

Agility, Knowledge Creation, and Dynamic Capabilities: Implications for the Soft Car Revolution

David J. Teece

Institute for Business Innovation, Haas School of Business, University of California, Berkeley

Abstract

Agility can be derived from the application of dynamic capabilities, from knowledge creation processes, or from the exercise of ambidexterity. This article clarifies the relationships among these three theoretical approaches then demonstrates their application with relation to the impact of the growing role of software on auto industry incumbents. The limitations of agility for the achievement of long-term competitive advantage are also analyzed.

Keywords: *agility, ambidexterity, dynamic capabilities, entrepreneurial management, knowledge creation*

I. INTRODUCTION

There are at least three well-known paradigms that endeavor to deal with the organizational and strategic dimensions of agility: ambidexterity, innovation/knowledge creation, and dynamic capabilities. Dynamic capabilities, associated with Teece, is a meta framework that incorporates the others. Ambidexterity is very much the focus of Tushman and O'Reilly; knowledge creation is the focus of Nonaka. This paper will expand and explore these relationships and give a sample application to software-dominated vehicles, or "soft cars."

II. ORGANIZATIONAL AGILITY

The term organizational agility is almost a synonym for "flexibility." In the 1930s, Nobel Laureate economist George Stigler (1939) defined flexibility in terms of the firm's ability to manage demand uncertainties. Organization theorists have used the term agility with a similar but not identical meaning.¹⁾ Doz and Kosonen (2008, p.65) defined strategic agility as the capacity to continuously adjust and

adapt strategic direction in a core business to create value for a company. Weber and Tarba (2014, p.5) defined it (somewhat tautologically) as "the ability to remain flexible in the face of new developments." Worley, William, and Lawler (2014, p.26) defined agility "as the capability to make timely, effective, sustained organizational change...[it is] a repeatable, organizational resource." In a similar way, one can refer to agility as the capacity of an organization to efficiently and effectively direct or redeploy its resources to value creating and value capturing (and protecting) activities as internal and external circumstances warrant. In addition to managing Stigler's demand shocks, agile organizations must manage supply-side uncertainty and adjust strategy as necessary and desirable.

Agility is also costly to develop and maintain, but not being agile can be even more costly. Costs will vary according to the structures and systems in place. Moreover, agility is not a one-size-fits-all solution. In one case, it might make sense to maintain redundancy or slack; in another, the best approach may be to build or buy general-purpose equipment or diversify the firm's customer base.

Firms can sometimes buffer themselves against risk by using financial instruments, thereby potentially obviating the need to enable agility through the firm's asset base. Importantly, the capabilities required to respond to negative events are often different from those needed to take advantage of positive developments.

Agility requirements are also context-sensitive. In stable markets, for example, it may be profitable to optimize basic operations and achieve efficiency at the expense of agility because the cost of protecting against possible future disruption may be too large to justify sacrificing current profits. However, when there is deep uncertainty, agility is likely to be a valuable organizational attribute—at least in the hands of good managers.

In essence, agility is about making organizations nimble—a tall order for a large organization—but not one that is impossible. Gerstner's stint at IBM was a case in point; and he encapsulated his experiences increasing IBM's agility in a book appropriately titled "Who Says Elephants Can't Dance?" (2002). To increase agility requires organizations to adopt cultures that favor change and aren't too bureaucratic. Laying a firm foundation of dynamic knowledge creation is also critical to an organization's ability to adapt to changes in the business environment (Nonaka and Toyama, 2002). But these changes are difficult. It's easier to pursue stability and business-as-usual because it takes less physical, emotional, and mental work.

Understanding agility requires an overall framework. A little reflection, of course, will quickly lead one to realize that agility, without more, is not a useful organizational asset, just as an army with high mobility is not a force to be reckoned with unless it has leadership, a strategy, and goals that the troops accept. While agility is the ability to move quickly—to adapt—it leaves open the question: adapt to do what? If agility is the right way to do "things," what are the right things a business needs to do? This is the strategy piece of the framework. It is elemental, but often omitted.

When a business adapts, there is also the need, in most cases, to continue to serve existing customer needs while new needs and opportunities are being explored. It takes the right organizational structures to simultaneously innovate while tending to

the ongoing needs of the existing business.

