

## UNDERSTANDING DYNAMIC CAPABILITIES

SIDNEY G. WINTER\*

The Wharton School, University of Pennsylvania, Philadelphia, Pennsylvania, U.S.A.

*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. Logically, one can then proceed to elaborate a hierarchy of higher-order capabilities. However, it is argued here that the strategic substance of capabilities involves patterning of activity, and that costly investments are typically required to create and sustain such patterning—for example, in product development. Firms can accomplish change without reliance on dynamic capability, by means here termed 'ad hoc problem solving.' Whether higher-order capabilities are created or not depends on the costs and benefits of the investments relative to ad hoc problem solving, and so does the 'level of the game' at which strategic competition effectively occurs. Copyright © 2003 John Wiley & Sons, Ltd.*

Many strategy scholars remain skeptical about the value of the concept of 'dynamic capabilities.' While some see dynamic capabilities as the key to competitive advantage (Teece, Pisano, and Shuen, 1997), others seem to doubt that there actually are such things. Still others believe that they exist, but suspect that they are 'born, not made'—i.e., they doubt that deliberate efforts to strengthen such capabilities are a genuine option for managers. And some believe that while they are a genuine option, they are not necessarily something that confers competitive advantage. This note seeks to reduce the mystery surrounding both the terminology and the phenomenon. It identifies some key issues and argues that clarity is served by keeping these issues distinct. As regards terminology, it offers a proposal that seems constructive—but

of course will really prove to be so only if it is widely adopted.

## ROUTINES AND CAPABILITIES

Following my own proposal (Winter, 2000), I begin by founding the concept of organizational capability on the broader concept of organizational routine: *An organizational capability is a high-level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type.* For present purposes, the points deserving emphasis here are the connotations of 'routine'—behavior that is learned, highly patterned, repetitious, or quasi-repetitious, founded in part in tacit knowledge—and the specificity of objectives. Brilliant improvisation is not a routine, and there is no such thing as a general-purpose routine.

Key words: dynamic capabilities; change; cost–benefit; problem solving

\*Correspondence to: Sidney G. Winter, The Wharton School, University of Pennsylvania, 2000 Steinberg Hall-Dietrich Hall, 3620 Locust Walk, Philadelphia, PA 19104-6370, USA.

### 'DYNAMIC' CONNOTES CHANGE

There is a broad consensus in the literature that 'dynamic capabilities' contrast with ordinary (or 'operational') capabilities by being concerned with change. Collis (1994) is particularly explicit and formal in making the point that dynamic capabilities govern the rate of change of ordinary capabilities. Following the example of the differential calculus, he points to the existence of second-order, third-order, etc. dynamic capabilities and explicitly makes the extension 'ad infinitum.' This terminological approach is adopted here, but with an important caveat as to whether higher-order capabilities 'exist' in an interesting sense. From a logical point of view, the 'existence' of higher-order rates of change is in question only in the mathematical sense that some derivatives might not exist; and from a computational point of view, a time sequence of  $N + 1$  values of a variable suffices to compute one value of the  $N$ th order rate of change. But if dynamic capabilities are similar to capabilities in that they involve *patterned* activity oriented to relatively specific objectives, then there is no guarantee that the organizational processes governing high-order change are highly patterned, and substantial reason to think otherwise. In this important substantive sense, high-order dynamic capabilities do not necessarily exist. This point is pursued below.

### THE 'ZERO LEVEL' IN THE CAPABILITY HIERARCHY

Constants and technical issues aside, everything is the derivative of its integral and the integral of its derivative. To make effective use of the concept of a hierarchy of rates of change, we need a convention to identify the 'zero level,' the analogue of position for variables moving in space. Because capabilities are complex, structured and multidimensional, this question may not have an answer that seems both clear and compelling in all cases. There is, however, a heuristic guide available that conforms to common sense and existing practice, at least for the capabilities of firms competing in markets. Consider a hypothetical firm 'in equilibrium,' an organization that keeps earning its living by producing and selling the same product, on the same scale and to the same customer population over time. The capabilities exercised in

that stationary process are the zero-level capabilities, the 'how we earn a living now' capabilities. Without them, the firm could not collect the revenue from its customers that allows it to buy more inputs and do the whole thing over again. By contrast, capabilities that would change the product, the production process, the scale, or the customers (markets) served are not at the zero level. New product development, as practiced in many firms, is a prototypical example of a first-order 'dynamic capability.' The capabilities that support the creation of new outlets by McDonalds or Starbucks are another prototypical example, focused on the domain of scale and (geographic) markets rather than product attributes. These examples are prototypical because they unquestionably involve first-order change, given the definition of the zero level, and it is equally beyond question that they are highly patterned and 'routine' in many respects. Given the terminological framework under construction here, these examples are a conclusive answer to anyone who doubts the 'existence' of dynamic capabilities. (Of course, their doubts may relate to a different understanding of 'dynamic capability'.)

