of an activity directed toward strategic change, as distinct from entirely *ad hoc* problemsolving (Helfat & Winter, 2011; Winter, 2003). This capacity for repeated and reliable performance is thought to stem in significant ways from organizational routines (Eisenhardt & Martin, 2000; Stadler, Helfat, & Verona, 2013; Winter, 2000, 2003). Winter (2003: 991), for example, has described an organizational capability as a "high-level routine (or collection of routines)." In addition, because dynamic capabilities are context specific and embedded within organizations, firms must build them over time (Helfat & Martin, 2015). Such capabilities are difficult to buy and sell, except as part of the sale of an entire organizational unit in which they are embedded; as a result, their development entails significant sunk costs (Winter, 2003). Thus, obtaining a systematic means to promote strategic change through dynamic capabilities requires a substantial commitment of organizational effort, time, and funds.

Not surprisingly, given the challenges of achieving strategic change as well as the organizational commitment required to do so, skeptics have asked whether dynamic capabilities truly exist and, if so, how they function and what outcomes they produce. Ultimately, only empirical research can answer these questions fully. For this reason, we next turn to a systematic analysis of recent research on dynamic capabilities, which has a substantial empirical component, supplemented by theoretical contributions.

METHODS

Sample

The starting point for our review and assessment of the literature is a comprehensive content analysis of journal articles about dynamic capabilities. The sample primarily consists of articles published between 2008 and 2016. We selected 2008 as the starting year because many previous literature reviews, such as Barreto's (2010) influential piece, ended in 2007. In terms of publication outlets, to identify articles for inclusion in our analysis, we began with the top 100 management journals according to Thompson Reuters' 2013 Journal Citation Report (coincidentally, the top 100 were also the management journals with an impact factor of greater than 1.0). Starting with this broad range of journals allows for the inclusion of studies from various subdisciplines of management that have adopted the dynamic capabilities perspective, while at the same time ensuring a certain level of academic rigor. Using a variety of databases that cover those 100 journals, we searched for articles containing "dynamic capabilit*" or "dynamic * capabilit*" in their titles or abstracts. This keywordbased search is consistent with our aim to focus on articles intended to substantially draw from and/or contribute to the field of dynamic capabilities research.³ Next, we further limited our sample to articles published in journals that feature a minimum of two relevant articles. This criterion places an emphasis on those outlets in which dynamic capabilities research is at least somewhat actively pursued by researchers. The procedure yielded a total of 314 articles published across 51 different management journals.

Finally, to ensure that our analysis also reflects important earlier empirical developments, we complemented these recent articles with highly cited empirical work published prior to 2008. Based on Peteraf et al.'s (2013) list of the most-cited articles in the dynamic capabilities research domain, we identified 31 articles that have an empirical component and added them to our sample, for a total of 345 articles. In the coding process, we then dropped 47 of these articles that only referred to dynamic capabilities superficially without substantively building on or contributing to the dynamic capabilities literature. Dropping these 47 articles led to a final sample of 298 articles. Table 1 provides an overview of the journals that published most of the articles in our sample.

Coding

In two separate coding sheets, we recorded both the current state of knowledge (i.e., what the articles in our sample have contributed to our knowledge of dynamic capabilities) as well as recommendations for future research (along with limitations identified by authors). This latter coding allows us to synthesize extant recommendations for future research, thus offering bottom-up insights into what the field as a whole sees as opportunities for future research (Brutus, Aguinis, & Wassmer, 2013; de Jong, Kroon, & Schilke, 2017). As noted by Campion (1993), previously articulated limitations and avenues for future research afford other researchers the opportunity to identify fruitful areas for further inquiry. Taken together, our dual-tracked coding approach provides a solid basis for our synthesis of what the

TABLE 1 List of Covered Journals with Five or More Identified Articles

Journal name	Number of articles
Strategic Management Journal	36
British Journal of Management	18
Industrial Marketing Management	16
Organization Science	15
Journal of Product Innovation Management	13
California Management Review	11
Journal of Management Studies	11
R&D Management	10
Technovation	10
Academy of Management Perspectives	9
Industrial and Corporate Change	9
Strategic Organization	9
Academy of Management Journal	8
International Journal of Project Management	8
International Small Business Journal	8
Journal of Management	8
Journal of Operations Management	8
Decision Sciences	7
International Journal of Management Reviews	7
International Journal of Operations and Production Management	7
Journal of International Business Studies	7
Journal of Management Information System	7
Research Policy	7
Journal of Engineering and Technology Management	6
Journal of Supply Chain Management	6
Asian Pacific Journal of Management	5
Small Business Economics	5

field has learned thus far as well as a springboard for examining where dynamic capabilities research could productively go next. We further augment the content analysis with our own assessment of the literature. Then we make recommendations regarding issues that we believe have been largely resolved and thus may not require significant additional study, as well as issues that in our view have received insufficient attention and should thus be at the center of future inquiry.

Our content analysis began with the first two coauthors reading an article in its entirety, paying particular attention to its discussion and limitations sections. We identified a statement as relevant only when it focused specifically on either dynamic capabilities or a particular instance of such a capability. In constructing a coding scheme, we followed an iterative approach of moving back and forth between

³ It is our assessment that the dynamic capabilities perspective has become institutionalized to a point where researchers aiming to contribute to or draw from this field explicitly use (a variant of) the term "dynamic capabilities." Given that the scope of our review is confined to the dynamic capabilities field only (and we do not attempt to cover other constructs related to strategic change unless they are explicitly studied from a dynamic capabilities viewpoint), we believe the keyword-based search is highly appropriate for identifying our sample.

our data and relevant theoretical frameworks (Duriau, Reger, & Pfarrer, 2007; Strauss & Corbin, 1990). While we concentrated on conceptually and theoretically relevant items, we also included methodological suggestions in our coding, as explained in more detail later. Based on a random sample of 20 articles, we developed initial coding sheets for classifying the current state of knowledge and relevant suggestions for future research. As we analyzed additional articles, we continued to hone the coding schemes by collapsing, dropping, and adding categories.

With regard to first-layer coding categories, we began with the fundamental building blocks of a theory summarized by Whetten (1989): what, how, why, and who/where/when. "What" pertains to the nature and properties of dynamic capabilities, whereas "how" refers to the pattern, sequence, and form of the relationships between dynamic capabilities and other dependent and independent variables of interest (i.e., consequences and antecedents). "Why" pertains to assumptions about the underlying causal mechanisms that explain why dynamic capabilities are related to other variables. Finally, "who/where/when" refers to certain boundary conditions under which the predicted relationships are most and least likely to hold.

Beginning with this first-layer typology of "what," "how," "why," and "who/where/when," we introduced increasingly fine-grained second and third layers by identifying reoccurring themes in the initial sample of 20 articles. For example, we specified "antecedent," "consequence," and "dynamics" as second-layer subclasses of the first-layer "how" category. Delving another layer deeper, we found variables such as "innovation outcomes," "external fitness," "firm-level performance," and "survival" to be frequently mentioned types of consequences, and thus we used these concepts, along with an "other (including unspecified)" category, as third-layer subclasses of the second-layer "consequence" category.

In addition to these theory-related issues, we expanded our coding scheme by including a fifth firstlayer category containing "methods" issues. The two coding sheets for the current state of knowledge and future research directions are substantively similar at the first and second layer. Appendices A and B present an overview of the emergent coding schemes for the current state of knowledge and future research directions.

The first two coauthors independently coded a subsample of 39 randomly selected articles (see Appendix C for a list of these articles). Based on this double coding, we found the agreement at the third-layer level to be 93 percent, indicating strong reliability. We reconciled disagreements in our initial independent coding through discussion and established mutually agreedupon definitions of the first-, second-, and third-layer concepts. The remaining articles in our sample were approximately equally divided between the two coders.

THE CURRENT STATE OF DYNAMIC CAPABILITIES RESEARCH

Informed by the content analysis of the 298 articles in our sample, our article speaks to both the current state of knowledge and important avenues for future research on dynamic capabilities. We start by synthesizing the current state of knowledge before turning to future research directions. Table 2 lists concepts that emerged in our coding of the current state of knowledge, provides brief explanations and examples of articles that have employed the concepts, and reports frequencies (number and percentage of articles) for each of the individual concepts identified in our coding.

As shown in Table 2 and explained later, our analvsis reveals that dynamic capabilities research has covered a variety of areas: definition of the construct; theoretical assumptions underlying dynamic capabilities; theoretical integration of dynamic capabilities and other theoretical lenses; dimensions according to which dynamic capabilities are characterized; antecedents to the creation and use of dynamic capabilities; consequences (outcomes) of the utilization of dynamic capabilities; mechanisms (mediators) through which dynamic capabilities affect outcomes; moderators of the relationship between dynamic capabilities and outcomes; dynamics with respect to the impact of dynamic capabilities on outcomes and the development of these capabilities over time; and methods. We begin with a discussion of the theoretical aspects on which the literature has focused in recent years. Then we formulate an organizing framework for understanding dynamic capabilities that encompasses the antecedents, dimensions, consequences, mechanisms, and moderators identified in the literature to date. We conclude our analysis of the current state of knowledge with a discussion of the dynamics involved and an examination of the methods used in studies of dynamic capabilities.

Theoretical Foundations

Definitions. Our findings make it clear that researchers have devoted significant attention to addressing earlier criticisms of the dynamic capabilities perspective on multiple fronts. First, Table 2 shows an

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TABLE 2 Overview of the Current State in Dynamic Capabilities Research

Concept	Explanation	Examples from Our Article Sample	Frequency (Percentage) ^a
Dynamic capabilities definitions	Ways in which dynamic capabilities have been concentualized		
Teece et al. (1997: 516)	"We define dynamic capabilities as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities thus reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions ()."	Døving and Gooderham (2008), Witcher and Chau (2012)	111 (37.3%)
Eisenhardt and Martin (2000: 1107)	"The firm's processes that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die."	Butler and Murphy (2008), Sarkis, Gonzalez-Torre, and Adenso- Diaz (2010)	59 (19.8%)
Helfat et al. (2007: 1)	"A dynamic capability is the capacity of an organization to purposefully create, extend, or modify its resource base."	Anand et al. (2010), Maatman, Bondarouk, and Looise (2010)	49 (16.4%)
Zollo and Winter (2002: 340)	"A dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness."	Arend (2014), Dobrzykowski, McFadden, and Vonderembse (2016), Romme, Zollo, and Berends (2010)	23 (7.7%)
Teece (2007: 1319)	"These capabilities can be harnessed to continuously create, extend, upgrade, protect, and keep relevant the enterprise's unique asset base."	Desyllas and Sako (2013), Zheng et al. (2011)	34 (11.4%)
Winter (2003: 991)	"Defining ordinary or 'zero-level' capabilities as those that permit a firm to 'make a living' in the short term, one can define dynamic capabilities as those that operate to extend, modify or create ordinary capabilities."	Athreye, Kale, and Ramani (2009), Rahmandad (2012)	17 (5.7%)
Other definition	A definition based on a reference not listed previously (e.g., Adner & Helfat, 2003; Barreto, 2010).	Gabler, Richey, and Rapp (2015), Sirmon and Hitt (2009)	53 (17.8%)
Theoretical assumptions	Taken-for-granted facts or assertions		
Bounded rationality	Degree to which individuals' decisions are limited by the tractability of the decision problem, the cognitive limitations of their minds, and the time available to make the decision	Augier and Teece (2009), MacLean et al. (2015)	7 (2.4%)
Managerial agency	Role of, and degree of heterogeneity in, managerial decisions and quality	Di Stefano et al. (2014), Helfat and Peteraf (2015)	9 (3.0%)
Heterogeneity of dynamic capabilities	Degree to which dynamic capabilities are firm specific versus have commonalities across firms in terms of key features ("best practices")	Barreto (2010), Kleinbaum and Stuart (2014)	11 (3.7%)
Theoretical integration	Combination of dynamic capabilities perspective with other theories		
Resource-based view of the firm	A theory focusing on how certain characteristics of resources can give the firm a competitive advantage	Kim and Mahoney (2010), Morgan, Vorhies, and Mason (2009)	12 (4.0%)

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TABLE 2 (Continued)