O'Reilly and Tushman (2004) employed the term "ambidexterity" to show why and how managers should be looking forward and backwards at the same time. They use Kodak and Boeing as companies that have not done this well. O'Reilly and Tushman found that firms that employed structural separation did it better, so long as they maintained close integration across the senior management team.

Their more general finding is that ambidextrous companies needed to have a top management team that is respectful of, and sensitive to, the different needs of different businesses. The team must be ambidextrous, even if every member of the team isn't. And to make that all work, an ambidextrous vision for the company has to be devised and shared. Organizational separation and senior team integration are amongst the key messages from O'Reilly and Tushman.

III. DYNAMIC CAPABILITIES²⁾

Dynamic Capabilities relate to "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece, Pisano, and Shuen, 1997, p.516). Today's business environments are even more rapidly changing, and the challenges they present are exacerbated by increasing uncertainty (Teece and Leih, 2016).

The Dynamic Capabilities framework provides a system-level approach to the management of the firm, including learning, innovation, and orchestration. In recent formulations, it has been related more explicitly to the agility literature (e.g., Teece, Peteraf, and Leih, 2016).

An important distinction is drawn between Dynamic Capabilities and "Ordinary Capabilities." The latter refers to efficient marketing, manufacturing, operations and so on that, even at best-practice levels, are usually insufficient to differentiate a firm from market leaders. In short, they are part of the "internal competences" that are governed by dynamic capabilities.

The strength of a firm's dynamic capabilities determines its ability to plan for and bring about the future. They are underpinned by organizational

and managerial competences for both “reading” and shaping the environment. These include developing business models that address new threats and opportunities. Dynamic capabilities thus define the firm’s capacity to innovate, adapt to change, and create change that is favorable to customers and unfavorable to competitors.

Dynamic capabilities can be thought of as falling into three primary activity clusters:

- identification, development, co-development, and assessment of technological opportunities (and threats) in relationship to customer needs (the “sensing” of unknown futures);
- mobilization and orchestration of resources to address needs and opportunities and capture value from doing so (“seizing”); and
- continued renewal (“transforming” or “shifting”).

Effective sensing, seizing, and transforming are essential if the firm is to sustain itself in the longer term as customers, competitors, and technologies change. The operation of each activity cluster is continuous or semi-continuous.

Dynamic capabilities can be analytically separated from the formulation of strategy but must be congruent with the strategic direction that emerges from the strategy process. A strategy that is consistent, coherent, and forward-looking is a vital complement to dynamic capabilities for achieving competitive advantage. They can enable—or hinder—each other.

Routines and processes are vital components of dynamic capabilities, allowing for a measure of replicability. However, strong capabilities are never based entirely on routines or rules. One reason is that routines tend to be relatively slow to change. Good managers think creatively, act entrepreneurially, and, if necessary, override routines.

The role of managerial cognition and human capital in the dynamic capabilities framework was first studied by Adner and Helfat (2003). At certain critical junctures, the ability of a CEO and the top management team to sense a key development or trend, and then delineate a response and lead the firm in its path forward is critical to the

firm’s dynamic capabilities. But the groundwork for decisive action at a particular time must be laid well in advance by fostering the organization’s values, culture, and collective ability to quickly implement a new business model or other required changes. This work, which can take years, is a major reason that dynamic capabilities are unique to each firm and hard for rivals to copy.

Managerial decisions determine how the enterprise creates, shapes, and deploys capabilities (Dosi, Faillo, and Marengo, 2008). When this is done well, the effort results in innovative combinations of resources supported by profitable value-capture mechanisms. As Silicon Valley entrepreneur Peter Thiel (2014) has written, forming radical new combinations—a form of asset orchestration—is itself an important capability. With reference to Elon Musk’s Tesla and SpaceX ventures, he said that “what was really impressive was integrating all these pieces together” and that this is “actually done surprisingly little today and so I think this is a sort of business form that when people can pull it off, is very valuable.”

As noted above, it is useful to distinguish between dynamic and “ordinary” capabilities. Ordinary capabilities enable the production and sale of a defined (and hence static) set of products and services (Winter, 2003). Organizations need access to such capabilities, but they often do not need to practice them or own them, as they can often be outsourced. Ordinary capabilities stem from the proficient utilization of the firm’s human resources, plant and (tangible and intangible) assets, processes, and administrative systems. The strength of a firm’s ordinary capabilities is a measure of its technical fitness.

