S Y M P O S I U M

THE ORGANIZATIONAL DRIVETRAIN: A ROAD TO INTEGRATION OF DYNAMIC CAPABILITIES RESEARCH

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Although the research domain of dynamic capabilities has become one of the most active in strategic management, critics have charged that it is plagued by confusion around the construct itself. In this paper, we uncover a potential reason for this confusion embedded in the unique nature of the construct's development path—a peculiarity that has led to split understandings of what constitutes a dynamic capability. We suggest a solution to this problem in the form of an illustrative metaphor— what we call the "organizational drivetrain." Our drivetrain represents a theoretical model aimed at combining different views of the definition of dynamic capabilities by explaining how routines and simple rules interact. This shows that it is possible to advance the development of the framework by combining divergent understandings into a coherent whole. We conclude by offering specific recommendations for how to achieve a greater unity of understanding and move the field even further forward.

Research on dynamic capabilities has been described as a promising perspective of scholarship in strategic management (Di Stefano, Peteraf, & Verona, 2010; Helfat & Winter, 2011; Teece, 2014). Scholarship on dynamic capabilities is indeed one of the most active research areas in the field of strategy, as shown by its sharp rise in both interest (i.e., number of publications dedicated to it) and influence (i.e., number of citations related to it). According to the Social Science Citation Index (SSCI) of the ISI Web of Science database, the yearly number of publications in this domain has grown from an average of 32 over the period 2000 through 2005 to an average of 137 in 2006 through

2010 to an average of 201 in 2011 through 2013. Similarly, the yearly number of citations has increased from an average of 386 in 2000 through 2005 to an average of 3,236 in 2006 through 2010 to an average of 6,860 in 2011 through 2013.

This pattern of rapid growth in interest and impact is rare in most management disciplines. Yet questions have arisen about the coherence and validity of this emerging conceptual perspective (e.g., Arend & Bromiley, 2009). Specifically, scholars have pointed to a lack of clarity and a failure to achieve consensus over the core elements of the construct—problems that could hamper the construct's development and lessen its potential to make a lasting substantive impact on the field of strategic management (e.g., Ambrosini & Bowman, 2009; Winter, 2003).

In this paper, we use bibliometric methods and content analysis to uncover a potential reason for this confusion, which is embedded in the unique nature of the construct's development path. Peteraf,

Di Stefano, and Verona (2013) presented evidence showing that the dynamic capabilities research domain has been socially constructed over a divide between two separate knowledge arenas that represent the legacy of the two seminal papers, namely Teece, Pisano, and Shuen (1997) and Eisenhardt and Martin (2000), respectively TPS and EM from now on. The fact that the two seminal papers offer not only different but *contradictory* understandings of the construct's core elements is the "elephant in the room of dynamic capabilities," as Peteraf and colleagues (2013) called it. Here we argue that the existence of this divide has deeply influenced the evolution of dynamic capabilities as a research field in ways that continue to be problematic. More substantially, we offer a possible solution to this problem in the form of a simple theoretical model aimed at combining different views of what constitutes a dynamic capability by explaining how routines and simple rules interact.[1]

From a descriptive viewpoint, we show that the field of endeavor as a whole has taken form and evolved over the divide created by the two seminal papers. We find evidence of a wide heterogeneity in disciplinary lenses and theoretical perspectives, heterogeneous foundations that can be directly mapped to the influence of the two distinct knowledge pools linked to the two papers. We explore the effects of this heterogeneity on the development of dynamic capabilities by performing a content analysis of the ways in which the most influential papers (from 1997 to 2012) have defined the construct. Our results indicate that there is a bifurcation of understandings with respect to each of the five structural components that make up the definition of dynamic capabilities, a bifurcation mirroring the divide in the underlying knowledge pools and the differing views of the two seminal papers. This suggests that the field is diverging in its understandings of dynamic capabilities as it evolves, rather than converging around a coherent and consistent interpretation of the construct.

Clearly, this can cause problems for the fruitful development of a new theoretical framework. It is crucial for a developing perspective to reach consensus on core theoretical elements (such as assumptions, definition of terms, core relationships between variables, and boundary conditions). Indeed, numerous scholars have lamented the lack of such consensus with respect to the dynamic capabilities construct, calling for a unification of the field (e.g., Barreto, 2010; Wang & Ahmed, 2007). In this paper, we offer a solution to this problem, suggesting that the very source of the problem (i.e., the underlying heterogeneity of theoretical approaches) may also hold the key to its resolution. Heterogeneous theoretical roots encourage the entry of a broader array of contributors to a field, which allows the field to develop on a richer, more diverse knowledge base. Authors with heterogeneous interests and expertise may play special roles in serving as conduits of knowledge, bringing creative new ideas into a field and diffusing the concept to a wider knowledge arena. And despite the apparent bifurcation of understandings regarding dynamic capabilities, there are ways to combine these understandings productively.

To show how scholars could advance the development of the dynamic capabilities framework by combining divergent understandings into a coherent whole, we introduce a simple, illustrative metaphor—what we call the "organizational drivetrain"—that represents a theoretical model aimed at combining different views of what constitutes a dynamic capability by combining divergent understandings into a coherent whole. Metaphors are an effective tool in management research (Cornelissen, 2005), and we employ this tool to highlight potential venues of integration in dynamic capabilities studies. We conclude by offering a set of additional recommendations for how to achieve a greater unity of understanding, and move the field even further forward.

DYNAMIC CAPABILITIES AS A BIFURCATED DOMAIN: EVIDENCE FROM THE FIELD

Despite the exceptional rise in interest in and influence of dynamic capabilities, criticisms of the dynamic capabilities perspective continue to mount (e.g., Eriksson, 2013; Schreyögg & Kliesch-Eberl, 2007; Wu, 2010). Common concerns are related to lack of consensus on basic theoretical elements and limited empirical progress (Easterby-Smith, Lyles, & Peteraf, 2009; Schilke, 2014). Moreover, critics have charged that the research domain of dynamic capabilities is plagued by confusion around the construct itself (Wilden, Devinney, & Dowling, 2013). In the first section of our paper, we

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[1] Unlike Di Stefano and colleagues (2010), this paper is focused on a particular concerning issue and its effect on the field's development. We use bibliometric tools to assist in our assessment of the effects of this problem, but then depart from bibliometrics and sketch a theoretical model aimed at offering a solution to the identified issue.

aim at uncovering a potential reason for this confusion, which appears to be embedded in the unique nature of the construct's development path. To this end, we document the heterogeneity in theoretical foundations of this field of endeavor and analyze its implications on the development of the topic. Our analyses shed light on a research field that has evolved over a theoretical divide, with two knowledge pools building on different theoretical foundations and giving rise to split understandings of the most fundamental component of the dynamic capabilities framework—that is, the definition itself of dynamic capabilities. In the second section of the manuscript, we offer a possible solution to this problem by sketching a simple theoretical model combining different views of what constitutes a dynamic capability.

Examining Foundations: Analysis of Theoretical Roots

In recent work, Peteraf and colleagues (2013) provided evidence that the dynamic capabilities research domain is being socially constructed on the basis of two distinct knowledge pools directly linked to the two seminal papers but otherwise disconnected from one another. This in turn is suggestive of the existence of a disciplinary divide at the roots of this field of endeavor. Here, we turn to the question of how the heterogeneity introduced by the two foundational papers, and the resulting separation between the two knowledge pools, may have affected the development of the field as a whole. To tackle this issue, we first examine the disciplinary lenses and theoretical perspectives that undergird influential dynamic capabilities research, in an attempt to ascertain the nature of the field's conceptual foundation and its relationship to the heterogeneity and differing perspectives referenced above.