Concept	Explanation	Examples from Our Article Sample	Frequency (Percentage) ^a
Organizational learning theory	A theory focusing on the processes through which knowledge is absorbed, processed, and retained	Denford (2013), Di Stefano et al. (2010)	13 (4.4%)
Evolutionary economics	A theory focusing on firm and industry dynamics, changing structures, and disequilibrium processes	Augier and Teece (2008), Fueglistaller and Schrettle (2010). Prime and Čater (2016)	8 (2.7%)
Transaction cost economics	A theory focusing on the costs of market transactions and the influence on make-or-buy decisions, firm boundaries, and governance issues	Augier and Teece (2009), Nickerson et al. (2012)	6 (2.0%)
Dynamic capabilities dimensionalization	Ways in which dynamic capabilities can be characterized and typologies constructed		
Procedural	Typologies differentiating between processes that underlie dynamic capabilities	Coordinating/learning/ reconfiguring Pierce (2009) Sensing/seizing/transforming Martin (2011)	159 (53.4%)
Routinization	Typologies differentiating between more and less- routinized processes and heuristics	Peteraf et al. (2013), Salvato (2009)	38 (12.8%)
Functional	Typologies differentiating between different functional domains/activities in a firm	Alliancing Schilke (2014a) New product development Danneels (2008) Mergers & acquisitions Bingham et al. (2015) Internationalization Bingham and Eisenhardt (2011)	188 (63.1%)
Hierarchical	Typologies based on the idea that each capability is nested within a higher-order capability; e.g., first- order dynamic capabilities reconfigure the organizational resource base, second-order dynamic capabilities reconfigure first-order dynamic capabilities, and so on	Heimeriks et al. (2012), Robertson, Casali, and Jacobson (2012)	38 (12.8%)
By unit of analysis	Typologies based on different analytical levels; dynamic capabilities associated with individual managers, teams, organizational units, firms, or firm networks (e.g., supply chains)	Individual Adner and Helfat (2003), Sirmon and Hitt (2009) Group Friedman et al. (2016), Hodgkinson and Healey (2011) Firm Coen and Maritan (2011), Rahmandad (2012) Beyond firm boundaries Dyer and Nobeoka (2000), Kim, Cavusgil, and Cavusgil (2013)	233 (78.2%)
Antecedents Experience	Drivers/sources of dynamic capabilities Direct contact with or observation of facts or events	Chen et al. (2012), Schilke and Goerzen (2010)	28 (9.4%)
Organizational structure	Way in which activities (such as task allocation, coordination, and supervision) are orchestrated	Eisenhardt et al. (2010), Felin and Powell (2016), Schilke and	28 (9.4%)
Organizational culture	Collective values, beliefs, and principles of organizational members	Anand et al. (2009), Bock et al. (2012), Song, Lee, and Khanna (2016)	19 (6.4%)

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TABLE 2 (Continued)

Concept	Explanation	Examples from Our Article Sample	Frequency (Percentage) ^a
Resources	Valuable tangible or intangible assets or supplies at the firm's disposal	Capron and Mitchell (2009), Salge and Vera (2013)	43 (14.4%)
Information technology	Application of computers and the Internet to store, study, retrieve, transmit, and manipulate data	Macher and Mowery (2009), Pavlou and El Sawy (2010)	12 (4.0%)
Human capital	Employees' skill sets	Hsu and Wang (2012), Kale (2010)	14 (4.7%)
Leadership	Group of individuals who guide a firm (e.g., the top management team or the CEO)	Day and Schoemaker (2016), Kor and Mesko (2013), Rindova and Kotha (2001)	16 (5.4%)
Managerial cognition	Managers' mental representations and action or process of acquiring knowledge and understanding	Dunning and Lundan (2010), Leiblein (2011)	16 (5.4%)
External environment	External surroundings or conditions in which a firm operates	Fawcett et al. (2011), Killen et al. (2012)	18 (6.0%)
Inter-organizational structure	Pattern of relationships through which firms are connected to each other	Jansen et al. (2005), Roberts and Grover (2012)	6 (2.0%)
Consequences	Outcomes of dynamic capabilities		
Firm-level performance	Financial or competitive firm accomplishments (such as accounting profitability or competitive advantage)	Desyllas and Sako (2013), Shamsie, Martin, and Miller (2009), Teece and Leih (2016)	113 (37.9%)
Domain-/process- specific performance	Specific accomplishments within a particular domain or process (such as acquisition integration, product quality, and supply chain management)	Acquisition performance Zollo and Singh (2004) Product quality performance Su et al. (2014) Supply chain performance Golgeci and Ponomarov (2013) Resource development performance	22 (7.4%)
External fitness	Degree to which the firm, its resources, or its activities are favored by the selection	Stadler et al. (2013) Helfat and Peteraf (2009), Lichtenthaler and Lichtenthaler (2000)	14 (4.7%)
Survival	Continued existence of the firm	Dixon et al. (2014), Rosenbloom (2000)	8 (2.7%)
Growth	Process of increase in size of key measures, such as annual revenues or number of employees	Filatotchev and Piesse (2009), Nickerson et al. (2012)	9 (3.0%)
Flexibility	Ability of the firm to accommodate major changes	Vanpoucke et al. (2014), Wilhelm, Schlömer, and Maurer (2015)	9 (3.0%)
Innovation outcomes	Results of processes of innovating, such as new product introductions, patents, etc.	Karim (2009), Mitchell and Skrzypacz (2015)	41 (13.8%)
Resource base change	Alterations to the portfolio of resources	Ambrosini et al. (2009), Helfat and Martin (2015)	17 (5.7%)
Learning	Acquisition of knowledge or skills	Agarwal et al. (2004), Easterby- Smith and Prieto (2008)	9 (3.0%)
Mechanisms	Intermediate variables through which an independent variable causally affects an outcome (here: through which dynamic capabilities influence consequences)		
Resource base	Portfolio of firm resources and capabilities	Fainshmidt et al. (2016), Karimi and Walter (2015), Protogerou et al. (2012)	11 (3.7%)
Moderators	Third variables that affect the strength of the relationship between dynamic capabilities and consequences		

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TABLE 2 (Continued)

Concept	Explanation	Examples from Our Article Sample	Frequency (Percentage) ^a
Organizational size	Largeness of the organization (often determined by the number of its members or the scale of its assets)	Arend (2015), O'Reilly et al. (2009)	6 (2.0%)
Organizational structure	Way in which activities (such as task allocation, coordination, and supervision) are orchestrated toward the achievement of organizational aims	Fang and Zou (2009), Wilden, Gudergan, Nielsen, and Lings (2013)	3 (1.0%)
Organizational culture	Collective values, beliefs, and principles of organizational members	O'Connor (2008), Roberts, Campbell, and Vijayasarathy (2016), Slater et al. (2014)	5 (1.7%)
Strategy	Sum of the actions a firm intends to take to achieve long-term goals	Carpenter et al. (2001), Engelen et al. (2014)	7 (2.4%)
Interorganizational structure	Pattern of relationships through which firms are connected to each other	Ambrosini and Bowman (2009), Subramaniam and Youndt (2005)	4 (1.3%)
Other organizational capabilities	Organizational capabilities other than the focal dynamic capability under investigation	Second-order dynamic capabilities Schilke (2014b) Idiosyncratic resources	18 (6.0%)
Industry sector	The field in which the firm conducts business	Pandza and Thorpe (2009), Piening (2013)	4 (1.3%)
Geographic area	The region or country in which the firm is located	Brouthers et al. (2008), Parente et al. (2011)	6 (1.0 %)
Environmental dynamism	The rate and unpredictability of environmental change	El Sawy, Malhotra, Park, and Pavlou (2010), Harris et al. (2009)	44 (14.8%)
Competitive intensity	The intensity of rivalry among competitors in an industry	Arrfelt, Wiseman, McNamara, and Hult (2015), Harvey, Skelcher, Spencer, Jas, and Walshe (2010)	5 (1.7%)
Dynamics	Time-dependent processes		
Evolution	Gradual development	Fischer et al. (2010), Jenkins (2010)	11 (3.7%)
Timing	The points in time at which dynamic capabilities are developed or exert their effects	Ambrosini and Bowman (2009), Bingham et al. (2015)	2 (0.7%)
Methods	Methodology employed by the article		
Empirical	Large-scale survey, qualitative methods, archival data, mixed methods, etc.	Karna et al. (2016), Lee and Kelley (2008), Lee and Kang (2015)	197 (66.1%)
Theoretical	Narrative theory, conceptual analysis, simulation modeling, closed form mathematical modeling, etc.	Chi and Seth (2009), Tang and Liou (2010)	101 (33.9%)

^a Frequency is the total number of articles referring to or using the concept, and percentage is the frequency divided by the total number of articles coded (i.e., 298).

increasing convergence among definitions of the dynamic capabilities construct. Whereas more than onethird of the articles that we analyzed refer to Teece et al.'s (1997) original conceptualization and about 20 percent refer to the definition of Eisenhardt and Martin (2000), the more recent integrative definition by Helfat et al. (2007) has seen increasing popularity, with 16 percent of articles referring to it.⁴

⁴ In our coding of definitions, we only counted a certain reference if the analyzed article explicitly referred to this reference as a source for the definition of dynamic capabilities.

Helfat et al. (2007) defined dynamic capabilities as "the capacity of an organization to purposefully create, extend, or modify its resource base" (p. 1) in a practiced and patterned manner. In an extension of this definition, Helfat and Winter (2011) noted that dynamic capabilities also provide the capacity for an organization to influence its external environment, as emphasized by Teece (2007). The definition of Helfat et al. (2007) and similar ones, such as those by Zollo and Winter (2002), Winter (2003), and Helfat and Winter (2011), avoid the potential tautology trap (Priem & Butler, 2001; Zollo & Winter, 2002) by not equating dynamic capabilities with performance and instead emphasizing their purpose of changing the organizational resource base and/or the external environment. These definitions also avoid confusion regarding whether environmental dynamism constitutes a defining element of dynamic capabilities (Zahra et al., 2006); as Helfat and Winter (2011) and Schilke (2014a) stress, dynamic capabilities can also exist in relatively stable environments as firms expand or otherwise alter their business. However, as discussed later, subsequent research has shown that environmental dynamism is an important antecedent to dynamic capabilities, in line with Teece et al. (1997), and is a relevant contingency when examining their effects.

Theoretical assumptions. Like any other theoretical approach, the dynamic capabilities perspective rests on certain theoretical assumptions. These assumptions have sometimes been made implicitly, but in recent years, more researchers have started to make them explicit and discussed their merits and justifications. In particular, some of the dynamic capabilities perspective's key assumptions that have received considerable attention pertain to decision makers' bounded rationality (Augier & Teece, 2009; MacLean, MacIntosh, & Seidl, 2015) and their agency in promoting strategic change (Di Stefano et al., 2014; Helfat & Peteraf, 2015), as well as the heterogeneity of dynamic capabilities between organizations (Barreto, 2010; Kleinbaum & Stuart, 2014).

A particularly noteworthy contribution in this regard is the groundwork by Augier and Teece (2008, 2009), who elaborated several of the dynamic capabilities perspective's assumptions visà-vis other theoretical approaches. For example, they clearly distance the dynamic capabilities tradition from a strict population ecology view, in that the former sees a clear role for managerial and organizational agency, whereas the latter usually considers path dependencies to be too strong for organizations to be able to adapt (except on the periphery). Moreover, the assumptions of the dynamic capabilities approach are portrayed as having many similarities with those of the behavioral theory of the firm, including the presumption of bounded rationality, the importance of firm heterogeneity, and a central role for learning. Augier and Teece (2008, 2009) also argue that despite complementarities with transaction cost economics, the dynamic capabilities approach differs from it in focusing on opportunity (rather than opportunism), on new resources (rather than existing ones), and on value creation (rather than value protection). We believe that theoretical work, such as Augier and Teece (2008, 2009), that helps to explain and clarify the theoretical assumptions of the dynamic capabilities paradigm has been valuable in helping the field to further converge and clarifying the scope conditions under which the concept is likely to provide most insight. Making assumptions explicit also enables researchers to draw out new predictions (Cohen, 1989), thus helping to further expand the dynamic capabilities perspective.

Theoretical integration. From its inception, the dynamic capabilities perspective has taken a highly integrative approach that flexibly draws on adjacent theories. Scholars have advocated continuing this approach and further enriching the dynamic capabilities perspective with other relevant theories (Arend & Bromiley, 2009; Helfat & Peteraf, 2009)—a call to which scholars have vigorously responded. Among the theories most frequently employed in recent dynamic capabilities research, the RBV, organizational learning theory, evolutionary economics, and transaction cost economics are most prominent (with 12, 13, 8, and 6 studies, respectively).

As we discussed earlier, the dynamic capabilities perspective originally had as one of its primary foci the modification of the firm's asset base, so the strong theoretical connection to the RBV in ongoing work is not surprising. Moreover, the emphasis of dynamic capabilities on strategic change necessitates insight into how organizations develop and integrate new resources and capabilities, which—as Zollo and Winter (2002) made clear—is where organizational learning theory comes in. Learning has three roles in the dynamic capabilities perspective, and these roles are sometimes not well distinguished. First, as is true for all capabilities, dynamic capabilities develop through learning, involving deliberate learning or learning-by-doing, or both (Zollo & Winter, 2002). Secondly, some types of dynamic capabilities are capabilities for learning; these capabilities enable organizations to learn, thereby facilitating organizational and strategic change. For example, Salge and Vera (2013) studied incremental learning as a dynamic capability that facilitates firm adaptation, and Schilke (2014b) analyzed the relationship between dynamic capabilities for "learning to learn" and dynamic capabilities for directly modifying the firm's resource base. And third, to the extent that dynamic capabilities enable organizations to learn, then learning is an outcome of dynamic capabilities.

With respect to other theories that have significantly informed the dynamic capabilities perspective, evolutionary economics has contributed an orientation toward innovation, as well as an emphasis on routines and path dependence (Helfat & Peteraf, 2009; MacLean et al., 2015). Approximately 16 percent of the articles in our sample refer either directly to evolutionary economics (3 percent) or to routinization (13 percent, as part of the dimensions of dynamic capabilities discussed later). One issue of ongoing contestation and debate is whether all dynamic capabilities are necessarily highly routine-based—a question to which we will return in our discussion of how dynamic capabilities may be dimensionalized. Finally, transaction cost economics can help dynamic capabilities scholars to more comprehensively address questions regarding firm boundaries, although this is an area where there is a noticeable gap in the literature, with only 3 percent of articles referring to this. As Argvres and Zenger (2012) argued, transaction cost and capabilities explanations of firm boundaries are deeply intertwined, and a synthesis of the two perspectives affords a more comprehensive understanding of boundary decisions that encompasses both holdup and asset-complementarity considerations. Overall, we applaud continuing efforts to highlight and leverage relevant overlaps with other theories as these efforts have the potential to further enhance the theoretical richness and precision of the dynamic capabilities approach (see Whetten, Felin, & King, 2009 for more general thoughts regarding the merits and challenges associated with theory borrowing).