Ordinary capabilities won’t necessarily allow the organization to grow, except perhaps geographically. They are by definition unable to help the organization respond creatively to positive or negative volatility and/or surprises. The most proficient manufacturers of vacuum tubes were defeated by the invention and mass production of transistors despite having built strong (ordinary) capabilities for efficiently manufacturing electrical devices in glass bulbs. Likewise, few of the best builders of sailing ships segued to the design and production of steamships, and steam locomotive manufactures

like the Baldwin Locomotive Works of Philadelphia completely missed the diesel-electric locomotive revolution.

Knowledge undergirding ordinary capabilities is largely explicit, taking the form of the best method to complete a task. Process refinements may involve firm-specific tacit knowledge and improvement processes.

The level of a firm's ordinary capabilities can be measured for a particular task or standard. Benchmarking best practice typically does precisely that.³⁾ Such knowledge can be acquired from consultants and other sources. However, even though knowledge about better or best practices is readily available and relatively easy to transfer, many managers fail to take advantage of them. This leads to a distribution of productivity within industries, with the widest spread occurring in markets where firms are less exposed to domestic or global competition (Bloom and Van Reenen, 2010). While firms that are very good at the ordinary tend to be more profitable, their continued prosperity is at risk from changes in their markets unless they have also developed good dynamic capabilities.

Competitive business environments never allow firms to run on autopilot for long. Henry Ford perfected the manufacturing efficiency of the Model T but eventually lost competitive advantage when rivals offered a range of more attractive design options. Many decades later, Nokia likewise got very good at making feature phones, but was overtaken by the smartphone revolution pioneered by Apple.

Cost-cutting strategies offer short-term profits but at the risk of starving long-term development. Indra Nooyi described the choice between efficiency and innovation that she faced when she became CEO of PepsiCo in 2006:

I had a choice. I could have gone pedal to the metal, stripped out costs, delivered strong profit for a few years, and then said adios. But that wouldn't have yielded long-term success. So I articulated a strategy to the board focusing on the portfolio we needed to build, the muscles we needed to strengthen, the capabilities to develop...we started to implement that strategy, and we

have achieved great shareholder value while strengthening the company for the long term. (Ignatius, 2015, p.85)

Nooyi chose to bank on strengthening Pepsi's dynamic capabilities, eschewing ordinary ones. Jeff Bezos at Amazon has demonstrated that he also understood the difference between ordinary and dynamic capabilities when he noted that "there are decisions that can be made by analysis...unfortunately, there's a whole other set of decisions that you can't ultimately boil down to a math problem" (Deutschman, 2004). Such decisions would include figuring out the next big thing, whether it was Amazon's Kindle e-reader or Amazon Web Services.

To summarize, dynamic capabilities require a longer-term focus. Short-run cost cutting, optimization, and other "best practices" should be subordinated to innovation-enhancing strategies.

IV. KNOWLEDGE CREATION AND DYNAMIC CAPABILITIES

There is little point in organizing to do new things, and being agile, if the company doesn't have new things to do that create value and that enable value capture by the enterprise. To create valuable new products, processes, and services, a company must innovate. There are two classes of ways to innovate:

- (i) investing in research and development to design or create new high-performance artifacts.
- (ii) achieving a "new combination" with existing artifacts, both internal and external to the organization, which may or may not require significant expenditure of R&D resources.

Invention in some cases involves employing scientific knowledge and converting tacit to explicit knowledge, which occurs both individually and socially (Nonaka and Toyama, 2005).

One of Takeuchi and Nonaka's early articles applied to method (i), above (Takeuchi and Nonaka, 1986). It described how to make product development more agile by switching from a sequential model to overlapping development phases and a team engaged in rugby-like "passing" of ideas

between members and functional areas. This later expanded into the Nonaka-Takeuchi model of knowledge creation, which places emphasis more on method (ii) and the associated social process of innovation (Nonaka and Takeuchi, 1995). It looked beyond what goes on in the R&D lab to how new knowledge is generated in the broader organization.

Like the dynamic capabilities framework, as well as in ambidexterity, the Nonaka-Takeuchi model eschews static analysis and focuses on dynamics. The organizational requirements highlighted by Nonaka and Takeuchi aren't quite the same ones emphasized by O'Reilly and Tushman, but there are important commonalities. Aspiration and vision are common to both. They also have autonomy (for the innovation team) in common.