It is worth noting that the 'zero level' is only locally defined. For a firm that does its own R&D, the producing and selling the product is zero-order activity. For an independent R&D lab, developing new products is zero order activity.

### THERE ARE MANY WAYS TO CHANGE

It is quite possible to change without having a dynamic capability. To begin with, change often occurs by *force majeure* from the environment, predictably or not, for better or worse. Whether it is because such an external challenge arrives or because an autonomous decision to change is made at a high level, organizations often have to cope with problems they are not well prepared for. They may be pushed into 'firefighting' mode, a high-paced, contingent, opportunistic and perhaps creative search for satisfactory alternative behaviors. It is useful to have a name for the category of such change behaviors that do *not* depend on dynamic capabilities—behaviors that are largely non-repetitive and at least 'intendedly rational' and not merely reactive or passive. I propose 'ad hoc problem solving'. Ad hoc problem solving is not routine; in particular, not highly patterned and

not repetitious. As suggested above, it typically appears as a response to novel challenges from the environment or other relatively unpredictable events. Thus, ad hoc problem solving and the exercise of dynamic capabilities are two different ways to change—or two categories comprising numerous different ways to change.

Of course, close study of a series of ‘fires’ may well reveal that there is pattern even in ‘firefighting.’ Some of the pattern may be learned and contribute positively to effectiveness, and in that sense be akin to a skill or routine. In organizational improvisation, as in jazz, creative achievement typically rises from a foundation of patterned and practiced performance, a fund of micro-patterns that are recombined and sequenced in creative ways (Miner, Bassoff, and Moorman, 2001). Responses to highly dynamic environments may also be patterned at a higher level, guided by adherence to relatively simple rules and structural principles (Eisenhardt and Martin, 2000). At the other end of the spectrum, even the most incremental effort at product modification can run into unexpected snags that are beyond the scope of the dynamic capability, and require a complementary dose of ad hoc problem solving. To acknowledge these points is not, however, to concede that there is no difference between dynamic capabilities and ad hoc problem solving; to say that would be to indulge in the ‘shades of gray’ fallacy. For the concepts and the contrast to be useful aids to understanding, it is not necessary that the pure forms exist in the world, or even that we have high ‘inter-rater reliability’ in sorting real cases into only two conceptual boxes.

## CONTRASTING COST STRUCTURES

Dynamic capabilities typically involve long-term commitments to specialized resources. The more pervasive and detailed the patterning of the activity involved, the higher the costs of the commitments tend to be. The ability to sustain a particular patterned approach to new product development, for example, depends to some extent on continuity in the engineering personnel involved; there may be substantial continuity in facilities and equipment as well. Similarly, an established replicator organization has a central staff that is the locus of its ability to bring together real estate, design skills,

construction, equipment and furnishings, advertising campaigns, new employees, etc., and create a new outlet. The size of that central capability determines the pace at which new outlets can be opened. For these sorts of commitments to be economically sound, the capability must be exercised: to have a dynamic capability and find no occasion for change is merely to carry a cost burden. On the other hand, an aggressive search for such occasions may also be a mistake. Attempting too much change—perhaps in a deliberate effort to exercise the dynamic capability—can impose additional costs when the frequent disruption of the underlying capability outweighs the competitive value of the novelty achieved. There is an ecological demand for balance between the costs of the capability and the use that is actually made of it. (Of course, deciding whether some dynamic capability is needed is only a small part of the total problem of making profitable capability investments; the larger part is deciding *which* among the many promising but uncertain investments should be undertaken—recognizing there are likely to be trade-offs or other interactions among them.)

By contrast, the costs of ad hoc problem solving largely disappear if there is no problem to solve. Many of those costs take the form of opportunity costs of personnel who have alternative productive roles in the (zero-level) capability. True, an organization that relied on dynamic capabilities could conceivably have a similar cost pattern. This would mean that people could step out of their zero-level roles and into their dynamic capability roles—their learned, patterned change roles—and then step back again when change was completed. The plausibility of this image is undercut by the ‘rustiness’ problem: successful maintenance of a skill or routine typically requires frequent exercise. Regardless of whether that objection is decisive in itself, it seems that, in practice, prominent examples of dynamic capabilities generally involve a lot of specialized personnel who are committed full time to their change roles, and other types of investments as well. The contrast with the lighter cost burdens of ad hoc problem solving is clear.