Organizing Framework for Dynamic Capabilities

Beyond theoretical considerations involving dynamic capabilities, researchers have significantly improved our understanding of the nomological network surrounding dynamic capabilities. Whereas knowledge of relevant facets of dynamic capabilities, as well as their antecedents and consequences, was underdeveloped 10 years ago (Arend & Bromiley, 2009; Danneels, 2008), a multitude of studies have since made significant progress on these issues. Figure 2 integrates the various findings of the studies in our sample into a new and comprehensive organizing framework that identifies the primary influences on, characteristics of, and outcomes of dynamic capabilities. Because Figure 2 reflects research to date in an area that is still developing, some portions of the framework are necessarily incomplete. As part of the discussion of dynamic capabilities research below, we identify remaining gaps in the literature, which call for additional research.

Dimensionalization. As shown in Figure 2, an increasing number of researchers have come to realize that dynamic capabilities are not a unitary concept; rather, these capabilities manifest themselves in various distinct forms (Eisenhardt & Martin, 2000; Helfat et al., 2007; Helfat & Winter, 2011). As such, scholars have developed different ways in which to dimensionalize the dynamic capabilities construct. Chief among these approaches are distinctions between (a) the types of processes in which dynamic capabilities are engaged (e.g., coordinating/learning/ reconfiguring—Teece et al. 1997; sensing/seizing/ transforming—Teece 2007); (b) the degree of routinization of dynamic capabilities (e.g., contrasting relatively spontaneous problem-solving with highly patterned routines-Winter, 2003); (c) the functional domain in which dynamic capabilities are applied (e.g., alliancing, new product development, mergers & acquisitions-Eisenhardt & Martin, 2000); (d) the hierarchy of capabilities (zero-, first-, second-, and higher-order capabilities-Collis, 1994); and (e) the focal unit of analysis (individual, team, organizational, and extra-organizational—Adner & Helfat, 2003; Felin, Foss, Heimeriks, & Madsen, 2012).

These different approaches have contributed much richness and nuance to our understanding of what constitutes concrete and observable dynamic capabilities. Teece's (2007) typology of sensing new opportunities (and threats), seizing these opportunities, and transforming the organization and its strategy as new opportunities and threats arise has been used in a large percentage of the articles in our sample. According to this typology, dynamic capabilities are reflected in distinct organizational processes aimed at gaining a comprehensive understanding of the business environment and emerging opportunities and threats (sensing), making strategic choices among investment opportunities and business models (seizing), and reconfiguring the organization's resources, structure, and capabilities (transforming).

FIGURE 2 Organizing Framework of Dynamic Capabilities



More than 50 percent of the articles refer to either this typology or the Teece et al. (1997) typology of coordinating activities, learning, and reconfiguring the organization.

Despite different labels, foci, and ordering, the two organizational process-based typologies in Teece (2007) and Teece et al. (1997) have many similarities and overlaps. A comparison of the two shows that Teece (2007) placed greater emphasis on sensing (which Teece et al. (1997) mentioned as a subprocess of reconfiguring), whereas Teece et al. (1997) devoted more attention to coordinating (which Teece (2007) mentioned as a subprocess of transforming). Therefore, we see Teece's (2007) discussion of organizational processes as an elaboration rather than a supersession of Teece et al.'s (1997) original typology.⁵

⁵ Similarly, although Teece et al. (1997) used what at first glance appears to be a different overarching framing with respect to strategic opportunities than Teece (2007), the two articles in fact have very similar approaches. Teece et al. (1997) framed the dynamic capabilities perspective broadly as one of processes-positions-paths, where a firm pursues paths (strategic opportunities) through the use of managerial and organizational processes, shaped by the firm's positions (its existing asset base). Teece (2007) focused on the goal of pursuing strategic opportunities without calling them paths, and then elaborated on the processes for doing so, namely sensing, seizing, and transforming.

Another way to dimensionalize dynamic capabilities is by their degree of routinization (Eisenhardt & Martin, 2000), which is addressed in 13 percent of the articles in our sample. Teece et al. (1997) and Teece (2007) incorporated organizational routines as important elements of dynamic capabilities, and this aspect of dynamic capabilities has also been emphasized by Winter (2003) and Helfat and Winter (2011). Yet, there is also evidence that some activities appear to be less routine. Nonetheless, on closer inspection, it turns out these activities frequently have important routinized aspects. For example, although new product development may have nonroutine aspects as the individuals involved explore new ideas, new product development often takes place within a stable framework of recurring (and therefore somewhat routine) organizational processes (see Iansiti & Clark, 1994). Similarly, Teece (2007) as well as later works such as by Augier and Teece (2008, 2009) have emphasized the "entrepreneurial" and less-routinized aspect of managerial decision-making. But as Adner and Helfat (2003) argued in their original conception of "dynamic managerial capabilities," managerial decision-making often relies on stable underpinnings that enable practiced and patterned behavior (Helfat & Martin, 2015). These underpinnings include the managerial resources of human capital, social capital, and cognition identified by Adner and Helfat (2003), as well as the mental processes (a subset of managerial cognition) examined by Helfat and Peteraf (2015). In summary, whereas dynamic capabilities can in many cases be associated with routines, the specific degree of routinization can certainly differ between individual instances of dynamic capabilities.

In addition, 63 percent of the articles use a functional typology to study specific functional domains and applications within the firm. The empirical literature has thus made concrete the insights of Eisenhardt and Martin (2000) and Winter (2003), who noted that dynamic capabilities pertain to specific activities and the context in which they are employed. New product development can probably be considered the most typical and traditional functional domain of dynamic capabilities since Iansiti and Clark's (1994) original investigation. Given that organizations can also try to access resources outside their current boundaries for purposes of strategic change, mergers and acquisitions as well as alliances are other heavily researched functional instances of dynamic capabilities. Recognition of the importance of these topics has contributed to the diffusion of the dynamic capabilities

perspective to adjacent fields, including operations management and marketing, in which interorganizational relationships are frequently studied. Moreover, because geographic expansion is another way to exercise dynamic capabilities, the purposeful management of organizational internationalization is an important activity embraced by strategy and international business scholars alike.

Another dimension of dynamic capabilities that has received considerable attention is their location within a hierarchy of capabilities, with 13 percent of the articles in our sample referring to this. Collis (1994) first proposed that dynamic capabilities nest within a larger hierarchy of capabilities. At the base of the hierarchy are operational capabilities, or what Collis (1994) termed "zero-order" capabilities, which can be modified by dynamic capabilities (termed "first-order" capabilities by Collis (1994)). These dynamic capabilities can themselves be modified by "second-order" and even "higher-order" dynamic capabilities (Collis, 1994). Winter (2003, 2008) and many other scholars have since adopted this terminology. Later work by Danneels (2008), however, referred to Collis's (1994) zero-order and first-order capabilities instead as first-order and second-order capabilities, respectively, creating some confusion with regard to terminology. Most subsequent research has used the Collis/Winter terminology.

Increasingly, scholars have also recognized that dynamic capabilities exist at different units of analysis. Over three-quarters of the articles in the sample addressed units of analysis in one way or another, reflecting the fact that dynamic capabilities can rest either at the organizational level, the managerial/ individual level, or some other level of analysis (e.g., the team level). Although research at the level of the organization remains most common, there has been an increasing interest in dynamic *managerial* capabilities as noted previously (Adner & Helfat, 2003; Helfat & Martin, 2015; Sirmon & Hitt, 2009), in line with the ongoing microfoundations movement in capabilities research more generally (Felin et al., 2012). Individual skills and cognitions have come to the foreground (Helfat & Peteraf, 2015), the inquiry of which now constitutes an important component of the dynamic capabilities perspective. Complementing the organizational and individual level, researchers have pointed to the importance of dynamic capabilities of key groups, such as top management and other executive teams (Friedman, Carmeli, & Tishler, 2016; Martin, 2011), and have even made the case that dynamic capabilities can operate beyond

firm boundaries, such as at the level of the production network (Dyer & Nobeoka, 2000) or the nation state (Teece, 2014). Taken together, these different foci adopted by various researchers make clear that the dynamic capabilities perspective has come to represent a comprehensive multi-level paradigm.

Despite a clear trend toward more fine-grained and concrete approaches (such as those reviewed previously), we continue to see some investigations into a generic dynamic capabilities construct. Although we believe that it clearly makes sense to talk about dynamic capabilities as a distinct phenomenon on a theoretical level, empirical study of such a general concept is problematic. As just noted, dynamic capabilities differ according to their functional domain, location in the capability hierarchy, and unit of analysis. In addition, any particular instance of a dynamic capability is context dependent with respect to the setting (e.g., firm, industry, and geography) in which it develops and is employed. Empirical study of dynamic capabilities therefore requires precision in defining and measuring specific instances of dynamic capabilities. It is then through theoretical induction that empirical researchers may generalize from their focal dimension back to the more general level of dynamic capabilities while being cognizant of the fact that further research on other types of dynamic capabilities may be needed to test the theory more conclusively.

Antecedents. Insight on where dynamic capabilities come from was limited for many years (Felin & Foss, 2005). However, as Figure 2 shows, recent investigations have identified a number of relevant antecedents at multiple levels of analysis, including the organizational, individual, and environmental levels, to elucidate factors that facilitate or hinder the development, maintenance, and usage of dynamic capabilities.

Consistent with Teece et al.'s (1997) original presentation of the dynamic capabilities perspective, existing resources—or "positions" in Teece et al.'s (1997) terminology—have received much attention among relevant organization-level drivers of dynamic capabilities (43 studies). Scholars have argued that resource-rich firms tend to have greater capability to plan, execute, and maintain strategic change (Giudici & Reinmoeller, 2012; Helfat & Peteraf, 2009). Different types of resources have been found to be conducive to dynamic capabilities, among them financial resources (El Akremi, Perrigot, & Piot-Lepetit, 2015), technological resources (Anand, Oriani, & Vassolo, 2010), and slack resources (Danneels, 2008).

Despite these largely consistent findings regarding the facilitating role of the existing resource base in the development of dynamic capabilities, scholars should also be aware of the position put forth by Rahmandad (2012), who suggested that resources and operational capabilities may function not only as complements to dynamic capabilities, but also as substitutes. In particular, managers pressed to prioritize short-term growth may decide to build operational capabilities and other organizational resources that help generate short-term returns while forgoing opportunities to build dynamic capabilities whose effects may only materialize in the longer term. As such, the relationship between organizational resources, operational capabilities, and dynamic capabilities may be more complicated than originally assumed.

In addition to organizational resources, organizational experience has seen a noticeable amount of attention as a potential source of dynamic capabilities (28 studies). For example, as noted earlier, dynamic capabilities develop in part through learning-bydoing, and dynamic capabilities become more proficient as organizations gain experience employing them. As summarized by Pisano (2002), "(t)he seeds of today's capabilities are sown in yesterday's experience" (p. 150). Consistent with this statement, Chen, Williams, and Agarwal (2012) argued that prior experience enhances firms' integrative capabilities for coordination across businesses when entering new industries, and Schilke and Goerzen (2010) found a significant relationship between alliance experience and alliance management capability.

In addition, a considerable number of studies have shed light on the effects of organizational structure (28 studies, including Eisenhardt, Furr, & Bingham, 2010; Felin & Powell, 2016; Schilke & Goerzen, 2010), organizational culture (19 studies, including Anand et al., 2009 Bock, Opsahl, George, & Gann, 2012), and information technology (12 studies, including Macher & Mowery, 2009 Pavlou & El Sawy, 2010) on dynamic capabilities.

Moving beyond the organizational level and adding microfoundations to the research agenda (Abell, Felin, & Foss, 2008; Felin, Foss, & Ployhart, 2015), a total of 46 studies have elucidated individual-level factors and their role in shaping dynamic capabilities, including human capital (Hsu & Wang, 2012; Kale, 2010), leadership (Kor & Mesko, 2013; Rindova & Kotha, 2001), and managerial cognition (Dunning & Lundan, 2010; Leiblein, 2011). For example, Kale (2010) showed how scientists who were educated or had work experience overseas helped Indian firms to acquire R&D capabilities, and Salvato's (2009) qualitative study of 90 new product development processes at the Italian design firm Alessi shed light on how mindful "microactivities" carried out by individuals shaped the organization's product development capability. Perhaps the strongest evidence of a causal relationship between managerial dynamic capabilities and performance emerged in an experiment that was conducted in a hyper-competitive environment, where advantages from market structure or strategic resources were unavailable. Nonetheless, traders with superior cognitive skills—in the form of strategic intelligence—outperformed competitors by up to 50% (Levine, Bernard, & Nagel, forthcoming).

Finally, another 24 investigations identified sources of dynamic capabilities outside the firm's boundaries, in particular studying the role of features of the external environment such as environmental dynamism (Fawcett, Wallin, Allred, Fawcett, & Magnan, 2011; Killen, Jugdev, Drouin, & Petit, 2012) and the interorganizational structure in which the firm is embedded (Jansen, Van Den Bosch, & Volberda, 2005; Roberts & Grover, 2012). These investigations highlight that firms' efforts to build dynamic capabilities do not occur in a vacuum but are substantially affected by the broader organizational environment. Fawcett, Fawcett, Watson, and Magnan (2012), for instance, described competitive pressures in the industry as a strong motivator that led firms to develop interorganizational collaboration capabilities. In addition, Zheng, Zhang, and Du (2011) linked network embeddedness to dynamic capabilities. These authors found that relational embeddedness facilitated knowledge acquisition capability and that the diversity of network and joint problem-solving contributed to knowledge combination capability.