With the right conditions, the Nonaka-Takeuchi knowledge-creating company can share tacit knowledge, create new concepts, and build new archetypes. They favor a "middle-up-down" management approach (Nonaka, 1988), which recognizes an important role for middle managers. Middle managers are the bridge between the vision of top management and the reality of what the firm is actually doing.

Nonaka and Takeuchi (1995, p.47) noted the affinity between the knowledge-creating company and dynamic capabilities even before the most frequently cited dynamic capabilities paper by Teece, Pisano, and Shuen (1997) had passed peer review.⁴⁾ They also noted the ability of Japanese firms to manage under uncertainty, honed through decades of unpredictable shocks after World War II (Nonaka and Takeuchi, 1995, p.4). Managing under uncertainty is of course precisely the turf where dynamic capabilities has planted its flag (Teece, Peteraf, and Leih, 2016).

Nonaka and Takeuchi's recent article on "Humanizing Strategy" restated the relevance of knowledge creation to managing under VUCA conditions (i.e., deep uncertainty) and argued for strategy to become more "future oriented" (Nonaka and Takeuchi, 2021). Dynamic capabilities is about both shaping and making the future, so the two treatments are closely related. Whereas "Humanizing Strategy" is about "making a better future," dynamic capabilities is about both shaping the future and ensuring the long-term evolutionary

fitness of the firm in a way that yields profits and a responsibility to "relevant"—but not all—constituencies. This is similar, although not identical, to Nonaka and Takeuchi's call to have "a social purpose in earning profits."

Another subtle difference is in the approach to entrepreneurial behavior. In articles, Nonaka has said that, in a knowledge-creating company, "everyone is a knowledge worker—that is to say, an entrepreneur" (Nonaka, 1991, p.97). I take this to mean generating and promoting new ideas. In dynamic capabilities, "entrepreneurial management" has a much more elaborate meaning:

Much like the founders of start-up companies, entrepreneurial managers in established firms assemble and deploy resources in pursuit of fresh opportunities, while imparting their vision of the future to the employees within their purview. They excel at the scanning, learning, creative and interpretive activity needed to sense (and later seize) new technological and market opportunities that may require building new capabilities. (Teece, 2016, p.209)

In other words, managers in the dynamic capabilities framework are creating high-level knowledge that will determine the future direction of the company. The ability to create or recognize opportunities is an essential element of entrepreneurship. While this is perhaps implicit in the Nonaka-Takeuchi model, it is an explicit element of dynamic capabilities.

Entrepreneurship is a powerful force in itself and has often sought to help society in small ways or large. The Honda jet story discussed in Humanizing Strategy (HS) can be contrasted with the SpaceX story which I use to illustrate dynamic capabilities (e.g., Schoemaker, Heaton, and Teece, 2018, p.33). HS is about "we." Dynamic capabilities are about "we" too; but there is little doubt that Elon Musk is indispensable to his team. The Honda jet story is a powerful one; but the success seems timid compared to SpaceX, building reusable rockets to go to Mars to save humanity versus building an executive jet that allows more time with the family.

Where dynamic capabilities favor the

entrepreneurial CEO, Nonaka and Takeuchi (2011) have a different leadership model in mind. In “The Wise Leader,” they detail six characteristics of the phronetic leader, which I will briefly characterize here. The first dimension is moral (“judge goodness”). The second is a form of sensing (“grasp the essence”). The third (“create shared contexts”) is similar to establishing a culture of innovation and knowledge sharing throughout the company. The fourth (“communicate the essence”) is about being able to express a vision of the future in ways that staff from various disciplines can easily internalize. The fifth is about being an effective leader (“political power”), and the sixth is about empowering employees (“fostering practical wisdom in others”).