To examine the foundations of dynamic capabilities research, we analyzed the references that are most cited by the leading papers on dynamic capabilities. An analysis of patterns in cited references (outgoing citations from a text) can provide information about the disciplinary bases and interdisciplinary breadth of a text's sources (White, 1996). For an emerging paradigm, this can reveal something about the theoretical roots, conceptual foundation, and intellectual heritage of a construct (Garfield, 1979). It reveals something of an author's knowledge base and disciplinary orientation, which in turn may affect the way the paper is written and the audience with

which it most resonates. We provide a classification of the most influential theoretical roots of dynamic capabilities research in Table 1, while we thoroughly describe the procedure used to generate this table in Appendix A.

References in the table are classified according to seven theoretical perspectives, ranked by total citation counts, that are explicitly mentioned by the 59 most influential papers in this domain, as identified in Appendix A (see Table A1). The seven perspectives are the resource-based view (Wernerfelt, 1984), the knowledge-based view (Kogut & Zander, 1992), behavioral theory (Cyert & March, 1963), evolutionary economics (Nelson & Winter, 1982), network theory (Granovetter, 1985), transaction cost economics (Williamson, 1975), and the positioning view (Porter, 1980).

One indicator of the relative influence of these different theoretical perspectives in dynamic capabilities research is simply the number of times the founding publications were cited by our panel of 59 core papers. From this, the strong influence of evolutionary economics becomes clear, matched only by that of the resource-based view (27 and 28 citations, respectively). This is an interesting result, as the extent of the influence of evolutionary economics on the development of dynamic capabilities is not so apparent. Less strongly represented but still influential is the knowledge-based view; its founding paper was cited directly by more than a third of the core papers (20 citations). About a quarter of the papers cite the founding reference for transaction cost economics, while about 15% cite the references representing behavioral theory, network theory, and the positioning view.

A second indicator of the relative influence of these different theoretical perspectives in dynamic capabilities research is the number of citations to related references—those associated with or based on the founding work. This indicator provides more indirect evidence regarding the influence of the founding work.[2] Moreover, there is a great deal of variation among the references included concerning the closeness of their connections to the

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[2] An absence of related references provides evidence of a negative kind. It suggests that references to the founding work should be discounted. Without additional support from related references, it is unlikely that a particular perspective provides significant theoretical support. Here, the single references related to Porter (1980), by Porter himself, suggests that this perspective does not underlie dynamic capabilities research in any meaningful way.

TABLE 1
Theoretical Roots of the Dynamic Capabilities Work[a]

	Resource-based view	Knowledge-based view	Behavioral theory	Evolutionary economics	Network theory	Transaction cost economics	Positioning view
Core work	Wernerfelt, 1984	Kogut and Zander, 1992	Cyert and March, 1963	Nelson and Winter, 1982	Granovetter, 1985	Williamson, 1975	Porter, 1980
Citations	*28*	*20*	*10*	*27*	*8*	*13*	*9*
Related reference(s)	Amit and Schoemaker, 1993	Ahuja and Lampert, 2001	Brown and Eisenhardt, 1997	Adler et al., 1999	Burt, 1982	Williamson, 1985	Porter, 1996
	Barney, 1986	Brown and Duguid, 2001	Cohen and Bacdayan, 1994	Helfat and Raubitschek, 2000	Gulati, 1999		
	Barney, 1991	Conner and Prahalad, 1996	Cohen and Levinthal, 1990	Karim and Mitchell, 2000	Hansen, 1999		
	Barney, 2001	Grant, 1996a	Eisenhardt, 1989	Tushman and Anderson, 1986	Kogut, 2000		
	Bharadwaj, 2000	Grant, 1996b	Gavetti and Levinthal, 2000				
	Collis, 1991	Henderson and Clark, 1990	Huber, 1991				
	Dierickx and Cool, 1989	Leonard-Barton, 1992	Lane and Lubatkin, 1998				
	Dyer and Singh, 1998	Leonard-Barton, 1995	Levinthal and March, 1993				
	Galunic and Rodan, 1998	Nahapiet and Ghoshal, 1998	Levitt and March, 1988				
	Grant, 1991	Nonaka, 1994	March, 1991				
	Henderson and Cockburn, 1994	Nonaka and Takeuchi, 1995	March and Simon, 1958				
	Hitt et al., 2001	Szulanski, 1996	Tripsas and Gavetti, 2000				
	Iansiti and Clark, 1994	Zahra et al., 2001					
	Lepak and Snell, 1999	Zander and Kogut, 1995					
	Lippman and Rumelt, 1982						
	Mahoney and Pandian, 1992						
	Penrose, 1959						
	Peteraf, 1993						
	Powell and Dent-Micallef, 1997						
	Prahalad and Hamel, 1990						
	Priem and Butler, 2001						
	Ross et al., 1996						
	Rumelt, 1984						
Citations	**274**	**139**	**129**	**30**	**24**	**7**	**7**

[a] Cohen's kappa for inter-coder agreement: 0.607. Related references are ranked according to the number of citations received by papers in the collection. Unless works are cited in the text, please refer to the original papers for complete references.

founding work. Some, such as Grant (1996) and Barney (1991), are perfect surrogates for the founding work. Others required more judgment to be classified because they have deep connections to multiple perspectives (e.g., Conner & Prahalad, 1996; Helfat & Raubitschek, 2000). Others have only a weak association with a given perspective and were classified only on the basis of their reference lists.

What these citation numbers may reveal more clearly, however, is something about the orientation of the researchers citing the references—that is, the authors of the core papers on dynamic capabilities. Researchers tend to cite those articles with which they are most familiar. Reference lists, then, are suggestive of a researcher's training, expertise, and focal interests (Price, 1965; White & Griffith, 1981). While authors may often cite founding references to well-known theoretical perspectives, citing a variety of the references associated with a given perspective requires deeper knowledge of the work in that area, and indicates more strongly the focus of the author's paper.

In this respect, the distribution of the citations to references related to the founding works is quite revealing. While the emphasis given to the resource-based view is hardly surprising, it is interesting that the second most active area for citations is behavioral theory (Cyert & March, 1963), given the fact that some proponents of this view (e.g., Bromiley, 2004) consider it to be in stark opposition to the resource-based view, which has an economics orientation and utilizes an equilibrium-based logic. In attending to such issues as organizational learning and memory, behavioral theory has a greater affinity to the knowledge-based view, also strongly represented.

In reflecting on the implications of these results and how they relate to the roots of dynamic capabilities, several things come to mind. First, the breadth of theoretical roots in the dynamic capabilities research domain appears to echo the heterogeneity in the underlying author knowledge pool found by Peteraf and colleagues (2013). It also suggests that this heterogeneity of author knowledge is now bearing fruit and contributing to the richness and complexity of the dynamic capabilities research domain. As noted by Teece (2014, p. 344): "A full understanding of how organizations and leaders exhibit strong or weak dynamic capabilities requires insights from many disciplines and sub-disciplines in the social sciences." Moreover, it indicates that there is a broad set of theoretical resources that scholars could continue to draw on in their efforts to develop the theory in a more concrete and robust manner. These implications may be among the most positive aspects of having two seminal papers that draw on different disciplinary foundations and offer differing perspectives on dynamic capabilities.

Second, the dominance of the direct influence of evolutionary economics on one hand and the resource-based view on the other provides an indicator of scholars' revealed preferences regarding the most promising theories for developing the dynamic capabilities construct further. That these are complementary theories, as suggested by their role in developing a dynamic resource-based view (e.g., Helfat & Peteraf, 2003), is also a promising sign that the research may develop along logically consistent and more unified lines.

The most interesting result, however—found by probing more deeply—indicates a more fundamental division within the dynamic capabilities research community. This result is also the most concerning. The strong affinity for behavioral theory is revealing in light of the concerns noted above over perceived incompatibilities with the resource-based view. The strong connection to the knowledge-based view invokes similar concerns, given the opinion by some that the more dynamic applications of the resource-based view are in opposition to the part concerned with sustainable competitive advantage (e.g., Schulze, 2004). These tensions among the different theoretical perspectives underlying the dynamic capabilities research field are reminiscent of the opposing logics employed by the two seminal papers and evidenced in their associated knowledge pools. The fact that behavioral theory is more closely aligned with organizational theory (the logic of EM) while the resource-based view is more closely affiliated with economics (the logic of TPS) demonstrates this point. We next dig deeper into the implications of this division in an attempt to uncover its consequences for the development of the research domain.