All of these investigations show that substantial progress has been made in elucidating under what conditions firms are likely to possess dynamic capabilities. A host of studies have built on Teece et al.'s (1997) framework, which emphasized prior paths and resource positions as relevant enabling conditions of dynamic capabilities (also see Eisenhardt & Martin, 2000; Teece, 2007). Other studies have extended this framework to consider a variety of additional factors that may affect dynamic capabilities.

Consequences. As noted earlier, a key reason that many management scholars have become interested in dynamic capabilities is their proposed influence on important outcome variables. Indeed, the performance-enhancing effect of dynamic capabilities is often viewed as a key tenet of this literature (Fainshmidt, Pezeshkan, Lance Frazier, Nair, & Markowski, 2016; Teece, 2014). Dynamic capabilities are proposed to confer a competitive advantage by adding unique value to the firm through systematic change, which may enhance operational efficiency and enable increased alignment with the environment (Di Stefano et al., 2014; Peteraf et al., 2013). In addition to providing value in these ways, dynamic capabilities can possess the other three characteristics of the RBV's value-rarity-inimitabilitynonsubstitutability (VRIN) framework (Ray, Barney, & Muhanna, 2004; Schilke, 2012). Not all organizations possess them (Collis, 1996); their path dependencies, intangibility, complexity, and organizational specificity make them hard to imitate (Gibson & Birkinshaw, 2004; Helfat & Winter, 2011), and few other means allow organizations to purposefully change on a continuous basis (Day & Wensley, 1988; Helfat et al., 2007).

Given this theoretical importance, it is not surprising that numerous studies have focused on various consequences of dynamic capabilities. In total, 113 studies have analyzed the effect of dynamic capabilities on firm-level performance outcomes frequently used in strategy research, such as competitive advantage or financial performance, with most of the studies positing and/or finding a positive effect. Additional support for this claim comes from many of the 40 studies that draw on the notion of external fitness and expand the empirical metrics of firm performance to include indicators such as survival, growth, and flexibility.⁶

In addition to these broad firm-level outcomes, researchers have looked at more domain- or function-specific outcomes, including acquisitions, product quality, and supply chain performance. This approach is much in line with the recommendations of Ray et al. (2004) to select appropriate outcome variables that are sufficiently close to a study's focal type of capability. Generally, these studies show that dynamic capabilities can enhance a variety of domain-specific outcomes. For example, Zollo and Singh (2004) reported a positive effect of a firm's postacquisition integration capability on its acquisition performance; Su, Linderman, Schroeder, and Van de Ven (2014) suggested that a meta-learning capability helps sustain a high level of product

⁶ External fitness refers to the extent of fit between the firm and its environment. Quantitative measures of external fitness include traditional metrics of firm performance such as profitability as well as indicators such as survival and growth (Helfat et al., 2007).

quality performance, whereas capabilities for sensing weak signals and resilience improve the consistency of product quality performance; and Golgeci and Ponomarov (2013) reported evidence that a firm's innovative capability can be a key contributor to supply chain resilience.

Finally, 26 investigations have refrained from studying consequences in terms of performance and instead have focused on organizational change as the dependent variable, examining changes in the resource base (Ambrosini, Bowman, & Collier, 2009; Stadler et al., 2013) and learning of various types (Agarwal, Echambadi, Franco, & Sarkar, 2004; Easterby-Smith & Prieto, 2008). As predicted by these authors, dynamic capabilities were found to help firms to bring about organizational change as well as to learn a variety of activities.

Mechanisms. Although organizational change was often treated as the final explanandum, 11 studies in our sample have explicitly modeled a multi-step causal chain, in which resource changes are the intermediate outcomes of dynamic capabilities, and these resource changes are the causal mechanisms⁷ through which dynamic capabilities affect performance outcomes (e.g., Karimi & Walter, 2015; Protogerou, Caloghirou, & Lioukas, 2012). Consistent with the theoretical positions of Eisenhardt and Martin (2000), Helfat and Peteraf (2003), Zahra et al. (2006), and Zott (2003), among others, these researchers have argued that dynamic capabilities' immediate purpose is to change the resource base, and that this change in the resource base, in turn, explains performance variations. According to this argument, resource changes serve as mediators through which dynamic capabilities affect performance.

We believe that explicitly modeling the causal mechanisms that explain the performance effect of dynamic capabilities is a particularly meritorious endeavor. Interestingly, change in the resource base is by far the most frequently studied mechanism, to the exclusion of other potentially important mediators. As we noted at the outset, dynamic capabilities may directly alter features of the external environment. Little research, however, has investigated this or other mediators, which in turn affect performance outcomes. In fact, only four percent of the articles in our sample explicitly examined possible causal mechanisms, suggesting a significant gap in the literature to which we will return later.

Moderators. Another important refinement in recent theorizing and empirical work on the consequences of dynamic capabilities rests on the recognition that such effects tend to be highly context specific. Increasingly, researchers have started to follow a contingent approach (Aragon-Correa & Sharma, 2003) and have identified relevant moderators of the effects of dynamic capabilities. The most frequently studied moderator is that of environmental dynamism. Schilke (2014a), for example, finds the dynamic capabilities-firm performance link to be the strongest under intermediate levels of environmental dynamism, whereas it is comparatively weaker when dynamism is either low (and there may be fewer opportunities to amortize the cost of dynamic capabilities development and maintenance) or high (and environmental changes may be too abrupt and unforeseeable to fully leverage planned strategic change). The 44 studies that model environmental dynamism as a contingency variable alleviate criticism of some earlier research that made it a component of dynamic capabilities or a precondition per definitionem (cf. Zahra et al., 2006). This line of work instead provides support for the claim that although environmental dynamism is likely to be a highly relevant condition determining the extent to which dynamic capabilities may affect organizational outcomes such as firm performance, dynamic capabilities can in principle exist and help firms compete in both relatively stable and highly dynamic environments (Helfat & Winter, 2011). Consistent with this logic, environmental dynamism has now been accepted as a central contingency variable in dynamic capabilities theorizing.

In addition to environmental dynamism, researchers have also studied interactions of dynamic capabilities with other variables, including other types of organizational capabilities (18 studies). For example, there is evidence of a negative interaction effect between first-order dynamic capabilities (i.e., those that change the resource base) and second-order dynamic capabilities (i.e., those that change firstorder dynamic capabilities), such that the two function as substitutes in positively affecting performance outcomes (Schilke, 2014b). In other words, with increasing levels of second-order dynamic capabilities, the marginal effect of first-order dynamic capabilities on performance outcomes diminishes-possibly because dynamic capabilities on both levels are primarily employed to attain the similar end of strategic change and thus may exhibit some element of equifinality.

⁷ In this article, we use the term "mechanism" to represent a variable through which an independent variable causally affects an outcome (Imai, Tingley, & Yamamoto, 2013: 7). That is, we consider "mechanism" as quasisynonymous with "mediator" (Baron & Kenny, 1986).

Additional moderators that have received recent attention include organizational strategy (Carpenter, Sanders, & Gregersen, 2001; Engelen, Kube, Schmidt, & Flatten, 2014), organizational size (Arend, 2015; O'Reilly, Harreld, & Tushman, 2009), organizational culture (O'Connor, 2008; Slater, Mohr, & Sengupta, 2014), industry sector (Pandza & Thorpe, 2009; Piening, 2013), geographic area (Brouthers, Brouthers, & Werner, 2008; Parente, Baack, & Hahn, 2011), and interorganizational networks (Ambrosini & Bowman, 2009; Subramaniam & Youndt, 2005), among others. These studies on relevant moderators have helped to infuse the dynamic capabilities perspective with a more contingent approach—one that explicitly considers that the effectiveness of dynamic capabilities may depend on the specific internal and external situation. Overall, we believe these studies have significantly helped to address earlier criticisms regarding the perspective's ill-defined boundary conditions (Arend & Bromiley, 2009).

Summary of the organizing framework. The organizing framework just described provides a comprehensive approach for understanding dynamic capabilities that, while based in prior work, provides a new way of framing research on the topic. Notably, it shows that the study of dynamic capabilities has advanced to a point at which the literature comprises not only conceptual research but also a great deal of empirical work that includes antecedents and consequences of dynamic capabilities, as well as moderators and mediators. Extant research has paid the most attention to the antecedents and consequences of dynamic capabilities, with some attention to moderators, and scholars are only starting to look into causal mechanisms (i.e., mediators).

In addition to providing an overview of what already has been achieved, our framework also provides a basis for future research, as discussed later. However, before we turn to avenues for future research, we briefly summarize two additional topics that surfaced in our analysis regarding dynamics and research methods.

Additional Considerations

Dynamics. As reflected in the model shown in Figure 2, most of the researchers have adopted a variance-based approach to theorizing, whereby a change in one variable is associated with a change in another variable (e.g., more experience in a certain field produces more dynamic capabilities). However, some scholars have also started to develop a temporal, process-oriented approach to dynamic

capabilities theorizing (see Mohr, 1982; Van de Ven & Poole, 2005 for the general distinction between variance and process theories). For example, attempts have been made to explain the evolution of dynamic capabilities over time (e.g., Fischer, Gebauer, Gregory, Ren, & Fleisch, 2010; Jenkins, 2010). These studies suggest that the development of dynamic capabilities may proceed through a series of typical stages, knowledge of which may prove particularly useful for practitioners attempting to implement such capabilities. Process-oriented studies have also shed light on the role of timing. For instance, Bingham, Heimeriks, Schijven, and Gates (2015) found codification of knowledge to be most effective in supporting the development of dynamic capabilities when such codification occurs in reverse chronological order, starting with the implementation phase and working backward through the earlier phases, such as due diligence in the case of the acquisition capabilities in this study. This role of codification extends the theoretical arguments of Zollo and Winter (2002), who emphasized the importance of codification of knowledge in developing dynamic capabilities, by adding a temporal component to the codification process.

This interest in how dynamic capabilities emerge, develop, grow, or terminate over time mirrors the increased interest in process approaches in management more generally (Langley, Smallman, Tsoukas, & Van de Ven, 2013). We believe that studying the evolution of dynamic capabilities and the role of time is highly consistent with the focus of dynamic capabilities on strategic change. Such change is clearly not achieved instantaneously but only over time and through multiple steps, and there is significant opportunity to more carefully unpack the individual stages involved, along with their sequencing and potentially reciprocal nature.

Research methods. Last but not least, dynamic capabilities research has clearly progressed from being a mostly conceptual undertaking to become a predominantly empirical field. Around two-thirds of the articles in our sample report empirical findings, with survey and qualitative methods being most prominent (33 percent and 23 percent of the articles in the full sample, respectively). We believe that this trend is encouraging as it requires researchers to specify empirical measures indicative of dynamic capabilities. Moreover, initial metaanalyses of dynamic capabilities have recently started to appear (Fainshmidt et al., 2016; Karna, Richter, & Riesenkampff, 2016; Pezeshkan, Fainshmidt, Nair, Lance Frazier, & Markowski, 2016). Studies like these help to synthesize and systematically juxtapose extant findings and add further nuance by exploring sources of heterogeneous effects.

Even among recent theoretical investigations, we have witnessed a greater diversity of approaches, ranging from traditional narrative theory development to formal modeling (e.g., Mitchell & Skrzypacz, 2015) and agent-based simulations (e.g., Coen & Maritan, 2011). Through their complementarities, these different methods and approaches hold great promise for the further development and refinement of the dynamic capabilities perspective.

FUTURE DIRECTIONS FOR DYNAMIC CAPABILITIES RESEARCH

Although these recent insights strongly support the value of the dynamic capabilities perspective and help to flesh out central elements of the theory, additional research is needed to more fully develop the dynamic capabilities perspective. We begin with a content analysis of what prior research has identified as important limitations and fruitful avenues for new research and use this as a basis for our own assessment and recommendations for future research on dynamic capabilities. In making recommendations, we focus on issues that we believe would benefit from additional attention above and beyond what has already been achieved in recent years. We highlight important topics that may have gone unnoticed thus far, as well as unresolved tensions in the literature. In addition, we flag a few areas that we believe either do not require substantial new research or would benefit from reorientation.

In discussing future research directions, we follow the same structure that we adopted in the previous section, starting with theoretical foundations, then proceeding through the individual parts of the organizing framework for dynamic capabilities, and finally turning to additional considerations of dynamics and methods. In each subsection, we start with a brief summary of the content-analytic results regarding potential research directions noted in prior work, listing those issues that have been mentioned particularly frequently as warranting further study. This is followed in each subsection by our more subjective assessment, along with our recommendations that go beyond those mentioned in earlier articles.

Of the 298 articles that we content analyzed, 220 (i.e., 74 percent) reported at least one limitation or direction for future research. Issues related to moderators were most frequent (109 articles), followed by suggestions regarding the consequences (96 articles) and the antecedents (80 articles) of dynamic capabilities. Table 3 provides an overview of frequencies along with selected illustrative quotes.

Before elaborating on the various suggestions that have been made in prior research, it is worth noting that several of the limitations and recommended avenues for future research that we identified in our sample have already been addressed, at least to some extent, in subsequent research. Indeed, we were surprised by the degree to which dynamic capabilities scholars have seemed to agree on promising directions for new research and then have followed up on the potential gaps identified by previous research. This indicates that the dynamic capabilities field has come a long way in a short period of time, evolving into a coherent research program characterized by cumulative progress. Nevertheless, more progress is warranted, as we discuss later.