Apart from the first characteristic, each of these is close, if not identical, to explicit components of entrepreneurial management in the dynamic capabilities framework. But there are differences of emphasis. In addition to its focus on ethics, the Nonaka-Takeuchi model of leadership maintains a suggestion of deeper, more permanent truths. This is made explicit in Humanizing Strategy (HS), which describes two kinds of wisdom: practical wisdom (experiential knowledge guided by values, principles, and morals) and “mother’s wisdom” (timeless knowledge rooted in culture and practice that is more individual or group-oriented) (Nonaka and Takeuchi, 2021). In dynamic capabilities terms, the knowledge or wisdom that arises from practice is a capability, either ordinary (if operational) or dynamic (if it affects other capabilities). But the Nonaka-Takeuchi model clearly sees it as ethical as well as “practical” in the Western sense. The two approaches, practical wisdom (wise leader) and dynamic capabilities (entrepreneurial manager), should be viewed as complementary.

Nonaka is one of the few to probe the meaning of (practical) wisdom in a corporate setting. Western debates over corporate social responsibility (CSR) touch on similar issues, but CSR isn’t wisdom.

Nonaka and Takeuchi expand these concepts to propose a “wise capitalism,” in which business and society are more in harmony. They point to the “Panmure House Declaration,” which was developed at an international conference of thought leaders in Edinburgh in 2019⁵⁾ and to the subsequent shift of the Business Roundtable,

a trade association for U.S. industry, away from the primacy of shareholder value maximization as promising moves in such a direction. However, the willingness of firms to take positions on social issues has arguably reduced their harmony with societies that are increasingly polarized. Similarly, corporate actions in response to human rights violations in China or Russia’s invasion of Ukraine have led to antagonism between multinational firms and these large economies. In short, not everyone is agreed on the “common good” that Nonaka and Takeuchi want firms to maximize.

Knowledge creation is another way that HS differs from dynamic capabilities. Nonaka’s SECI process for knowledge creation emphasizes the interpersonal and social aspects of innovation. In dynamic capabilities, product and process innovation comes not only from SECI but also from formal R&D, open innovation, Schumpeterian recombinations, and business model innovation. Furthermore, knowledge, in addition to being created, must be categorized in order to support a business model; the dynamic capabilities framework explicitly addresses the need to decide whether knowledge will be kept proprietary or not (Teece, 2020).

More fundamentally, the dynamic capabilities framework sees competitive advantage (value capture) as being just as important as knowledge creation (value creation). HS advocates “a social purpose in earning profits.” Dynamic capabilities are compatible with notions such as stakeholder capitalism and purpose-driven corporations to the extent they are conducive to sustaining the long-term competitive advantage of the firm, but they have not been given primacy. Again, the two approaches are complementary.

To summarize, Dynamic Capabilities (DC), Humanizing Strategy, and Ambidexterity each embrace a dynamic approach to strategy in which the company endeavors to create the future. DC and HS are more explicit about the need to respond flexibly to the business environment. DC and HS also differ in how they approach the moral dimensions of business.

V. AN APPLICATION OF THE FRAMEWORKS TO THE UPCOMING “SOFT CAR” REVOLUTION IN THE AUTOMOBILE INDUSTRY

A. *The Honda City Car and the Soft Car Revolution*

Nonaka has set out the *Ba*-based development of the Honda City car:

In 1978, top management at Honda inaugurated the development of a new-concept car with the slogan “Let’s gamble.” The phrase expressed senior executives’ conviction that Honda’s Civic and Accord models were becoming too familiar. Managers also realized that along with a new postwar generation entering the car market, a new generation of young product designers was coming of age with unconventional ideas about what made a good car.

The business decision that followed from the “Let’s gamble” slogan was to form a new-product development team of young engineers and designers (the average age was 27). Top management charged the team with two—and only two—instructions: first, to come up with a product concept fundamentally different from anything the company had ever done before; and second, to make a car that was inexpensive but not cheap. (Nonaka, 1991, p.100)

The Nonaka and Teece frameworks are both tightly focused on innovation in environments of change and uncertainty. As expressed by Prof. Nonaka:

In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge. When markets shift, technologies proliferate, competitors multiply, and products become obsolete almost overnight, successful companies are those that consistently create new knowledge, disseminate it widely throughout the organization, and quickly embody

it in new technologies and products. These activities define the ‘knowledge-creating’ company, whose sole business is continuous innovation. (Nonaka, 1991, p.96)

Unsurprisingly then, the two approaches can be powerfully combined through the application of Dynamic Capabilities analysis within a *Ba* team environment (Nonaka, Hirose, and Takeda, 2016). *Ba* defines the mission, resource, and team requirements to knowledge creation; Dynamic Capabilities provides the analytic framework within which the *Ba* team can work.