From Heterogeneous Theoretical Roots to the Definition of the Construct

What are the implications of the heterogeneity in theoretical foundations, and the resulting evolution of the field over a disciplinary divide, for the development of research on dynamic capabilities? One might tackle this question from many angles, including its relevance for the assump-

FIGURE 1
Defining DC: The Emerging Evidence
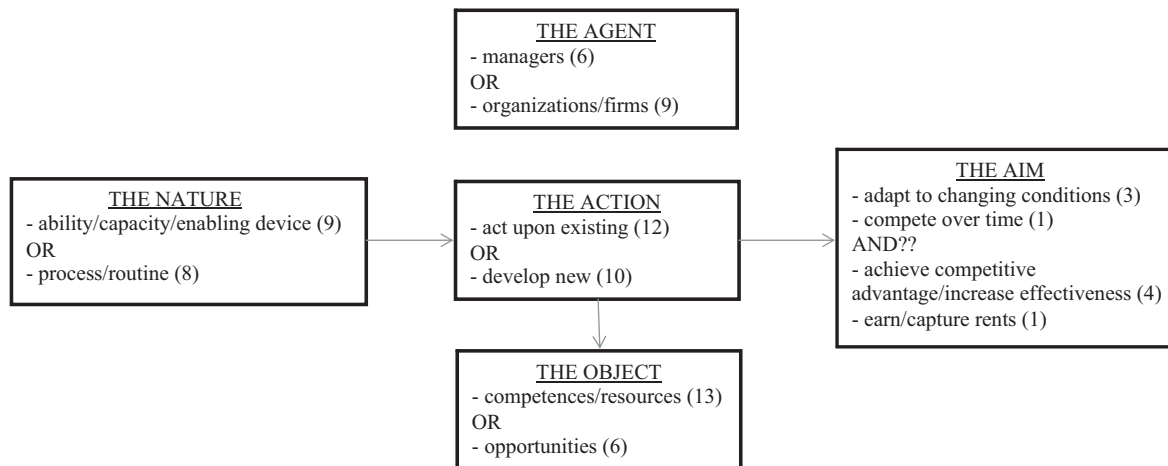
Note: Cohen's kappa for inter-coder agreement: 0.957. The numbers in parentheses refer to the number of papers in the collection using each of the approaches within the definitional options. Some papers use more than one single approach, and hence the numbers do not necessarily sum up to 17 (i.e., the number of definitions coded).

tions behind the frame, the definition of the construct, the framework's core variables, the relationships among the variables, and the construct's boundary conditions. In this paper, we limit our attention to the question of how the divided understandings of the two seminal papers, and the resulting heterogeneity in the theoretical foundations of the most influential papers, have affected the way that the dynamic capabilities construct is understood. That is to say, we look at how this has affected the way the leading papers on the topic have defined dynamic capabilities.

We begin there, because settling on a definition is the natural starting point for the robust development of any construct. But in addition, the lack of a consistent definition has been a concerning issue for many prominent critics of the dynamic capabilities research domain (e.g., Zahra, Sapienza, & Davidsson, 2006). Indeed, one of the most complex debates and thorny issues occupying core researchers in dynamic capabilities research is how to define dynamic capabilities. Due to the complexity of the construct, this has perhaps sparked the most discussion and produced the most confusion. While TPS first defined the term "dynamic capabilities," their definition has been expanded and refined by subsequent authors.[3] In

the process, it has also been modified, producing conflicting understandings regarding critical issues, including the nature of dynamic capabilities and their effect on organizational outcomes.

We bring a content analytic approach to this issue to uncover the underlying structure of the debate, identify the main points of contention, and clarify understandings, in the hope of helping to move the debate forward. The summary model we draw lays out the basic structure of the definitions of dynamic capabilities in terms of five structural components: (1) the nature of the construct (what a dynamic capability fundamentally is), (2) the agent (who exerts it), (3) the action (by doing what), (4) the object of the action (on which direct object), and (5) the aim or purpose of the construct (with which ultimate goal). Figure 1 depicts the summary model, while we thoroughly describe the procedure used to generate this figure in Appendix B. We drew Figure 1 as developing along two axes. The horizontal axis shows the logical link connecting the nature of dynamic capabilities, the action it entails, and the ultimate goal for which it is exerted. The vertical axis concentrates on the action, portraying its antecedent (i.e., the agent exerting this action) and consequence (i.e., the object of the action).

As Figure 1 reveals, our content analysis uncovers the existence of polarization within each of the

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[3] While definitions of dynamic capabilities were published before theirs (e.g., Teece & Pisano, 1994), TPS preceded these in working paper form, which was available in 1990.

five content domains around two main approaches.[4] That is to say, there is a bifurcation of the understandings among the field's most influential papers regarding each of the five structural elements comprising the definition of dynamic capabilities. We next consider the meaning and importance of these divisions within the content domains of the definition. Table 2 provides references to the papers that adopt the different positions within each domain, together with a representative quote.

The nature. The debate over the basic nature of dynamic capabilities concerns whether it is defined in terms of *latent action*, such as an ability, capacity, or enabling device, or in terms of *constituent elements*, as in a process, routine, or pattern. As shown in Figure 1, existing definitions are evenly divided with respect to this issue, and there is no single paper that takes both perspectives at the same time. Interestingly, the distinction between dynamic capabilities as an ability versus dynamic capabilities as a process dates back to the two seminal manuscripts, with TPS advocating the former position and EM supporting the latter.

TPS (1997, p. 516) were the first to define dynamic capabilities in terms of latent action, as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." Similarly, Teece (2000, p. 35) defined dynamic capabilities as "the ability to sense and then seize opportunities quickly and proficiently"; Zahra and colleagues (2006, p. 918) simply talked of "the abilities to reconfigure a firm's resources and routines"; and Kale and Singh (2007, p. 982) explained that "dynamic capability refers to the capacity of an organization to purposefully create, extend, or modify its resources or skills."

On the other hand, EM (2000, p. 1107) were the first to define dynamic capabilities in terms of its constituent elements by arguing: "We define dynamic capabilities as 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." Similar definitions are provided, for instance, by Amit and Zott (2001, p. 497), who defined dynamic capabilities as "rooted in a firm's managerial and organizational processes," and Aragon-Correa and Sharma (2003, p. 73), who wrote that dynamic capabilities "consist of a set of specific and identifiable processes." In a similar vein, Zollo and Winter (2002, p. 340) explained that "a dynamic capability is a learned and stable pattern of collective activity through which organizations systematically generate and modify operating routines for improved effectiveness."

The fundamental difference between these two conceptions is related to the degree of observability. Action that is latent cannot be observed until called into use, while constituent elements have a more concrete and observable form (Helfat, Finkelstein, Mitchell, Peteraf, Singh, & Winter, 2007). This has implications for the empirical identification of dynamic capabilities and suggests some of the challenges involved. But as Helfat and colleagues (2007, p. 37) observed, "approaching research on dynamic capabilities from a process perspective (may) provide the needed link to action."

The agent. With respect to the issue of agency, our content analysis of definitions shows that the research is divided over whether the focus of dynamic capabilities is on the role of the manager or on that of the organization. This is a level of analysis issue within dynamic capabilities research. And while there is a split over this issue, the numbers provided in the figure show that the agency of organizations is receiving greater attention at present. Among those who see dynamic capabilities as concerned with the role of the organization as a whole are Kale and Singh (2007, p. 982), who wrote of "the capacity of an organization," while Teece (2000, p. 42) referred to "the ability of an organization."