Theoretical Foundations

Definitions. As noted earlier, we observed considerable convergence in the definition of dynamic capabilities, even if 15 articles in our sample suggest that consensus on a single definition has not been achieved. Although there is not one single definition, the three most used definitions of Teece et al. (1997), Eisenhardt and Martin (2000), and Helfat et al. (2007) are complementary and build on one another. The other frequently used definitions are highly consistent with these three. In addition, definitions such as that of Helfat et al. (2007) have clarified that dynamic capabilities do not involve a tautology with respect to performance, and Helfat and Winter (2011) have incorporated the potential to influence the external environment in their definition. In our view, because these definitions have built on one another to achieve considerable clarity, converging on a single general definition is not a high priority. However, whichever reference a researcher uses, we find it critically important to explicitly state a concrete definition of dynamic capabilities so as to avoid ambiguity. In addition, subcategories of dynamic capabilities certainly require precise definitions in line with preexisting general definitions, such as that which Adner and Helfat (2003) provided for dynamic managerial capabilities in line with the general definition of dynamic capabilities in Teece et al. (1997).

In addition to using an explicit definition of dynamic capabilities, we believe it is important for authors to provide a clear elaboration of why an

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TABLE 3

Illustrative Evidence for Suggested Limitations and Future Research Recommendations

Concept	Illustrative statements	Frequency (percentage) ^a
Theoretical foundations		
Definition	 "Despite its importance for firm prosperity and the scholarly attention devoted to it, dynamic capability remains underspecified (). In particular, the 'competence to add competences' has not been systematically conceptualized ()." (Danneels, 2008: 519) [Clarity of definition] "In spite of the consensus that dynamic capabilities play a crucial role in 	15 (5.0%)
	competitive advantage, complete consensus in defining the term has not been achieved." (Argote & Ren, 2012: 1375) [<i>Convergence of definitions</i>]	
Theoretical assumption	 "More generally, particular attention should be given to the assumptions underlying dynamic capabilities' theoretical underpinnings, namely, the assumptions about managerial rationality. Perhaps some choices need to be made between a more bounded rationality-oriented approach, in line with evolutionary economics, and a more full rationality-oriented approach, as suggested by the RBV." (Barreto, 2010:277) "Examining the assumptions about individuals' rationality () is important." (Capron & Mitchell, 2009: 309) 	14 (4.7%)
	[Bounded rationality] "The dynamic capabilities framework invites further research into () the role of managers and leaders in enterprise performance." (Augier & Teece, 2009: 418) [Managerial agency]	
Theory integration	 "The current literature tends not to distinguish between incremental dynamic capabilities and renewing dynamic capabilities. () there is value in conceptually developing the paper, for example by extending it further into the learning () literature." (Ambrosini et al., 2009: S21) [Organizational learning] "Thus, we also recommend that the DCV draw more deeply on the sizable, more-established ENT literature for added insights ()." (Arend, 2014: 49) 	21 (7.1%)
	"Taken together, these insights underpin the need for resource-based theorists to broaden their scope and embrace other perspectives (e.g., institutional theory, social cognition approaches) to more fully understand how dynamic capabilities and resources develop." (Schilke, 2014b: 376) [<i>Other</i>]	
Organizing framework for dynami	ic capabilities	
Dimensionalization- underlying processes	 "Future research is encouraged to explore () knowledge acquisition capability, integration capability and coordination capability." (Chang, Bai, & Li, 2015: 27) [Coordinating/learning/reconfiguring] "For example, future empirical work could be directed towards the enrichment of this study's framework with additional dimensions focusing on the entrepreneurial function embedded in dynamic capabilities i.e. managerial capabilities for sensing and seizing opportunities." (Protogerou et al., 2012: 641) [Sensing/seizing/transforming] "Dynamic capabilities theory explains when organizations need flexible 	27 (9.1%)
	processes, but it is less forthcoming on how those processes work." (Harris et al., 2009: 402–403) [<i>Other</i>]	
Dimensionalization- routinization	"Future (possibly qualitative) research should take up the challenge of investigating the interplay between highly routinized and ad hoc resource reconfiguration in greater detail." (Schilke, 2014a: 199)	8 (2.7%)

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TABLE 3 (Continued)

Concept	Illustrative statements	Frequency (percentage) ^a
	"() we believe future work can gain considerably deeper insight into the interplay between routinization and ad hoc problem solving." (Heimeriks et al., 2012: 721)	
Dimensionalization- functional domain	"Additional studies could expand the focus of our analysis to include inter- firm integration ()." (Vanpoucke et al., 2014: 459) [<i>Alliancing</i>]	67 (22.5%)
	"Moreover, an extension of this thinking could further address whether the model of radical innovation capability suggested here needs to be modified ()." (Slater et al., 2014: 563–564) [New product development]	
	"Other organizational capabilities, such as stakeholder integration and continuous operations improvement, may be included in the study to explore environmental management capabilities ()." (Wong, 2013: 131) [Other]	
Dimensionalization- capabilities hierarchy	"() three levels of dynamic capability could be researched empirically to find evidence to give them greater depth and allow for more understanding of the concepts." (Ambrosini et al., 2009: S21)	14 (4.7%)
	"Further, it would be interesting to investigate the effects of widely used meta- routines () on dynamic capabilities." (Pentland, Feldman, Becker, & Liu, 2012: 1504)	
Dimensionalization- unit of analysis	 "Embracing a multilevel perspective, future research could also consider individual-level constructs (such as characteristics of the managers involved in strategic alliances)." (Schilke & Goerzen, 2010: 1213) "Future research would benefit from examining more precisely the interaction of individual characteristics of key players and the tools and practices they 	42 (14.1%)
	use to achieve innovation and firm growth." (Uhlaner, van Stel, Duplat, & Zhou, 2013: 605) [<i>Individual</i>]	
	"We also know relatively little about how the interaction of cognitive capabilities of individuals in the top management team affects team decision making, () Future research could investigate whether diversity of managerial cognitive capabilities within a team helps or hinders strategic change." (Helfat & Peteraf, 2015: 846) [<i>Group</i>]	
	"New theory may arise that relates activities outside the organization's boundaries to dynamic capabilities () of the organization. Ultimately, a dynamic theory of firm boundaries may emerge from such inquiry." (McGahan, 2012: 16)	
Dimensionalization- other dimensionalization approach	[Beyond Jirm boundary] "() work that conceives metacognition, emotion management, and self- regulation as core dynamic managerial capabilities." (Hodgkinson & Healey, 2011: 1511) [Cognitive subdimensions]	6 (2.0%)
d. F. F. Carrier	"Using other, more detailed relationship phase models would result in different NC components." (Mitrega et al., 2012: 749)	
Antecedents	"() future research can theoretically extend our model by identifying country, industry () variables that are antecedent to the dynamic capability development mechanisms identified in our model." (Malik & Kotabe, 2009: 444) "Other factors that may also drive or constrain capital misallocation include	80 (26.9%)
	() external factors such as market dynamics and pressures from investors." (Arrfelt et al., 2015: 1032) [<i>External environment</i>]	
	"Further investigation can improve the understanding of factors that affect dynamic capabilities () such as () organizational culture ()." (Cheng, Chen, & Huang, 2014: 183) [Organizational culture]	

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TABLE 3 (Continued)

Concept	Illustrative statements	Frequency (percentage) ^a
	"Second, given the value-creating potential of marketing capabilities revealed in our study, it is important to know how such capabilities are developed." (Morgan et al., 2009: 917) [<i>Other</i>]	
Consequences	"Given the rising competitive pressure accompanying globalization and rapid technological advancement, assessing the influence of a dynamic collaborative capability on firm competitiveness is timely." (Allred et al., 2011: 130) [Firm-level performance]	96 (32.2%)
	"However, more research is needed to explore the long-term effects () on project and firm level innovation outcomes." (Im et al., 2013: 182) [Innovation outcomes]	
	 "Further research on this line could analyze the effect of this capability on firms' ability to overcome technological gaps." (J. Anand et al., 2010: 1228) "Moreover, we did not examine the costs of the process, (), we encourage additional studies in management control on the costs of dynamic capabilities." (Donada, Nogatchewsky, & Pezet, 2016: 112) [Other] 	
Mechanisms	"For instance, it is possible that dynamic capabilities influence performance through specific organizational capabilities () or top management team competencies (). Future research may benefit from incorporating such mediating mechanisms into a model of the dynamic capabilities- performance relationship." (Wilden et al., 2013: 89) [<i>Resource base</i>]	28 (9.4%)
	 "() an examination of additional potential mediating mechanisms (i.e., intermediate outcomes) between higher-order dynamic capabilities and performance would likely enhance our understanding of the consequences of dynamic capabilities." (Fainshmidt et al., 2016: 1369) "Moreover, we need deeper insight into the variety of mechanisms that underlie the performance effects of capabilities." (Schilke, 2014a: 199) "() although MDCs have been found to positively affect IJV performance and competitive advantage, the specific mechanism through which such an effect to hear intervention of the provide the performance of the specific mechanism. 	
Moderators- organizational characteristics	 effect takes place is left to be investigate." (Fang & Zou, 2009: 757) [Other] "Further specifying and explaining contingencies such as organization type or structure may be an interesting avenue for future research." (Fourné, Jansen, & Mom, 2014: 30) [Structure] "() it would be useful to determine how dynamic capability can reconfigure the existing "ordinary" resource base to render it suitable to drive the EO-performance relationship. () the research on the interaction of "ordinary" and dynamic capabilities is still in its infancy." (Engelen et al., 2014: 1364) 	73 (24.5%)
	[Other capabilities] "The resource allocation process in smaller, entrepreneurial firms is likely to differ from the process in larger firms. Small firms may not have well established resource allocation practices and procedures in place." (Coen & Maritan, 2011: 114) [Size]	
Moderators- setting	 "Indeed, we hope that this research will trigger further research into the nature and value of incremental learning capabilities in the public sector and beyond." (Salge & Vera, 2013: 170) [Industry sector] "The data also come mainly from European respondents. Although our tests supported the findings in other regions, further research could look into possible geographical differences." (Vanpoucke et al., 2014: 459) [Geographic area] 	73 (24.5%)

TABLE 3 (Continued)

Concept	Illustrative statements	Frequency (percentage) ^a
	 "Finally, future research could also explore the temporal pacing by which dynamic capabilities affect operating-routine performance under varying levels of environmental dynamism or the occurrence of exogenous shocks." (Wilhelm et al., 2015: 342) [Environmental dynamism] "On the empirical front, the clear implication of our work is that scholars need to take into account the relevant contingencies in their investigation before they can predict and test for particular outcomes of dynamic capabilities." (Peteraf et al., 2013: 1407) [Other] 	
Additional considerations	"Further recearch pade to cancider how project canchilities evolves grow and	21 (7 1 %)
Dynamics	Brady, 2016: 322)	21 (7.170)
	the evolution of organizational capabilities?" (Roberts et al., 2016: 65) [<i>Evolution</i>]	
	"A future longitudinal study would be desirable to complement this research study by revealing the evolution of the associations between the dimensions of EII, corporate environmental innovativeness and adaptability, and business and environmental performance." (Wong, 2013: 131) [<i>Timing of effects</i>]	
	"Such studies may also be able to shed light on the question of whether the performance effects of dynamic capabilities at various levels are more pronounced in the short or long term." (Schilke, 2014b: 376) [Unstable theoretical effect]	
	"The emphasis of TPS () is on complex routines and organizational mechanisms. The emphasis of EM () is on simple routines and managerial mechanisms. Both levels of analysis and both types of mechanisms are important and both at work within the firm, either sequentially or simultaneously. () Really understanding dynamic capabilities requires seeing the complete picture and exploring interlinked dynamic bundles as a whole." (Peteraf et al., 2013: 1407)	
Mathada	[Other] "() we believe our field's understanding of the temporal processes behind	71 (22.9%)
internal validity	capability development could benefit greatly from longitudinal work that either uses quantitative panel data or is based on an inductive, theory- building approach (or, perhaps, both)." (Heimeriks et al., 2012: 721)	71(23.070)
	"Sixth, we did not control for the level of mode-specific experience each firm had. It is possible that mode experience may also provide some type of resource-based advantage. Future research may wish to explore this idea." (Brouthers et al., 2008: 214)	
Methods-	"We conclude that the findings reported here support this basic hypothesis.	99 (33.2%)
external validity	although specific findings may not be readily generalized to other industries and to larger firms. () Future research might extend our approach to other professional service industries, and possibly to other sectors and larger firms as well." (Døving & Gooderham, 2008: 855) [Issues with generalizability]	
	"At the same time, we acknowledge the limitations of the low response rate for the APICS data." (Wu, Melnyk, & Flynn, 2010: 745) [Issues with (survey) response]	
Methods-	"() our measures of capital allocation competency may be too stringent in	78 (26.2%)
construct validity	defining over and underinvestment, thus limiting the number of recorded allocation errors in our study." (Arrfelt et al., 2015: 1032) [<i>Issues with operationalization of construct</i>]	

TABLE 3	
(Continued)	

Concept	Illustrative statements	Frequency (percentage) ^a
Methods- statistical conclusion validity	 "() we rely on subjective staff perceptions of the three incremental learning routines. () Future research might thus wish to collect objective rather than subjective data to capture the constitutive routines of incremental learning." (Salge & Vera, 2013: 170) [Issues with data source] "It would also be valuable for further research to use different empirical methods to capture the relationship between a firm's constraints, sourcing modes, and ultimate performance." (Capron & Mitchell, 2009: 309) [Issues with analysis method] "Unfortunately, collecting longitudinal data on constructs that cannot readily be assessed from archival sources, such as second-order competences or organizational culture, poses tremendous data collection challenges. () This relatively small sample size limited the inferences from the longitudinal analysis." (Danneels, 2008: 537–538) [Issues with sample size] 	79 (26.5%)

^a Frequency is the total number of articles referring to or using the concept, and percentage is the frequency divided by the total number of articles coded (298).

article's focal construct can be considered an instance of dynamic capability. Not every form of change is evidence of a dynamic capability. Moreover, because dynamic capabilities (like all capabilities) are context dependent, instances of dynamic capabilities pertain to a particular activity and setting (see our discussion above). For this reason, in empirical work, we believe it is imperative to zoom in on a particular instance of dynamic capabilities (e.g., associated with a specific functional activity). When authors of empirical analyses explain how their object of study is consistent with the core features of dynamic capabilities, such as supporting patterned behavior directed toward strategic change, this helps to generalize their findings to the broader and more abstract level of dynamic capabilities theory. Conversely, a lack of fit between the object of study and the definition of dynamic capabilities severely limits the extent to which a research study can advance understanding of dynamic capabilities.