## NO ‘RULE FOR RICHES’ HERE

It should now be apparent that it is not necessarily advantageous for a firm to invest in (first-order) dynamic capabilities. Rivals who rely on ad

hoc problem solving to accomplish change when needed are carrying a lower cost burden. If opportunities for competitively significant change are sparse enough or expensive enough to realize, then the added cost of dynamic capabilities will not be matched by corresponding benefits on the average—even if an occasional notable success might suggest the contrary. Also, if the change environment does sustain dynamic capabilities relative to ordinary capabilities (plus ad hoc problem solving), competition among many firms pursuing a similar dynamic capabilities strategy may compete away the rents, because (for example) product markets are saturated with rival innovations or because the salaries of scientists and engineers are bid up. A related and long-familiar example of a disadvantageous dynamic capability is innovative R&D that does not pay off in the presence of strong rivals who invest only in imitative R&D (see, for example, Nelson and Winter, 1982). The (descriptive) rule for riches is to occupy a favored and relatively uncontested place in the ecology of behaviors—for example, by having a strong R&D unit when others in the industry lack both innovative and imitative capabilities. While an individual actor can exert some influence on that ecology, it may well have difficulty in identifying the favored and uncontested niches, or in forestalling unfavorable change after such a niche has been exploited for a while. Hence, the rule is of little prescriptive value.

## HIGHER-ORDER CAPABILITIES

If exogenous change is ‘competence destroying’ at the level of first-order dynamic capabilities, those who invest in routinizing the response to familiar types of change may find themselves disadvantaged relative to more flexible players who have invested in higher-order capabilities. Deliberate investments in organizational learning may, for example, facilitate the creation and modification of dynamic capabilities for the management of acquisitions or alliances (Zollo and Winter, 2002). Collis (1994) argues that the existence of higher-order capabilities provides a rebuttal to any claim that there is generally advantage to be had from strength at any particular level of dynamic capability: there is always a higher level, and in his view superiority at the higher level always ‘trumps’

superiority at a lower level. Here, the same skeptical conclusion about advantage rests on the alternative argument that ad hoc problem solving is always a substitute for dynamic capability and may be economically superior. Collis also makes, however, the related interesting suggestion that there is a historical tendency for the locus of competitive action to rise in the capability hierarchy. Strategic innovation often involves ‘changing the game’ in a way that ‘takes it to a higher level’—a phrase that often connotes a focus on strengthening higher-order change capabilities. This notion appeals at the descriptive level and there is clearly some logic to it. Knowledge advances cumulatively, imitation spreads solutions around, and problems that are visible, urgent, and recur at high frequency tend to get solved before problems with the opposite attributes. But these considerations do not suffice to make the progression to a higher ‘order’ of competition a logical necessity, since the levels differ in the cost–benefit balance of capability investments, and exogenous change could at any time tip an existing balance in favor of lower-order capabilities supplemented by ad hoc problem solving. The argument for such upward progression is therefore missing an appropriate assumption that restricts the character of exogenous change in such a way as to assure that the investment in higher-order capabilities tends to pay off, while the cost-cutting move in the opposite direction does not. Just how such an assumption might be framed is unclear, but the logic is incomplete without it.

## REPRISE

Probably some of the mystery and confusion surrounding the concept of dynamic capability arises from linking the concept too tightly to notions of generalized effectiveness at dealing with change and generic formulas for sustainable competitive advantage. The argument here is that clarity is served by breaking this linkage. There is no way to hedge against every contingency. There is no general rule for riches. That investing in dynamic capabilities (of whatever order) can be a partial hedge against the obsolescence of existing capability, and can sometimes yield relatively sustainable advantage, is obvious from the nature of ‘dynamic capability,’ as defined here. That this cannot be uniformly or inevitably advantageous is equally obvious, from the meaning of ‘investing:’

the thought experiment of raising the costs while holding the gross benefits constant makes the net benefit disappear, and certainly the world is capable of turning such a thought experiment into a real experiment. The concept of dynamic capability is a helpful addition to the tool kit of strategic analysis, but strategic analysis itself remains a matter of understanding how the idiosyncratic attributes of the individual firm affect its prospects in a particular competitive context.

### ACKNOWLEDGMENTS

I am indebted to David Collis, Tammy Madsen, Maurizio Zollo, and participants in the Wharton Technology Mini-Conference for comments on earlier drafts; remaining flaws are my own responsibility. Research support from the Reginald H. Jones Center of the Wharton School is gratefully acknowledged.

### REFERENCES

- Collis DJ. 1994. Research note: how valuable are organizational capabilities? *Strategic Management Journal*, Winter Special Issue **15**: 143–152.
- Eisenhardt KM, Martin J. 2000. Dynamic capabilities: what are they? *Strategic Management Journal*, Special Issue **21**(10–11): 1105–1121.
- Miner AS, Bassoff P, Moorman C. 2001. Organizational improvisation and learning: a field study. *Administrative Science Quarterly* **46**: 304–337.
- Nelson RR, Winter SG. 1982. The Schumpeterian trade-off revisited. *American Economic Review* **72**: 114–132.
- Teece D, Pisano G, Shuen A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* **18**(7): 509–533.
- Winter SG. 2000. The satisficing principle in capability learning. *Strategic Management Journal*, Special Issue **21**(10–11): 981–996.
- Zollo M, Winter SG. 2002. Deliberate learning and the evolution of dynamic capabilities. *Organization Science* **13**: 339–351.