In contrast, papers arguing in favor of a pivotal role for the decision-maker include Zahra and colleagues (2006, p. 918), who defined dynamic capabilities as "the abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision-maker(s)," and Galunic and Eisenhardt (2001, p. 1229), who portrayed dynamic capabilities as "the organizational and strategic processes by which managers manipulate resources into new productive assets in the context of changing markets." Similarly, Knight and Cavusgil (2004, p. 127) viewed dynamic capabilities as "reflecting the ability of managers to renew the firm's competences so as to achieve congruence with the changing business environment."

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[4] To a degree, there is also some division of opinion within the subcategories listed here, such as whether dynamic capabilities are better categorized as routines or processes. In the coders' judgment, however, these distinctions are less fundamental than those highlighted by the model.

TABLE 2
Defining Dynamic Capabilities (DC): A Bifurcated Domain

Domain	Approach	Papers	Example
Nature	Ability/capacity/enabling device	Teece et al., 1997; Teece, 2000; Zahra and George, 2002; Benner and Tushman, 2003; Winter, 2003; Knight and Cavusgil, 2004; Zahra et al., 2006; Kale and Singh, 2007; Teece, 2007	DC refers to the *capacity* of an organization to purposefully create, extend, or modify its resources or skills [Kale and Singh, 2007: 982].
	Process/routine	Eisenhardt and Martin, 2000; Amit and Zott, 2001; Galunic and Eisenhardt, 2001; Zollo and Winter, 2002; Aragon-Correa and Sharma, 2003; Colbert, 2004; Santos and Eisenhardt, 2005; Sapienza, Autio, George, & Zahra, 2006	We define DC as the firm's *processes* that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change (Eisenhardt and Martin, 2000: 1,107).
Agent	Managers	Galunic and Eisenhardt, 2001; Colbert, 2004; Knight and Cavusgil, 2004; Santos and Eisenhardt, 2005; Zahra et al., 2006	We define [DC] as the abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its *principal decision-maker(s)* (Zahra et al., 2006: 918).
	Organizations/firms	Teece et al., 1997; Eisenhardt and Martin, 2000; Teece, 2000; Amit and Zott, 2001; Zahra and George, 2002; Zollo and Winter, 2002; Aragon-Correa and Sharma, 2003; Benner and Tushman, 2003; Kale and Singh, 2007	A DC is a learned and stable pattern of collective activity through which *organizations* systematically generate and modify operating routines for improved effectiveness [Zollo and Winter, 2002: 340].
Action	Change existing	Teece et al., 1997; Eisenhardt and Martin, 2000; Galunic and Eisenhardt, 2001; Zahra and George, 2002; Zollo and Winter, 2002; Benner and Tushman, 2003; Winter, 2003; Colbert, 2004; Santos and Eisenhardt, 2005; Sapienza et al., 2006; Zahra et al., 2006; Kale and Singh, 2007	DC are the organizational and strategic routines by which managers *alter their firms' resource base* through acquiring, shedding, integrating, and recombining resources to generate new value creating strategies (Sapienza et al., 2006: 914).
	Develop new	Eisenhardt and Martin, 2000; Teece, 2000; Galunic and Eisenhardt, 2001; Aragon-Correa and Sharma, 2003; Benner and Tushman, 2003; Colbert, 2004; Knight and Cavusgil, 2004; Santos and Eisenhardt, 2005; Sapienza et al., 2006; Teece, 2007	DC consist of a set of specific and identifiable processes that, although idiosyncratic to firms in their details and path dependent in their emergence, have significant commonality in the form of best practices across firms, *allowing them to generate new, value creating strategies* (Aragon-Correa and Sharma, 2003: 73).
Object of the action	Competences/resources	Teece et al., 1997; Eisenhardt and Martin, 2000; Galunic and Eisenhardt, 2001; Zahra and George, 2002; Benner and Tushman, 2003; Winter, 2003; Colbert, 2004; Knight and Cavusgil, 2004; Santos and Eisenhardt, 2005; Zahra et al., 2006; Sapienza et al., 2006; Kale and Singh, 2007; Teece, 2007	One can define DC as those that operate to extend, modify, or create *ordinary capabilities* (Winter, 2003: 991).
	Opportunities	Teece, 2000; Zollo and Winter, 2002; Aragon-Correa and Sharma, 2003; Santos and Eisenhardt, 2005; Sapienza et al., 2006; Teece, 2007	DC . . . the ability to sense and then seize *opportunities* quickly and proficiently (Teece, 2000: 35).
Aim	Adapt to changing conditions	Teece et al., 1997; Eisenhardt and Martin, 2000; Knight and Cavusgil, 2004; Benner and Tushman, 2003	We define dynamic capabilities as the firm's ability to *integrate, build, and reconfigure internal and external competences to address rapidly changing environments* (Teece et al., 1997: 1229).
	Achieve an advantage over market rivals	Teece, 2000; Zahra and George, 2002; Zollo and Winter, 2002; Teece, 2007; Amit and Zott, 2001	[DC] enable the firm to reconfigure its resource base and adapt to changing market conditions to *achieve a competitive advantage* (Zahra and George, 2002: 185)

While these two views of the agency issue may not be incompatible, it is easy to envision how they are representative of different theoretical foundations, could lead to different predictions, and would tend to be studied with different empirical approaches. Moreover, one could speculate that the two views may have different appeal for different types of audiences. The organizational view may signal a greater interest in building a robust theoretical foundation for the emerging paradigm. The managerial view, with its emphasis on practice, may suggest more concern for the real-world utility of the framework and its applications.

The action. A domain in which we observe an almost even split between researchers taking each of the two perspectives is the *action*, where the split is over whether dynamic capabilities change an existing base or act to create something new. As an example of the former orientation, consider Zahra and colleagues (2006, p. 918), who defined dynamic capabilities as "the abilities to reconfigure a firm's resources and routines." On the other hand, Aragon-Correa and Sharma (2003, p. 73) defined dynamic capabilities as "a set of specific and identifiable processes that . . . have significant commonality in the form of best practices across firms, allowing them to generate new, value-creating strategies."

This distinction may not be a problematic one, however, because there are definitions that propose both views at the same time. For instance, Benner and Tushman (2003, p. 238) argued that "a firm's ability to compete over time may lie in its ability both to integrate and build upon its current competencies while simultaneously developing fundamentally new capabilities." Analogously, Santos and Eisenhardt (2005, p. 498) defined dynamic capabilities as "organizational processes by which members manipulate resources to develop new value-creating strategies," thus putting emphasis on both the action on an existing base and the aim at creating something new.

The object of the action. Tightly connected to the issue of the action is the issue of whether the object of the action of dynamic capabilities is the firm's capabilities and resources versus its opportunities. However, different from above, researchers tend to support either one or the other perspective. This may suggest that the differing positions indicate a researcher's orientation and interests.

Definitions focusing on capabilities include Winter (2003, p. 991), who characterized dynamic capabilities as "those that operate to extend, modify, or create ordinary capabilities." As for resources,

Colbert (2004, p. 348) explained that "dynamic capabilities are the organizational and strategic processes through which managers convert resources into new productive assets in the context of changing markets."

An example of a definition focused on opportunities is the one provided by Teece (2000, p. 35), who referred to dynamic capabilities as "the ability to sense and then seize opportunities quickly and proficiently." Similarly, Aragon-Correa and Sharma (2003, p. 73) explained that "dynamic capabilities consist of a set of specific and identifiable processes that, although idiosyncratic to firms in their details and path dependent in their emergence, have significant commonality in the form of best practices across firms, allowing them to generate new, value-creating strategies."

The aim. A more critically divided issue concerns the aim or purposeful outcome associated with dynamic capabilities, and the likelihood of realizing that aim. That it remains a divided issue, despite its criticality, is suggestive of the complexities and subtleties involved. It is also indicative of differences that may be harder to reconcile, deriving from the mental models, disciplinary-based viewpoints, and theoretical orientations of the researchers driving the debate.

While the general aims of dynamic capabilities in terms of addressing new market needs, seizing opportunities, adapting to changing conditions, and competing over time are found throughout our sample, this is not true with respect to the aim of dynamic capabilities to improve organizational performance in relation to market rivals. Our results here reveal that there is a divided understanding over whether dynamic capabilities are associated with any indicators of competitive performance or whether they are concerned only with the more general notion of helping an organization to respond to changing conditions.