Theoretical assumptions. Given the mix of economic and behavioral theories that provide the foundations of the dynamic capabilities perspective (Arend & Bromiley, 2009; Peteraf et al., 2013), we believe that the perspective will gain additional theoretical depth from efforts to further elaborate and develop its theoretical assumptions—a point made by 14 articles in our sample. One area that we would like to single out for further elaboration concerns the stance on managers' rationality (also see Barreto,

2010; Capron & Mitchell, 2009). Although considerable headway has been made (Augier & Teece, 2008; Augier & Teece, 2009), from our perspective, the extent to which managers are boundedly rational and under what particular circumstances they can be expected to deviate from full rationality would benefit from greater explanation (an issue we will come back to later).

Future research would in our view also benefit from greater elaboration of agency in the dynamic capabilities framework, following up on recent investigations into this matter (Augier & Teece, 2009; Es-Sajjade & Pandza, 2012; Helfat & Martin, 2015; Helfat & Peteraf, 2015; Salvato, 2009). For example, under what conditions are managers able to significantly alter their own and their organizations' (change) routines? What is the role of employees at different levels in the organizational hierarchy for strategic change? More broadly, when and how can organizations overcome the paradox of embedded agency and be able to envision and affect change in their external environment, despite environmental pressures that structure their cognitions, define their interests, and influence their identities? Questions like these should provide plenty of fodder for future studies on the theoretical foundations of the dynamic capabilities perspective.

Theoretical integration. One of the features that makes the dynamic capabilities framework highly approachable for scholars with diverse backgrounds

is its openness and flexibility in integrating relevant ideas from other theoretical streams. We believe that following this trajectory and constructively bringing in other perspectives is important to further develop the dynamic capabilities framework and advance our current understanding of purposeful strategic change, as 21 articles in our sample emphasize. For example, in our content analysis of future research directions, we observed a high frequency of articles suggesting stronger integration of the dynamic capabilities perspective with the broader entrepreneurship literature (Augier & Teece, 2009; MacLean et al., 2015). Moreover, building on the early work of Zollo and Winter (2002), the organizational learning literature has been identified as another candidate for further enriching the dynamic capabilities perspective (Ambrosini & Bowman, 2009; Easterby-Smith & Prieto, 2008). Although recent research has made headway on this, such as in the theoretical implications drawn by Bingham et al. (2015) in their study of concurrent learning, it is our belief that this area merits additional investigation.

At the same time, we think that other theoretical streams, beyond those identified in our content analysis of future directions, offer relevant insights that have been underused in dynamic capabilities research. These literatures include those on institutional theory, heuristics and biases, the behavioral theory of the firm and closely related but underused areas of evolutionary economics, and transaction cost economics.

Institutional theory shares with the dynamic capabilities perspective a strong emphasis on habitualized action (Greenwood, Oliver, Sahlin, & Suddaby, 2008); the concept of organizational routines resonates strongly with the idea of institutionalization, whereby specific cognitions and actions become objectified and ultimately exterior to the individual (Tolbert & Zucker, 1996). Moreover, both literatures have at their center an interest in how organizations navigate the interface with their environment. As a result, we see significant potential for greater cross-fertilization between them.

Specifically, we can envision at least three concrete ways in which institutional theory may enrich dynamic capabilities scholarship. First, whereas both literatures are fundamentally concerned with the organization—environment interaction, dynamic capabilities scholars have viewed organizational adaptation to the external environment as mostly beneficial, focusing on strategic fit. Institutional theorists, on the other hand, have studied conformity with a more critical stance, emphasizing that adherence

to environmental institutions can also come with important disadvantages, such as a decrease in technical efficacy or a weakening of differentiationbased competitive advantage (Heugens & Lander, 2009; Meyer & Rowan, 1977). We believe dynamic capabilities scholars would be well advised to consider whether resisting environmental conformity pressures may be a sensible option for some organizations (Oliver, 1991; Schilke, forthcoming). Second, in studying the organizational environment, dynamic capabilities scholars have for the most part focused on issues related to technology or customer demand. Although these are highly relevant aspects of the environment, we propose that the understanding of the organizational environment developed by institutionalists could prove highly informative for dynamic capabilities theorizing. Building on the seminal work by DiMaggio and Powell (1983), institutionalists have singled out mimetic, normative, and coercive pressures as critical environmental forces imposed on organizations, and it would be interesting to study the extent to which different types of dynamic capabilities may be useful in dealing with these various environmental pressures (Oliver, 1997).

Third, institutionalists have recently devoted great effort to better understanding embedded agency (Battilana, 2006; Battilana & D'Aunno, 2009; Schilke, forthcoming; Suddaby, Viale, & Gendron, 2016). In doing so, they have advanced the notion of institutional entrepreneurship (Battilana, Leca, & Boxenbaum, 2009; Maguire, Hardy, & Lawrence, 2004), whereby change agents (either organizations or individuals) create new institutions or transform existing ones. Initiating and implementing divergent change is clearly also at the heart of Teece's (2007) intriguing but underinvestigated notion of market shaping, and we encourage dynamic capabilities scholars to build on these recent developments in institutional theory and explore ways to apply them.8

Furthermore, we support ongoing efforts to infuse the dynamic capabilities perspective with psychological theory on heuristics (Bingham & Eisenhardt,

⁸ It is worth noting that the study of market shaping can also be undertaken from the perspective of behavioral theory and evolutionary economics discussed later, as organizations not only search for new knowledge and capabilities, but also shape their environments over time (see Gavetti, Helfat, & Marengo, 2017). Thus, dynamic capabilities may also benefit from integrating this approach to market shaping.

2011; Maghzi, Gudergan, Wilden, & Lin, 2016). The notion of heuristics (and the related concept of simple rules, per Sull & Eisenhardt, 2015) has loomed prominently in the debate about dynamic capabilities (Eisenhardt & Martin, 2000), but—compared with the routine-based approach—it has seen relatively less theoretical progress over the years. With the shift toward microfoundations, we believe there is potential to focus more on heuristics. It is clear that we need greater insight into how individuals employ dynamic capabilities and come to make decisions regarding strategic change, so as to better understand how dynamic capabilities operate on the ground.

We believe that building on recent disciplinary insights can help us understand what types of heuristics managers draw from in employing dynamic capabilities, when they most likely use them, and whether doing so will be effective. Cognitive psychologists, such as Gigerenzer and colleagues, have significantly advanced the knowledge of heuristics (Artinger, Petersen, Gigerenzer, & Weibler, 2014; Gigerenzer & Gaissmaier, 2011). Regarding relevant types of heuristics, Gigerenzer and Todd (1999) propose three higher-order building blocks: (1) search rules that determine what information is explored and in what order, (2) stopping rules that determine when to stop searching for cues, and (3) decision rules that indicate how to make a decision, given the collected information. The potential applicability of these building blocks to the sensing and seizing microfoundations of dynamic capabilities is apparent, but it requires further elaboration to make the building blocks more directly applicable to the context of organizational decision-making (Maghzi et al., 2016). Heuristics have other salient applications to dynamic capabilities as well. Heuristics are commonly applied under conditions when people must make decisions under uncertainty, with incomplete information, unknown probabilities of potential outcomes, multiple goals, and ill-defined problems (Gigerenzer & Gaissmaier, 2011). These findings can provide a useful starting point for future research to study the antecedents to heuristics-based deployment of dynamic capabilities.

Finally, in our view, it is important to highlight that although in the management literature heuristics have traditionally been associated with biased or faulty decision-making, including with respect to dynamic capabilities (Teece, 2007), heuristics can also be highly effective and outcome enhancing (Mousavi & Gigerenzer, 2014; Todd & Gigerenzer, 2007). The question of whether and under what conditions heuristics-based dynamic capabilities enhance versus inhibit performance outcomes should provide plenty of opportunity for future research.

Another relevant literature that is attracting increasing attention in work on dynamic capabilities but that we believe could still benefit from additional integration—is related to the behavioral theory of the firm (Augier & Teece, 2008; Winter, 2000). As noted earlier, many assumptions and intellectual foundations central to dynamic capabilities are rooted in the behavioral theory of the firm (Cyert & March, 1963; Simon, 1957). According to this theory, decision makers are boundedly rational and satisficing; that is, they initiate search based on organizational performance relative to aspirations and slack resources. Furthermore, the behavior of firms is viewed as resting primarily on their routines, particularly those for storing knowledge, adapting aspirations, allocating attention, and adapting the rules of organizational adaptation.

Clearly, the dynamic capabilities perspective is well aligned with these positions, as evidenced by Winter's (2000) analysis of aspirations and satisficing in the development of dynamic capabilities. In addition, Ocasio's (1997) elaborations of the behavioral theory of the firm imply that the distribution of attention to certain issues and answers may also be an important aspect of dynamic capabilities, as suggested by Helfat and Peteraf (2015). Indeed, the behavioral theory of the firm suggests that it is the dynamic nature of attention and aspirations that enables search and the generation of new (entrepreneurship) opportunities. Similarly, other studies following the behavioral tradition (Hu, Blettner, & Bettis, 2011; Hu, He, Blettner, & Bettis, 2017) emphasize the important performance implications of aspiration adaptation speed, attention allocation dynamics, and reference group setting strategies within firms. Thus, further integration of the dynamic capabilities paradigm with the behavioral theory of the firm is a rich avenue for future research. With respect to broader behavioral considerations, there is also an opportunity to further integrate the literatures on social capital (Adner & Helfat, 2003; Kemper, Schilke, & Brettel, 2013) and social networks (Kleinbaum & Stuart, 2014) into the dynamic capabilities perspective.

Finally, we believe that dynamic capabilities research would benefit from additional integration of two streams of research coming from an economics perspective: evolutionary economics (a close cousin to the behavioral theory of the firm) and transactions cost economics. Although the original idea of dynamic capabilities by Teece et al. (1997) drew on evolutionary economics in important ways (see Foss,

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Heimeriks, Winter, & Zollo, 2012; Helfat & Peteraf, 2009), as noted earlier, the theory has primarily been used with reference to routines. Although evolutionary economics has also informed the emphasis on innovation in dynamic capabilities research, the important role of search in evolutionary economics has gone largely unnoticed by dynamic capabilities scholars. In particular, in evolutionary economics, search is local in the neighborhood of existing knowledge and routines (Helfat, 1994; Piezunka & Dahlander, 2015); as a consequence, local search can constrain adaptation to major market shifts. From this perspective, we believe it is important to ask questions such as what types of dynamic capabilities enable firms to go beyond local search and under what conditions? How might dynamic capabilities for search interact with dynamic capabilities for shaping firms' external environments? And where in the organization might these different types of capabilities for search and shaping reside?

With respect to transactions cost economics, we noted earlier that consideration of the boundaries of the firm is a gap in the literature in dynamic capabilities, with only a few articles referring explicitly to it. We agree with Jacobides and Winter (2005), Nickerson, Yen, and Mahoney (2012), Argyres and Zenger (2012), and others that the analysis of many strategic decisions would be incomplete without the consideration of both organizational capabilities and transaction costs. For example, we know relatively little about the extent to which transactions costs affect which dynamic capabilities firms develop and how this affects the boundary of the firm with respect to capabilities.

Although the dynamic capabilities perspective is likely to benefit from the creative combination of different theories, we caution against making only superficial contributions to theory. As previously noted in our Methods section, we dropped a total of 47 articles from our sample that only referred to dynamic capabilities cursorily and in passing, without visibly building on or contributing to the perspective's key tenets. We would thus like to repeat Giudici and Reinmoeller's (2012) call to avoid reification of the dynamic capabilities concept. Continued careful attention to how research tests, extends, or refutes specific elements of dynamic capabilities theory is central to enriching our current understanding of the phenomenon.

Organizing Framework for Dynamic Capabilities

Dimensionalization. It is worth repeating that dynamic capabilities are highly complex phenomena

and that many distinct types of dynamic capabilities exist. Different dimensions can be usefully applied to categorize and distinguish dynamic capabilities, which improves understanding of how a study's focal constructs fit with the broader nature of dynamic capabilities. The literature has now advanced such that future researchers can explicitly situate their focal dynamic capabilities along some of the dimensions outlined in the previous section (i.e., procedural, routinization, functional, hierarchical, by unit of analysis).