Those papers that define the aim of dynamic capabilities in terms of adaptive change include TPS (1997, p. 516), according to which dynamic capabilities are "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." In a similar vein, Knight and Cavusgil (2004, p. 127) explicitly recognized the aim to "to achieve congruence with the changing business environment," and Benner and Tushman (2003, p. 238) talked of dynamic capabilities as "a firm's ability to compete over time."

Those papers that define the aim of dynamic capabilities in terms of competitive performance use terms such as competitive advantage, effectiveness, profitability, or rents rather than restricting themselves to more general objectives. Examples include Zahra and George (2002, p. 185), who explained that dynamic capabilities "enable the firm to reconfigure its resource base and adapt to changing market conditions in order to achieve a competitive advantage," and Teece (2007, p. 1320), who asserted that the "ambition" of the dynamic capabilities framework "is nothing less than to explain the sources of enterprise-level competitive advantage over time." Other examples include Zollo and Winter (2002, p. 340), who argued that "a dynamic capability is a learned and stable pattern of collective activity through which organizations systematically generate and modify operating routines for improved effectiveness," while Amit and Zott (2001, p. 497) asserted that dynamic capabilities "enable firms to create and capture Schumpeterian rents."

This difference in viewpoint may be a reflection of the types of outcomes that different types of researchers find interesting—a possible result of the differences in their disciplinary orientations. Those with a background in economics, for example, are much more likely to be concerned with the issue of competitive outcomes and profitability. The real debate over the aim of dynamic capabilities, however, lies beneath the surface of the results captured in Figure 1. The central issues are twofold. The first question is whether dynamic capabilities can lead to competitive advantage or whether they can produce only competitive parity. This debate was sparked by EM (2000, p. 1108), who characterized dynamic capabilities as best practices, noting that while dynamic capabilities may be "idiosyncratic in their details," they also exhibit "commonalities" that make them equally effective across firms. As examples of best practice, then, they cannot be a source of competitive advantage. This view contrasts sharply with the position of TPS (1997, p. 516), who linked dynamic capabilities directly to the notion of competitive advantage, asserting that dynamic capabilities "reflect an organization's ability to achieve new and innovative forms of competitive advantage." Moreover, Teece (2007) explicitly contested the claim that dynamic capabilities are best practices.[5]

The second question is over the strength of the relationship between dynamic capabilities and competitive advantage. At one end of the spectrum of views, there are those who hold that dynamic capabilities necessarily provide firms with a competitive advantage. This, however, is not a matter for debate, but only a matter of confusion, in that it produces the same tautology of which the resource-based view has been accused (e.g., Bromiley & Fleming, 2002). Whether a specific dynamic capability is capable of creating value, providing a competitive advantage, or generating rents depends on a set of conditions that Helfat and colleagues (2007) described concisely. Advancing the level of understanding within the field concerning these issues depends on a more uniform use and better understanding of various performance metrics (Peteraf & Barney, 2003).

A Summary of Our Findings

We asked whether the heterogeneity of the underlying author knowledge pools and the opposing logics found in the two seminal papers have been consequential for the development of the dynamic capabilities research domain. To address this question we first investigated the nature of the theoretical foundations undergirding the leading research papers on dynamic capabilities. We then took a closer look at the ways in which dynamic capabilities have been variously defined by those leading papers.

The results of our first investigation reveal that the field is being built from a multiplicity of theoretical roots, mirroring the heterogeneity found in the underlying author knowledge pools. We provide evidence regarding the specific nature of those foundations as well as some indicators of which among them are the most influential and most likely to support future dynamic capabilities research. Within the theoretical foundations, however, we find signs of some underlying incompatibilities and opposing logics that may well have their origins in the opposing logics found in the two seminal papers. More specifically, we find evidence that while many papers are rooted in behavioral theory (which is aligned with the logic of organizational theory employed by EM), others draw more from the resource-based view (which is closer to the economics logic of TPS).

To explore the effect of this split in perspectives further, we performed a content analysis of the ways in which the dynamic capabilities construct

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[5] See Peteraf and colleagues (2013) for more on the differences between the seminal papers regarding competitive advantage.

has been variously defined. Here, too, we find evidence of divided understandings that echo the divided views of the seminal papers. Further, we observe a bifurcation within each of the five content domains comprising the definition of dynamic capabilities. That each part of the definition of dynamic capabilities is split along two different dimensions is also suggestive of the source of this development, harkening back to the divide in the underlying author knowledge pools.

A look at the nature of the split within each of these definitional content domains is also revealing. This is particularly the case with respect to the *aim* of dynamic capabilities, where the divided views seem to give expression to the underlying tensions found among the field's theoretical roots. There the division is over whether the aim of dynamic capabilities is to achieve an advantage over market rivals or whether it is simply to adapt to changing conditions (or create them). The concern with competitive advantage is rooted in competitive strategy, with its focus on competitive dynamics and their implications for firm performance. It is also strongly associated with the resource-based view and its economic underpinnings. In contrast, the objective of adapting to change is a central part of organization theory, with its concern for broader organizational objectives such as growth, learning, and organizational change. This is also the purview of behavioral theory; with its assumption of satisficing behavior, it is less concerned with competitive outcomes.

What seems evident is that this split in understanding is linked not only to the two opposing logics utilized in the seminal papers, but also to the divide in the theoretical underpinnings supporting the dynamic capabilities research field. That this is consequential for the development of the field stems from the fact that this split in understandings reflects not just a difference in interests and perspectives but a tension stemming from some underlying incompatibilities.

Our results are indicative that the dynamic capabilities research domain is diverging in its understandings of the construct as it evolves, rather than converging around a consistent definition and coherent interpretation of how dynamic capabilities should be framed. These problems, however, are not insurmountable. In the next section, we propose one possible approach to a resolution of these differences.

A ROAD TO INTEGRATION: THE DRIVETRAIN METAPHOR

Because the divided understandings of dynamic capabilities appear to stem from the differing perspectives of the two seminal papers, one route toward a more unified understanding is to combine the differing views of the foundational papers into a more holistic, integrative framework. When such views are not only different but are contradictory and in direct opposition to one another (Peteraf et al., 2013), this may be a difficult aim to achieve. But as we demonstrate here, it is not an impossible objective, and its achievement may help to heal the fissures that emerged along the construct's development path.

We first highlight some key differences in the views of the two seminal papers. We next show how those differences relate to the split views of the field regarding the dynamic capabilities construct. We then introduce our metaphorical notion of the organizational drivetrain and show how this concept can provide a path toward integrating the differing views of the two foundational papers. We close by linking this back to the problem of bifurcated understandings in the definition of dynamic capabilities and its resolution.

The differences between the portrayals of dynamic capabilities in TPS and EM are starkest and most divergent in high-velocity environments, where change occurs rapidly. Under these conditions, EM averred that dynamic capabilities take the form of simple rules, whereas TPS portrayed dynamic capabilities as involving complex routines under whatever conditions they are deployed. Simple rules, as described by EM (p. 1113), are in a "continuously unstable state" that makes them "difficult to sustain," thereby posing an internal threat to a company's ability to maintain a competitive advantage. They rely on the creation of "new knowledge" to "allow for emergent adaptation" (EM, p. 1116). Their existence suggests "a richer conception of routines" that includes "more fragile, 'semi-structured' ones" in the form of simple rules that are "iterative and cognitively mindful, not linear and mindless," as routines are usually conceived (EM, p. 1117). This contrasts boldly with TPS's depiction of routines as an efficient and robust set of processes—a depiction that matches closely the one found in evolutionary economics (Nelson & Winter, 1982) and elsewhere (e.g., Cyert & March, 1963).