A multitude of investigations have usefully built on the procedural distinctions of Teece et al.'s (1997) coordinating, learning, and reconfiguring processes and Teece's (2007) sensing, seizing, and transforming processes. Making these different organizational processes concrete has helped to enhance our knowledge of how dynamic capabilities manifest themselves in organizations. But as 27 articles in our sample point out, further work on process dimensions is needed, and we agree with this assessment. Moving forward, it would be fruitful to add greater richness to our understanding of these organizational processes, such as by providing in-depth accounts of how they work on the ground (Harris, Collins, & Hevner, 2009), by comparing their relative relevance across different settings, by studying their alignment as a set (Roberts & Grover, 2012), and by identifying overlaps or interconnections among them. Now may also be a good time to move beyond these established procedural typologies and enrich the dynamic capabilities framework with additional organizational processes that may have been previously overlooked (Protogerou et al., 2012). That is, rather than take existing procedural distinctions for granted, researchers may want to consider recombining, revising, or extending them.

Another distinction that has received considerable attention since Eisenhardt and Martin's (2000) original discussion is that between highly structured and less-routinized forms of dynamic capabilities. Although Winter (2003) convincingly argued that a certain degree of routinization is necessary for a process to qualify as a dynamic capability, as we noted previously, it is clear that the degree of routinization may vary and that such differences may have important implications. This is why eight articles call for further research on the routine aspect of dvnamic capabilities. Making significant headway on this topic, a recent study by Wohlgemuth and Wenzel (2016) suggests that strongly routine-based and more fluid dynamic capabilities can coexist within the same organization. We see significant

opportunity for future research not only to investigate the interplay between the two types of dynamic capabilities (also see Heimeriks, Schijven, & Gates, 2012; Peteraf et al., 2013; Schilke, 2014a) but to also shed light on their potentially distinct antecedents and their relative performance impacts.

Furthermore, the notion of purposeful strategic change through dynamic capabilities can be applied to even more organizational functions and activities than those that have been investigated thus far. Although 20 articles in our content-analysis sample called for additional investigation of new product development-historically the most studied functional area within dynamic capabilities researchthere is no shortage of suggestions for additional areas worthy of study from a dynamic capabilities perspective, including environmental management capabilities (Wong, 2013), political capabilities (Dixon, Meyer, & Day, 2014), corporate restructuring capabilities (Schilke, 2014b), and business model adaptation capabilities (Mezger, 2014; Wirtz, Schilke, & Ullrich, 2010). Ongoing areas of empirical investigation into dynamic capabilities, on topics such as acquisitions, alliances, and capital allocation, among others, would also benefit from additional research. And we see particular merit in studying more than one functional dynamic capability at once, so as to uncover similarities and differences between individual capabilities and analyze firms' dynamic capabilities profiles as a whole.

Another dimension of dynamic capabilities that has received calls for additional research concerns the hierarchy of capabilities (14 articles in our sample). As noted earlier, the idea that capabilities can be viewed hierarchically is not new (Collis, 1994; Zollo & Winter, 2002), but seeking additional empirical insight into higher-order dynamic capabilities and their relationship with "regular" dynamic capabilities is in our view another important opportunity for deepening dynamic capabilities research, following the lead of the studies by Heimeriks et al. (2012) and Schilke (2014b). We consider the notion of dynamic capabilities of a higher order as particularly appealing because it enables dynamic capabilities scholars to respond to the question of where (first-order) dynamic capabilities come from with an answer that makes use of its key concept-namely, capabilities. In addition, in light of studies discussed earlier showing that capabilities may be substitutes rather than complements, we believe that it would be helpful for future research to address the conditions under which lower- and higher-order dynamic

capabilities are complements versus substitutes and when operational and dynamic capabilities are complements versus substitutes.

Traditionally, researchers have located dynamic capabilities at the organizational level of analysis; however, as noted earlier, starting in the early 2000s, the recognition that such capabilities can also exist at the individual level has become increasingly diffused (Adner & Helfat, 2003; Augier & Teece, 2009; Felin & Foss, 2005; Helfat & Martin, 2015). Various calls for greater insight into individual-level dynamic capabilities (a total of 19 articles) have been complemented by suggestions to consider additional units of analysis, including units that go beyond firm boundaries (10 articles). In particular, research on supply chain management has indicated that dynamic capabilities may also operate at the interorganizational level of the supply chain system, an intriguing idea that we find worthy of greater research attention. In addition, a particularly challenging but also potentially rewarding effort for future research would be to shed more light on crosslevel dynamics (also see Huikkola, Ylimäki, & Kohtamäki, 2013; Jansen et al., 2005; Salvato & Rerup, 2011). Questions that we offer for future research include, for instance, how exactly do dynamic managerial capabilities affect organizational dynamic capabilities? Is more dynamic managerial capability always "better" or does it depend on the composition of a variety of skills? Moreover, what about the other causal direction-that is, how do organizational dynamic capabilities affect the development of dynamic managerial capabilities? And how does the team level of dynamic capabilities intervene in the individual-to-organization relationship?

In summary, the more nuanced approach of investigating specific kinds of dynamic capabilities that are distinguished along a variety of dimensions has in our opinion added much richness to the dynamic capabilities research agenda. In addition to further exploring individual elements of selected typologies, we believe that the dynamic capabilities perspective can benefit from future research that integrates and juxtaposes these typologies with one another to provide added coherence and crossfertilization. For example, what are the similarities and differences in routinization at the individual and organizational levels of analysis? Do coordination, learning, and reconfiguration processes matter to all functional dynamic capability domains? How might higher-order dynamic capabilities operate at the team versus firm level? Exploring questions like these will require data on more than one dimension

of dynamic capability for them to be systematically compared. In addition to such integrative efforts, the list of dimensionalization approaches has not yet been fully exhausted. Other ways to characterize dynamic capabilities may, for instance, be based on differentiating between temporal phases (Mitrega, Forkmann, Ramos, & Henneberg, 2012) or the psychological processes involved (Helfat & Peteraf, 2015; Hodgkinson & Healey, 2011). As such, we view research into the different dimensions to be particularly promising to further advance insight into the nature of dynamic capabilities.

Antecedents. Scholars continue to remain very interested in the origins of dynamic capabilities, with a total of 80 articles addressing future research on the antecedents of dynamic capabilities. As discussed previously, much is known already about the role of prior paths-experience-and positionsresources-as well as other antecedents such as organizational structure. However, there are relatively few studies that examine interactions among different antecedents, and there are important antecedents that are largely unexplored. For example, the relationship between leadership and dynamic capabilities is a micro-level topic that in our view has untapped potential (also see Kanter, Bird, Bernstein, & Raffaelli, forthcoming). Moving beyond firm boundaries, we need to know more about how different types of networks and network positions may shape dynamic capabilities, a topic that has received relatively little attention. Overall, it is clear there is not a single source for dynamic capabilities, so we see potential for future research to continue to elucidate a variety of important antecedents.

One notable aspect of dynamic capabilities research to date is that several of the antecedents in the framework depicted in Figure 2 also show up elsewhere in the figure. The fact that some antecedents may also be dimensions, mechanisms, moderators, and/or consequences of dynamic capabilities has gone largely unremarked in the literature. A case in point is environmental dynamism, which can be both an antecedent to a dynamic capability (Piening, 2013) and a moderator of the dynamic capabilityperformance effect (Schilke, 2014a). Interestingly, the theoretical argument underlying both positions is virtually identical; it is based on the idea that building and maintaining organizational change routines tends to be particularly advantageous when there is some change in the environment. That is, firms may be more likely to develop dynamic capabilities in at least a moderately changing external environment, and dynamic capabilities are also likely to have a greater effect on performance in this circumstance.

We believe that one reason why environmental dynamism shows up in different places may have to do with the varying degree to which scholars assume managers to be rational. Analogous to the "discriminating alignment hypothesis" in transaction cost economics (Williamson, 1991), scholars who assume relatively high levels of rationality will expect managers to anticipate that returns to dynamic capability investments are dependent on the degree of environmental dynamism and to only invest in those capabilities up to a certain point that is aligned with the dynamism of the firm's environmentsuggesting an antecedent role of environmental dynamism. In contrast, scholars that put less faith in managers' rationality regarding dynamic capability development decisions would instead allow for suboptimal dynamic capability endowments (Bromiley, 2004); researchers then would predict variations in the performance effects of these capabilities as a function of environmental dynamism—suggesting a moderating role of environmental dynamism. And if managers are boundedly rational, we are likely to observe environmental dynamism as both an antecedent and a moderator to some degree. All of these approaches are internally consistent and viable as long as one's position regarding managerial rationality is laid out clearly—a point that goes back to our earlier discussion about the benefits of stating the theoretical assumptions used in a study.

Another concept that occupies several roles in Figure 2 is organizational learning. As noted earlier, sometimes learning is considered an antecedent, sometimes a dimension, and sometimes a consequence of dynamic capabilities. Of course, learning (much like dynamic capabilities) is a highly multifaceted phenomenon (Argote, 1999). First, the ante*cedent* type of learning can often be understood as a higher-order meta-routine that helps organizations to develop lower-order organizational change routines (in line with our previously mentioned discussion of dynamic capabilities at different hierarchical levels; also see Schilke (2014b) and Zollo and Winter (2002)). Second, subprocesses of learning in the *dimensions* that underlie dynamic capabilities tend to refer to learning as it pertains to altering the organizational resource base (Teece et al., 1997). Finally, consequences of dynamic capabilities may include learning outcomes, such as new knowledge-based resources or improved operational routines. Additional research would be helpful to better understand the relationships among the elements of organizational learning in different parts of the dynamic capabilities framework.

Similarly, resources have multiple roles in the organizing framework. As antecedents, resources provide the inputs necessary to build and maintain dynamic capabilities, and they are also used in conjunction with dynamic capabilities (Winter, 2003). As causal mechanisms, resources that have been altered through dynamic capabilities in turn provide the basis for other consequences, such as changes to firmlevel performance. In yet other research, the modified (and ideally improved) resource base of the organization is treated as the outcome of exercising dynamic capabilities. In light of these different roles that resources play, we believe that further longitudinal investigations focusing on the reciprocal nature of the dynamic capabilities-resources relationship and introducing explicit feedback loops would help to further elucidate this logic.

Finally, most research on antecedents has remained agnostic with regard to whether the analytical focus is on identifying factors that facilitate (a) the creation/development, (b) the maintenance/sustainment, or (c) the actual exercise/usage of dynamic capabilities. We believe that future research would benefit by separating these analytically so as to ascertain whether some antecedents matter more in some of these categories than others. In addition, we see an opportunity to investigate feedback loops from dynamic capabilities to organizational and individual-level antecedents through an impact on consequences such as learning.

Consequences. Given the variety of different dynamic capabilities, the articles in our sample continue to recommend additional investigations into common outcome variables, such as firm-level performance (57 articles) or innovation outcomes (12 articles). In addition, we also observed various scholars advocating greater nuance and investigating more fine-grained aspects of performance consequences, such as project-specific outcomes (Im, Montoya, & Workman, 2013), cost efficiency measures (Vanpoucke, Vereecke, & Wetzels, 2014), and customer satisfaction (Fawcett et al., 2011). Other recommendations aimed at further broadening the range of consequences to include those not directly related to performance, such as the level of trust in organizations (Laeequddin, Sardana, Sahay, Waheed, & Sahay, 2009), the organization's scope of diversification (Døving & Gooderham, 2008), selected entry modes in international expansion (Brouthers et al., 2008), and CEO pay (Carpenter et al., 2001).

We believe that, although much evidence for a link between dynamic capabilities and performance outcomes has accumulated already, the study of such consequences will, and should, remain at the core of future inquiry. As mentioned earlier, a key aspect that sets the dynamic capabilities perspective apart from other literatures on change is its strong orientation toward explaining competitive advantage. Therefore, we expect many future studies to have some type of performance measure as their dependent variable. Relevant outcomes, however, are not always firm-level performance. As noted earlier, as per Ray, Barney, and Muhanna (2004), scholars are well advised to choose an outcome variable that is sufficiently close to their study's focal type of capability rather than always use a broad and aggregated firm performance measure. For example, even though a dynamic capability may be highly beneficial, a firm may still lack in overall performance for other reasons, making it more difficult to detect an effect of dynamic capabilities. Therefore, more proximal measures of dynamic capability effectiveness are often appropriate. Furthermore, more research on the effects of dynamic capabilities on relevant "nonperformance" outcomes such as organizational structure would be fruitful, especially when such variables are modeled as intermediary outcomes in a multi-step chain, as discussed next.

Mechanisms. A total of 28 articles in our sample point to the need for greater knowledge of causal mechanisms in dynamic capabilities research. We concur this is a noticeable gap in the literature. As Figure 2 shows, with the exception of changes in the resource base mediating the dynamic capability– performance link, the mechanism category has remained underspecified and relatively few articles have addressed causal mechanisms at all. Mechanisms are fundamental to theory building and enrichment (Stinchcombe, 1991). Thus, we view the exploration of relevant mediators as an important opportunity for the next decade of dynamic capabilities research.

First, we see an interesting opportunity for future work to add greater richness to our understanding of the mechanism of resource base change, given this mechanism's central role in many foundational works (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003; Zahra et al., 2006; Zott, 2003) and the diverse ways in which resource changes can potentially come about.⁹ Specifically, is there evidence for a more pronounced mediating role of intentional

⁹ We are grateful to the associate editor for pointing us to this important suggestion for future research.

versus coincidental change, for change in tangible versus intangible resources, or for increased resource diversity versus depth?

Moreover, we believe that several mediating variables other than resource changes could reasonably be added. For instance, as we pointed out previously, the general topic of shaping the environment merits greater attention from a dynamic capabilities perspective. Teece (2007) provides several concrete examples, including transforming regulations, technological standards, partners, and other institutions within the business ecosystem. That is, firms can use dynamic capabilities to alter many features of their external environments, which in turn may affect performance outcomes. Current empirical research on these topics has yet to strongly pursue them from a dynamic capabilities perspective, creating a significant opportunity to make an important contribution. We thus advocate further explorations of the mediating role of bringing about changes in the external environment in the dynamic capabilityconsequences link.

Furthermore, previous studies have sometimes emphasized the upsides of dynamic capabilities without accounting for their costs (cf. Clifford Defee & Fugate, 2010). The importance of costs in developing and deploying dynamic capabilities was pointed out by Winter (2003) and has been noted in more recent studies (Schilke, 2014a; Stadler et al., 2013), but this is still an understudied area. For example, researchers could measure the costs associated with dynamic capability deployment as a separate variable, or obtain good proxy measures for these costs, which would allow them to consider deployment costs as an additional intermediate mechanism in explaining the link between dynamic capabilities and their consequences. Costs are relevant to other parts of the organizing framework as well. For example, because the costs of developing dynamic capabilities are largely sunk (i.e., difficult to recoup through direct sale), firms should consider the cost of developing a dynamic capability when deciding whether to invest in doing so (Winter, 2003). This reasoning suggests that the (firm- and situation-specific) development cost of dynamic capabilities is also a likely antecedent that would benefit from future research.

In addition, we need research that pays more attention to the kinds of mechanisms that Verona and Zollo (2011) and Zollo, Bettinazzi, Neumann, and Snoeren (2016) call "non-behavioral objects of action" and that are typically not among the types of firm resources traditionally considered by strategy scholars. Rather than addressing material, behavioral changes, these mechanisms capture how dynamic capabilities may lead to changes in cognitive, emotional, and motivational traits of individual organizational members, their shared mental models and cognitive frames, and even the organization's identity, which in turn can have important performance consequences.

Finally, it is noteworthy that we did not come across any investigations of antecedents to dynamic capabilities that incorporated mediators between antecedents and dynamic capabilities. It would be beneficial to advance extant research on antecedents by gaining a better understanding of how exactly they exert their effects on dynamic capabilities. For this reason, we believe that developing a layer of relevant mediators is important.

Moderators. The study of moderators has been one of the main growth areas in recent dynamic capabilities research, and scholars have advocated continuing on this trajectory. Other organizational capabilities and certain organizational structures are among the organizational-level moderators most frequently suggested for further study (21 and 13 articles, respectively). Among environmental moderators, the industry sector (34 articles), environmental dynamism (23 articles), and the geographic area (22 articles) are among the top picks for further investigation.

To add further richness to this line of inquiry, we suggest considering moderated mediation. Advances in software packages (e.g., Preacher & Hayes, 2004) have made it possible to more easily estimate a variety of more complex models that can shed light on where exactly the moderator comes into play—for example, at either the dynamic capabilities—mediator or the mediator—consequence link. Thus, future studies could explore whether environmental dynamism primarily conditions the dynamic capability resource change link or the resource change—firm performance link, or both.

Future research could also incorporate the impact of dynamic capabilities on variables currently treated as moderators, such as organizational size, culture, structure, strategy, and other capabilities. These are clearly features of organizations that dynamic capabilities may act upon, suggesting that feedback loops from dynamic capabilities to moderators of their effects merit additional investigation.

Additional Considerations

Dynamics. Researchers are increasingly considering implementation of dynamic capabilities and

associated issues of timing (Anand et al., 2009; Harreld, O'Reilly, & Tushman, 2007). It is encouraging to see that the dynamic capabilities concept is diffusing to more practitioner-oriented outlets (e.g., the California Management Review). We view this as an important issue, because managers will more fully appreciate the value of the dynamic capabilities perspective if we are able to provide them with additional practical guidance on how to foster the growth of those capabilities in their firms (Felin & Powell, 2016; Nickerson et al., 2012). In particular, further studies focusing on the steps involved in developing and successfully implementing dynamic capabilities would be very desirable (Allred, Fawcett, Wallin, & Magnan, 2011; Beer, 2013; Malik & Kotabe, 2009; Narayanan, Colwell, & Douglas, 2009). In line with our previous suggestions regarding theoretical integration, dynamic capabilities scholars may find relevant guidance in this regard from the change management literature (also see Fawcett et al., 2012; Sune & Gibb, 2015). This literature also speaks more broadly to issues of planning strategic change, the role of change leaders, and dealing with employee resistance.

More generally, we encourage researchers to approach the study of dynamic capabilities from a process perspective in their future investigations, consistent with Langley et al.'s (2013: 1) powerful primer on process studies in management, in which they urge organizational scholars to "take time seriously, illuminate the role of tensions and contradictions in driving patterns of change, and show how interactions across levels contribute to change." The striking tension between dynamic change and (relatively) stable routines, although at the heart of dynamic capabilities, remains somewhat counterintuitive and underilluminated. Further research is needed to elaborate on how dynamic capabilities can affect change while at the same time following repetitious behavioral patterns that, despite their continuity, may ultimately also be subject to change as these routines are being performed, contextualized, and reinterpreted.

Research methods. In coding limitations and suggestions related to empirical methods, we followed the taxonomy employed by Brutus et al. (2013), which maps the four general threats to validity (i.e., internal, external, construct, and statistical conclusion). Most of the identified issues are quite general and apply to much strategy research beyond dynamic capabilities, as indicated by the illustrative quotes about methods in Table 3. However, beyond the issues identified in the content analysis, there are

several other methodological considerations that we believe are particularly germane to dynamic capabilities research and that we hope will encourage new methodological approaches in the study of dynamic capabilities.

First, we suggest more mixed-methods research. which can allow for simultaneous theory extension and testing. So far, most studies on dynamic capabilities have relied on either qualitative or quantitative approaches, but combing the two in a single investigation opens up significant potential for providing deep insight into the functioning and the broader role of dynamic capabilities. Second, we encourage additional use of archival data and empirical proxy variables (see Stadler et al., 2013). Our analysis indicated that this well-established approach to empirical research has been less used in dynamic capabilities research than survey and qualitative methods. There are a variety of ways to measure dynamic capabilities through proxy variables with archival data. For example, one approach is to use a measure of prior experience that goes into developing a dynamic capability (see Chen et al., 2012). Another approach is to use an intermediate outcome of a dynamic capability as a measure of the extent of "capability" that is then used to produce a subsequent outcome. Yet another approach is to measure inputs to a dynamic capability. All of these approaches have been used in the broader capabilities literature and are applicable to dynamic capabilities. In addition, a broader set of econometric techniques, including those that more precisely analyze cause-and-effect relationships, can often be applied to archival data.

Third, meta-analyses may prove useful. Given the significant body of empirical research on dynamic capabilities that has accumulated, we can now start to synthesize existing findings using meta-analytic techniques. The recent meta-analysis by Fainshmidt et al. (2016) is a good example: these authors not only provided synthetic evidence for the positive performance effect of dynamic capabilities but also added previously largely unexplored moderators, such as the economic context. Fourth, quasi-replications that seek to reproduce prior findings about dynamic capabilities in different settings (e.g., in different industries, time periods, and countries) can help scholars to gain a greater understanding of the extent to which prior empirical results are generalizable (Bettis, Helfat, & Shaver, 2016). The findings of such studies may, in turn, suggest additional theoretical considerations.

Fifth, as more dynamic capabilities scholars move into microfoundations, we see experimental methods as an attractive methodological choice (Bitektine, Lucas, & Schilke, forthcoming; Foss et al., 2012). The recent investigations by Levine et al. (forthcoming) and Wollersheim and Heimeriks (2016) are two of few dynamics capabilities studies that use laboratory experiments. The former neatly demonstrates how laboratory experiments can advance the theory of dynamic capabilities: Levine et al. (forthcoming) construct in the laboratory a realistic market, where participants trade assets for real money. Through experimental design, the researchers eliminate possible advantages from market structure or strategic resources, disentangling the effect of dynamic capabilities from other possible sources of competitive advantages. Thus, when they find widespread performance heterogeneity, they can causally tie it to preexisting differences in managerial dynamic capabilities, operationalized through strategic intelligence. Wollersheim and Heimeriks (2016) identify several distinct advantages of dynamic capabilities in terms of resource use efficiency, coordination efficiency, appropriate action sequencing, and greater deliberation. As they argue, laboratory experiments can benefit the study of dynamic capabilities by providing a means to assess causality, hold constant potential confounding factors, and isolate underlying processes. Several types of experimental paradigms, including routine-prone card games or interdependent production tasks (Foss et al. 2012), can be fruitfully employed to bring dynamic capabilities into the laboratory by studying reactions to environmental shocks. Field experiments also could add to the empirical base of dynamic capabilities; this approach has been used to study the role of managers in strategic change (Helfat & Martin, 2015) and could be applied to dynamic capabilities more generally.

CONCLUSION

Interest in dynamic capabilities has grown substantially in recent years. In this article, we have taken stock of the flourishing stream of research on dynamic capabilities, with a particular focus on where the field can move next as scholars continue to broaden and deepen extant knowledge. Going beyond earlier review articles, the article develops a comprehensive meta-framework of dynamic capabilities that reflects the richness of recent investigations, synthesizing prior research and providing a basis for future research. Based on an integrative analysis of a large sample of relevant investigations, this article takes important steps toward further unifying the field of dynamic capabilities.

Our review shows that the recent stream of research has moved the dynamic capabilities perspective significantly forward while addressing earlier criticisms regarding the underspecification of the dynamic capabilities construct. At this point, the most frequently used general definitions of dynamic capabilities are complementary to one another and have achieved substantial clarity, for which reason we believe that further convergence is not a high priority. Scholars have also made substantial progress in addressing the earlier criticism that empirical work was lacking, which is clearly no longer the case as most of the research on dynamic capabilities is now empirical. In addition, research has made substantial progress identifying and investigating antecedents to dynamic capabilities and demonstrating their consequences, which earlier critiques had singled out as requiring greater attention. A good deal of work has also addressed earlier criticism of illspecified boundary conditions by investigating contingencies in the dynamic capabilities-performance relationship. Of note, many of these studies have investigated environmental dynamism as a contingency variable, addressing prior criticisms that environmental dynamism should not be viewed as a precondition for dynamic capabilities.

Despite this progress, we have identified important gaps in the literature that call for additional research. These include the need for significantly more attention to integration of underused theories, complemented by empirical research; mechanisms involving dynamic capabilities; feedback loops between dynamic capabilities and their antecedents, consequences, mediators, and moderators; interactions among antecedents to dynamic capabilities; complementarity versus substitution effects among different dynamic capabilities and between dynamic capabilities and operational capabilities; the costs of developing and employing dynamic capabilities; the role of dynamic capabilities in shaping the external environment; and process-based approaches to the evolution of dynamic capabilities. We have also pointed to the unresolved tension between more versus lessroutinized dynamic capabilities and have therefore called for additional research on which types of dynamic capabilities are more or less heavily routinized and the consequences for organizations. And we have further suggested that scholars reorient the study of the consequences of dynamic capabilities to

focus more heavily on proximal outcomes. Beyond this, to continue to make empirical progress, we advocate greater use of archival data and laboratory studies. Knowledge gained from additional research in these areas holds the potential to considerably augment the organizing framework for dynamic capabilities that we provided. We hope not only to aid individual scholars in identifying interesting research questions but also to help the body of research on dynamic capabilities to further develop and grow.

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APPENDIX A. EMERGENT CODING FRAMEWORK—CURRENT STATE OF KNOWLEDGE





APPENDIX A (Continued)



APPENDIX B. EMERGENT CODING FRAMEWORK—FUTURE RESEARCH DIRECTIONS



APPENDIX B (Continued)



• Other (including unspecified)

APPENDIX B (Continued)



APPENDIX C. LIST OF THE INITIAL 39 ARTICLES USED TO DETERMINE INTER-RATER AGREEMENT

Allred et al. (2011) Ambrosini et al. (2009) Argote and Ren (2012) Augier and Teece (2009) Barreto (2010) Bock et al. (2012) Bock et al. (2012) Butler and Murphy (2008) Capron and Mitchell (2009) Chiang, Kocabasoglu-Hillmer, and Suresh (2012) Coen and Maritan (2011) Danneels (2008) Desyllas and Sako (2013) Dixon et al. (2014) Døving and Gooderham (2008) Easterby-Smith and Prieto (2008) Eisenhardt et al. (2010) Ellonen, Wikström, and Jantunen (2009) Engelen et al. (2014) Giudici and Reinmoeller (2012)

Harris et al. (2009) Hofmann, Theyel, and Wood (2012) Hsu and Wang (2012) Laeequddin et al. (2009) Leiblein (2011) Maatman et al. (2010) MacCormack and Iansiti (2009) Macher and Mowery (2009) Maniak, Midler, Beaume, and von Pechmann (2014) Martin (2011) McGahan (2012) Nieves and Haller (2014) O'Connor (2008) Salge and Vera (2013) Schepker, Oh, Martynov, and Poppo (2014) Schilke (2014a) Tang and Liou (2010) Townsend, Cavusgil, and Baba (2010) Witcher and Chau (2012)