The distinction over whether dynamic capabilities comprise well-honed, complex routines or fragile, simple rules is not a minor matter. In the first instance, it has obvious implications for whether or not dynamic capabilities can provide an organization with a sustainable competitive advantage. If they take the form of simple rules, they cannot support a sustainable advantage due to their own fragility and short-lived nature, according to EM. The contrasting position by TPS is that the dynamic capabilities framework provides a much-needed solution to the conundrum of how a firm can achieve and sustain a competitive advantage under turbulent conditions. This speaks to the split in understandings that we exposed above with respect to the construct's aim.

The distinction also links to other aspects of the definition in which there are divided understandings. Because simple rules are cognitively mindful aspects of the context set by top management, they imply that the *agency* rests in individual managers; in contrast, complex routines highlight the agency of an organization. Regarding the *action* and the *object of the action*, simple rules are more likely to be involved in developing something new in response to new opportunities, while complex routines are more concerned with changing existing resources and capabilities.

Given the extent and import of these differences in the seminal views, how then can we bring them together fruitfully? Our answer is that we can do so by broadening our perspective to see the two views as each focused on a different part of a larger, interconnected, and more fully dynamic system. To convey our conception of this system, we introduce the notion of an "organizational drivetrain," using a bicycle's drivetrain to illustrate its workings metaphorically.[6] We make no attempt in this paper to develop a fully fleshed-out model of the organizational drivetrain system; rather, we provide a simple illustrative sketch of how this system might operate and how it might help to integrate the different understandings about dynamic capabilities. We offer this sketch in the hope that others might find our efforts thought-provoking enough to merit further development.

We begin with the observation that even under the most turbulent of environmental conditions,

when there may be a greater reliance on simple rules to respond flexibly, companies have no less a need for complex organizational routines to implement the simple rules and create the needed internal changes. Indeed, the two types of "routines"—simple and complex—must be linked to one another as part of a well-coordinated dynamic system to cope effectively with the pressures of rapid environmental change.

Consider, for example, the alliancing process at Yahoo, which Eisenhardt and Sull (2001) characterized as consisting largely of two simple rules that limited the types of alliances the company could pursue. While those rules may have sharply circumscribed the nature of Yahoo's alliancing activities, they were surely only the starting point. Other much more complex routines, such as those for building relationships, exchanging information, and coordinating activities, were doubtless also involved in altering the firm's resource base and enabling it to respond nimbly to changing conditions. We posit that Yahoo's success in alliancing was attributable not only to its use of simple rules, but also to the well-honed and robust routines behind all the activities required for the creation and management of its alliance portfolio. Yahoo's simple rules were likely only a part of a dynamic system of interlinked parts that included a set of complex routines for creating and enabling change—an integrated system in which the TPS view of dynamic capabilities *as well as* the EM view of dynamic capabilities both played a role. And if this is true with respect to alliancing in high-velocity environments, it is likely also true for product development, mergers and acquisitions, resource allocation, decision-making, and many other types of processes that are commonly viewed as being deployed in the exercise of dynamic capabilities.

We conceive of such a system as operating in the form of an "organizational drivetrain," in which both stable and adaptive processes are operating simultaneously, not unlike the drivetrain of a bicycle, in metaphorical terms. A bicycle's drivetrain consists of two sets of gears connected by a chain. As the rider pedals, the gears in the front (called the crankset) get activated and set in motion the gears in the back (the freewheel) through the chain. A derailleur then enables the rider to shift gears to cope with the challenges of a changing landscape (see Figure 2).

In the organizational drivetrain, the front gears (of which there are a small number) can be thought of as the simple rules, which are selected and controlled by the organization's top management (the rider).

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[6] Management theories have often used metaphors to better articulate their principles and to make the relationships among variables more explicit (Cornelissen, 2005).

FIGURE 2
The Organizational Drivetrain
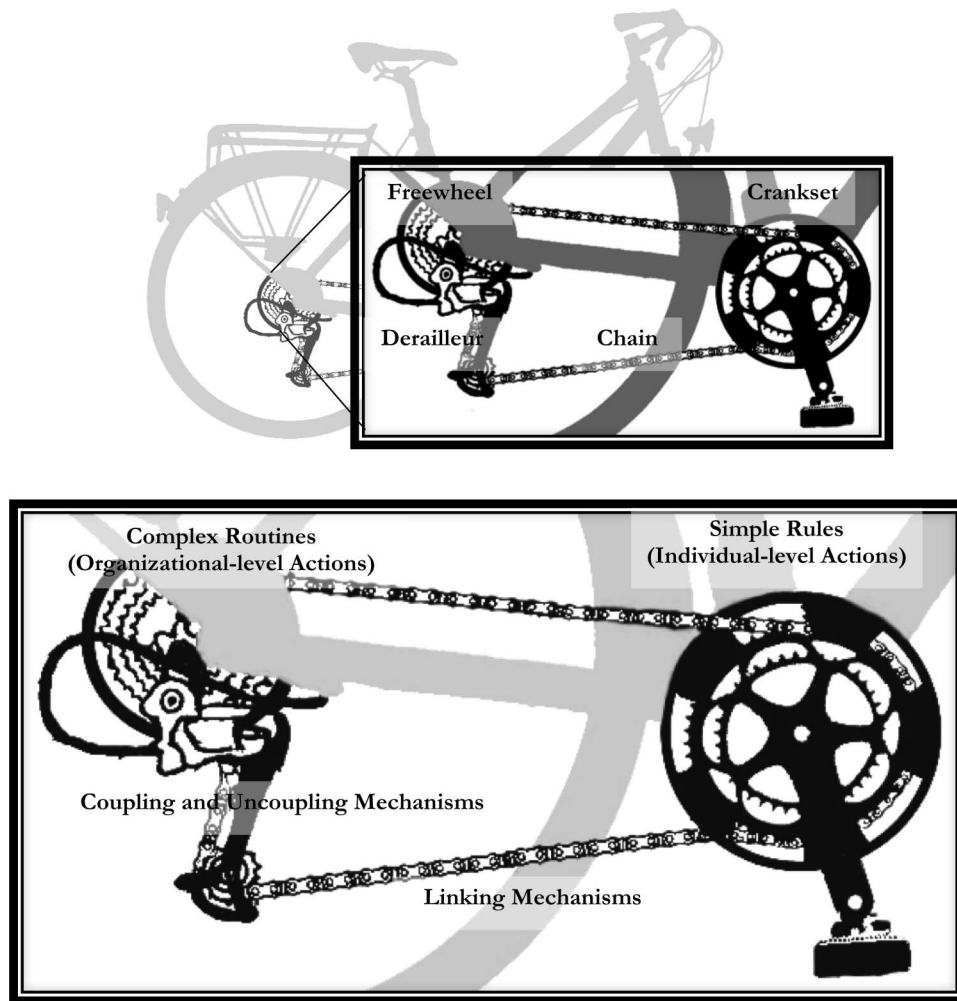
They transmit power to the freewheel, which represents the more numerous set of complex routines that the organization deploys internally to create and manage change. The structure at the top, in the form of simple rules, acts as a constraint on the action taking place at the more complex organizational level. But both sets of mechanisms are part of a dynamic system in which the chain represents the linkages that coordinate the two levels of action, and the derailleur stands in for the process of uncoupling and recoupling that allows for the kind of flexible adjustment to a challenging environmental landscape described by Martin (2011).

As an illustration of an organizational drivetrain in action, consider Cisco Systems, long considered the world leader in computer networking equipment. Cisco built its business (net sales of $46.1 billion in 2012) largely by creating and refining a system for making acquisitions—a dynamic capability for which it is widely admired.[7] Eisenhardt and Sull (2001) credited its prowess in this arena to the simple rules that Cisco has developed to guide its acquisition process. Cisco looks for young, R&D-intensive companies with products or technologies related to those of Cisco that are still in the developmental stage. In sum, at Cisco acqui-hiring is a dynamic capability (see also Chatterji and Patro in this issue to understand acqui-hiring as a dynamic capability). The targets must pass four critical tests to be considered: They must share Cisco's vision of

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[7] According to Kleinbaum and Stuart (2014), Cisco also presents network responsiveness as a dynamic capability.

where their industry is headed, they must be culturally compatible with Cisco, they must provide a quick win for shareholders, and they must provide a long-term strategic win for stakeholders (Eisenhardt & Sull, 2001).

While these simple rules undoubtedly narrow the field of potential targets and provide clear guidance for starting the acquisition process, they provide little more than a starting point. Created and controlled by Cisco's top management, they are like the front gears in our drivetrain metaphor, connected to more complex routines managed by others within the organization. Even Eisenhardt and Brown (1999, p. 76, emphasis added) acknowledged that "Cisco's pattern for adding businesses includes *routines* for selecting acquisition targets . . . for mobilizing special integration teams, for handling stock options, and for tracking employee retention rates." Clearly, these comprise a complex set of routines performed at the organizational level rather than simple routines in the form of simple rules, as described by EM.

Consider, for example, the process of selecting targets, perhaps the simplest aspect of performing an acquisition. While the simple rules enumerated above (the crankset of our metaphor) can help narrow the field of potential targets, even they cannot be implemented without engaging a far more complex set of investigative and analytic routines (the metaphorical freewheel). How would Cisco's top managers know, for instance, which targets could provide a long-term strategic win for stakeholders without a great deal of sophisticated strategic and financial analysis? At Cisco, this analysis has traditionally been performed by a 40-person business development group that has developed a highly routinized set of processes for conducting analysis of this sort (Ewers, 2006). This analysis takes place both at the target-identification stage and at the due-diligence stage, once a nonbinding agreement between Cisco and a target has been struck. Due diligence involves several routines for examining the target's financial statements, inventories, legal status, and relationships with vendors and customers, as well as an analysis of the potential synergies that might be realized and their implications for the hoped-for "long-term strategic win" specified among Cisco's simple rules.

These two types of mechanisms (simple rules and the complex routines with which they are linked) are part of a dynamic system for making acquisitions that operates like our conception of the organizational drivetrain. It is an adaptive system that may involve coupling and uncoupling parts of the system, balancing and unbalancing, as learning takes place and/or as conditions change (Eisenhardt, Furr, & Bingham, 2010; Martin, 2011). To adjust for improved communication systems and pursue new types of opportunities, for example, Cisco discarded its former simple rule that a target must have geographic proximity to Cisco. To incorporate its learning into its system, it adopted a new simple rule to avoid all earn-outs, linking this rule to more complex routines for setting up incentive systems for newly acquired firms.

Cisco's competitive advantage in computer networking technology has been created and sustained by its superior capabilities in making acquisitions. But its success cannot be attributed to simple rules; even those that have proven long-lived, rather than ephemeral, are obviously transparent and imitable. Nor can it be attributed to complex routines, most of which represent well-understood processes, such as those involved in due diligence. Rather it is due, arguably, to the socially complex and hard-to-imitate *dynamic bundle* of resources and capabilities (Peteraf et al., 2013) whose workings are represented by our concept of the organizational drivetrain. We posit that this interlinked, adaptive system more fully describes the nature of Cisco's dynamic capability in mergers and acquisitions and undergirds its long-standing competitive advantage.

While our description of the organizational drivetrain metaphor and the Cisco example provide only a brief outline of the system that we envision, note that even in this form it suggests a resolution of many of the problems uncovered above. First, it demonstrates that the differing conceptions of dynamic capabilities presented by TPS and EM over whether dynamic capabilities are complex routines or simple rules need not be thought of as contradictory and opposing visions. Rather, they may be viewed as complementary contributions to our understanding of the various parts that make up a complex, dynamic system.

Second, it provides a way to unite many of the divided understandings of how dynamic capabilities are defined. In the dynamic system that we describe, dynamic capabilities involve both individual and organizational levels of analysis because individuals set the context in the form of simple rules, which then enable and constrain a set of complex routines at the organizational level. This same dynamic system is involved in both changing existing capabilities and developing new

ones, implying that it acts on the existing resource base as well as the new opportunities arising in the ever-changing landscape. The view of the organizational drivetrain is also consistent with works that tend to conceive dynamic capabilities as higher-order capabilities because it helps with envisioning different types of linkages between higher-order capabilities and organizational routines (see Kahl, 2014 and Schilke, 2014).

Last, our conception of an organizational drivetrain also suggests a resolution to the debate over whether dynamic capabilities in high-velocity environments can go beyond managing change to also provide a sustainable competitive advantage. In this respect, we note that even if specific simple rules are unstable and ephemeral, the system as a whole is not. Moreover, the interconnectedness, reliance on tacit knowledge, and complexity of a system involving a variety of moving parts suggest that the real source of sustainable competitive advantage for an enterprise is the difficulty of imitating and substituting for the entire dynamic bundle (Peteraf et al., 2013) that the system represents.

CONCLUSIONS

While a variety of ideas for moving the field forward have been offered elsewhere (e.g., Barreto, 2010; Schilke, 2014; Zahra et al., 2006), here we address more specifically the question of how to overcome the theoretical divide our analysis has exposed. To this end, we have sketched out a simple metaphor we believe can help show intuitively that the opposing views can be effectively combined. The metaphor of the drivetrain illustrates the existence of two types of dynamic capabilities, as well as of a system dynamically connecting them, thus allowing them to operate simultaneously and in a coordinated, complementary manner. However, the example offered here is just one of the possible strategies to achieve a greater unity of understanding for the field of dynamic capabilities to move forward. In this respect, we see at least two other approaches that could help achieve the same goal.

A first possible strategy is to foster the conversation among dynamic capabilities researchers. Examples of how these conversations can take place are offered by the book by Helfat and colleagues (2007), which brought together a group of top scholars in the research domain. Along similar lines, organizational behavior scholars are also trying to create a conversation to better highlight the

organizational mechanisms that link ambidexterity to dynamic capability literature (Kleinbaum & Stuart, 2014; O'Reilly & Tushman, 2008). A similar effort is the one animating the research carried out by Wilden and colleagues (2013), which combines a machine-based text analysis of 107 papers, a survey with authors in the field, and Delphi-based roundtables with strategy experts and leading authors to discuss the findings from data, in an attempt to create a mutually agreed upon definition of the core construct.

A healthy debate around these issues can sharpen thought, enliven the conversation, and spur greater research productivity. A greater awareness of the logical alternatives for framing dynamic capabilities might also oblige scholars to be more explicit about their assumptions, usage of terms, and underlying logic. While this is always desired, it is all the more important for research on dynamic capabilities, given that it builds on two distinct knowledge pools. This would likely discourage the inappropriate mixing of theoretical approaches and might facilitate more robust empirical approaches and conceptual advancement. But at the same time, it might compel scholars to choose between the logics in framing their own work or at least knowingly attempt to test one against the other. One outcome of this could be a branching of the field (Di Stefano et al., 2010). Another outcome could be the unification of understandings and creation of more holistic models. An example of this sort is the one provided by Peteraf and colleagues (2013), who used a contingency perspective to reconcile two seemingly mutually exclusive views of dynamic capabilities.

A second possible strategy to overcome the potential problems uncovered by our research is to exploit opportunities for productive work that spans the structural divide exposed by our research. An excellent example of one such attempt is provided by Schreyögg and Kliesch-Eberl (2007), who developed a dual-process model designed to "manage the paradoxical side of organizational capabilities" and overcome some of the most profound differences that characterize approaches on both sides of the divide. In other cases, such attempts at bridging perspectives across the structural divide could involve topics of mutual interest where there are more opportunities for cooperation and fewer opportunities for conflict. The identification of such topics would enable the field to reap the potential benefits of its multidisciplinary knowledge network and might even enable cooper-

ative interdisciplinary efforts. One such topic might be the microfoundations of dynamic capabilities, which has been gaining ground since it was introduced (Devinney, 2013; Teece, 2007).

While there has been considerable conflict over the outcomes associated with dynamic capabilities, this new focus brings attention back to internal processes and, more specifically, to the role of individuals in creating, implementing, and renewing dynamic capabilities. In this arena, there may be more opportunities for scholars to find greater common ground. For example, both evolutionary economics and organizational theory have strong ties to behavioral theory (Cyert & March, 1963; Simon, 1945, 1957), which could provide some of the theoretical undergirding for the microfoundations of dynamic capabilities. Recent work on heuristics and managerial cognition provides an example of topical areas in which the conflict between researchers with different disciplinary backgrounds seems minimal (e.g., Eisenhardt et al., 2010; Taylor & Helfat, 2009). Similarly, the study of constructs such as that of "dynamic managerial capabilities" (Adner & Helfat, 2003) seems to minimize the differences across the two camps of the divide and bring researchers with different orientations together.

In conclusion, we hope our suggestions will help future research in this domain to overcome the differences in the two knowledge pools and the resulting bifurcation in the understanding of the five structural components of the definition of dynamic capabilities. We hope this will allow researchers to move the field forward even more productively.

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APPENDIX A

Analysis of Theoretical Roots

To examine the foundations of research on DC, we conducted a content analysis of the references cited by the most influential papers in this research domain. Our starting point was the identification of the leading articles on DC. Our data source was the management section of the SSCI (Social Science Citation Index) of the ISI Web of Science database, which provides bibliographic information on more than 1,700 leading scholarly social science journals in more than 50 disciplines. Our search was limited to the management category because the concept of DC originated there. Our list of leading articles, displayed in Table A1 below, is constituted by papers published before 2013 whose citation numbers exceed 100 citations, consistent with previous studies using similar subjective criteria (e.g., McMillan, 2008; Ponzi, 2002).

Next, we extracted the references cited by all the leading DC articles previously identified. Beginning with 3,528 references, we narrowed these down to the top-cited references: those that were cited by at least six papers in our core panel. This cutoff implies that at least one of every 10 papers in the panel cited a given reference. This choice was driven by an interest in including only the very top-cited references. This criterion led to a set of 84 articles and books highly cited by the core papers of the DC literature. We further narrowed this list by eliminating seven papers focused directly on DC. In particular, six of these were part of our core panel, while the seventh (Teece & Pisano, 1994) is closely related to TPS. The final set is hence made up of 77 publications. The full list of papers is available from the authors upon request.

What is immediately apparent from a perusal of this list is that it contains a set of publications that are widely considered foundational to a set of theoretical perspectives familiar to researchers in management. There are seven such perspectives represented: evolutionary economics (Nelson & Winter, 1982), the resource-based view (Wernerfelt, 1984), the knowledge-based view (Kogut & Zander, 1992), transaction cost economics (Williamson, 1975), behavioral theory (Cyert & March, 1963), network theory (Granovetter, 1985), and the positioning view (Porter, 1980).

To assess the relative influence of these different perspectives for research on DC, we classified the references in terms of the extent to which they were associated with these seven founding references. To accomplish this, the three authors independently coded the content of the titles, keywords, and abstracts of each remaining reference, as well as the reference lists of these papers, and classified the publications accordingly. The three resulting classification lists were then compared iteratively until an agreement was reached for each remaining reference. We used Cohen's kappa (Cohen, 1960) to test for agreement among coders because the data are nominal in form (e.g., diversification, innovation, capability life cycles), with no natural ordering. The computed value of 0.607 indicates substantial agreement. The results are displayed in Table 1 in the text.

APPENDIX B

Analysis of Definitions

To examine how the most influential papers have chosen to define the construct, we employ a data analysis

TABLE A1
The Most Influential DC Research Papers as of 2012

Paper	Citations	Paper	Citations
Teece and colleagues (1997)	3,895	Sapienza and colleagues (2006)	157
Eisenhardt and Martin (2000)	1,772	Lavie (2006)	157
Zahra and George (2002)	1,087	Zollo and Singh (2004)	157
Zollo and Winter (2002)	921	Becker (2004)	156
Dyer and Nobeoka (2000)	698	Teece (2000)	155
Winter (2003)	476	Becker and Huselid (2006)	149
Amit and Zott (2001)	474	Carpenter, Sanders, and Gregersen (2001)	146
Benner and Tushman (2003)	468	Jacobides and Winter (2005)	145
Helfat and Peteraf (2003)	455	Agarwal, Echambadi, Franco, and Sarkar (2004)	138
Teece (2007)	454	Galunic and Eisenhardt (2001)	137
Melville, Kraemer, and Gurbaxani (2004)	388	Raisch and Birkinshaw (2008)	136
Sambamurthy, Bharadwaj, and Grover (2003)	346	Malhotra, Gosain, and El Sawy (2005)	136
Makadok (2001)	346	Vohora, Wright, and Lockett (2004)	134
Wright, Dunford, and Snell (2001)	322	Adner and Helfat (2003)	133
Wade and Hulland (2004)	292	Todorova and Durisin (2007)	132
Subramaniam and Youndt (2005)	286	Zhu (2004)	129
Danneels (2002)	266	Madhok (2002)	127
Knight and Cavusgil (2004)	260	Jarzabkowski (2004)	117
Helfat (1997)	251	Kale and Singh (2007)	115
Aragon-Correa and Sharma (2003)	236	Lubatkin, Simsek, Ling, and Veiga (2006)	115
Hitt and colleagues (2001)	235	Santos and Eisenhardt (2005)	115
Zahra, Sapienza, and Davidsson (2006)	190	Schreyögg and Kliesch-Eberl (2007)	113
Jansen, Van Den Bosch, and Volberda (2005)	177	Colbert (2004)	111
Zhu and Kraemer (2002)	177	Dutton, Ashford, O'Neill, Hayes, and Wierba (1997)	111
Newbert (2007)	175	Lockett and Wright (2005)	108
Rai, Patnayakuni, and Seth (2006)	174	Kang, Morris, and Snell (2007)	107
Ireland, Hitt, and Sirmon (2003)	174	Bhatt and Grover (2005)	104
Zott (2003)	168	Ahuja and Katila (2004)	103
Rindova and Kotha (2001)	165	King and Tucci (2002)	103
Barua, Konana, Whinston, and Fang (2004)	160		

and interpretation procedure inspired by the "ladder of analytical abstraction" described by Miles and Huberman (1994) for the interpretation of data in qualitative research. According to this approach, the researcher extracts text to work on, tries out coding categories to find a set that fits, identifies themes and trends in the data, and finally constructs an explanatory framework. As Miles and Huberman (1994, p. 91) explained, "the progression is a sort of 'ladder of abstraction' (Carney, 1990). You begin with a text, trying out coding categories on it, then moving to identify themes and trends, and then to testing hunches and findings, aiming first to delineate the 'deep structure' and then to integrate the data into an explanatory framework. In this sense we can speak of 'data transformation,' as information is condensed, clustered, sorted, and linked over time (Gherardi & Turner, 1987)."

In particular, we start by extracting the definitions of dynamic capabilities from the influential papers of our panel. Out of 59 papers, 17 provide an original definition of DC. Of the remaining papers, 10 quote explicitly a

definition provided by others (namely, Teece & Pisano, 1994, p. 541; TPS, p. 516; or EM, p. 1107), while the rest do not provide an explicit definition, although in using the construct, 22 of them cite others who have defined it.

Once we extracted the definitions, we coded them using thematic coding. That is to say, we broke down the text into manageable and meaningful content categories, grouping together data referring to similar themes under the same umbrella terms, allowing us to make comparisons among the different cases (Miles & Huberman, 1994). This process led us to the development of a summary model, shown in Figure 1 in the text, that shows five main issues over which there is debate and, in bifurcated form, alternative approaches to these issues. To minimize subjectivity in interpretations, we chose to classify definitions into one or the other approach to the five main issues based on the specific words used by the authors, without any attempt at interpretation. In constructing this model there was high agreement among coders, as indicated by a Cohen's kappa value of 0.957.