Combined, the two frameworks provide a clear and actionable roadmap for strategy development in times of change and uncertainty. An analysis of the process of strategy development at IBM in the 2000s under a Dynamic Capabilities approach—the “IBM Business Leadership Model” (Harrell, O’Reilly, and Tushman, 2007)—shows the application of *Ba* principles:

- **Self-Organizing, Open Boundaries**—teams were formed to address specific initiatives (known as “Winning Plays”) and were made up of combinations of relevant senior executives;
- **Shared Sense of Purpose**—strategy development for each Play worked within a clearly defined overall corporate mission, e.g., CEO Sam Palmisano’s 2002 declaration that IBM would become an “on demand company”;
- **Ability to Synthesize Different Types of Knowledge**—strategy development was informed by intensive cross-disciplinary “deep dive” gatherings;
- **Commitment by Participants**—teams were composed of successful general managers, seconded full-time to strategy development for 18- to 30-months;
- **Phronetic Leadership**⁶⁾—teams were tasked “to actively experiment and challenge their thinking in the design and implementation of strategy, including taking ideas from a wide range of sources and creating pilots and experiments to shape industry change ... not simply with new products and services, but also with operational and business model

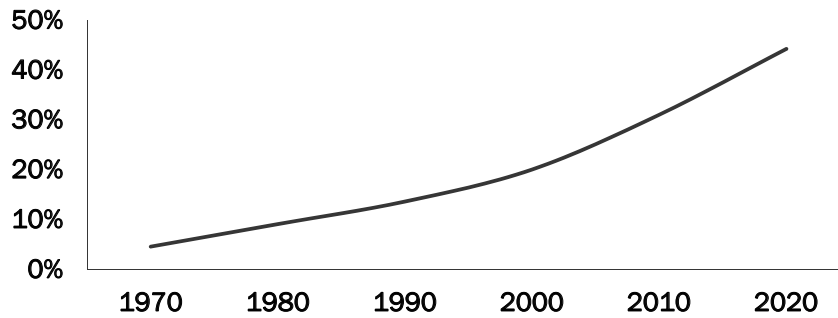


Figure 1: Electronic Systems as Percentage of Total Car Cost

Source: IHS, Deloitte, BRG analysis

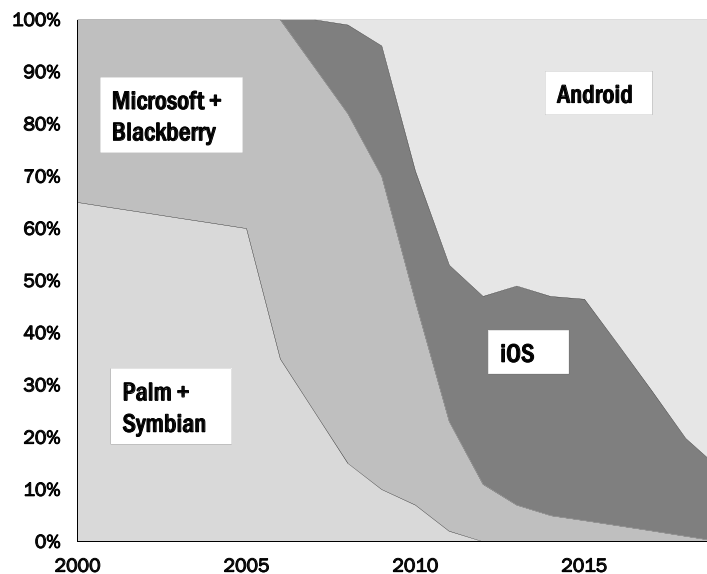


Figure 2: Smartphone Operating System Market Shares

innovations.” (Harreld et al., 2007, p.30)

Today the auto industry faces a major strategic challenge, across all OEMs, driven by the oncoming revolution in automobile software. Software component technologies have been growing in importance for commercial and personal vehicles for decades as the presence of programmable electronics in the vehicles has expanded (see Figure 1).

Over the next decade, software will become the most important element in defining commercial and passenger vehicle brand, differentiation and performance. First, software will integrate together all control, navigation, safety, and entertainment

systems into a unified consistent interface for the driver—and management system for the fleet manager. Second, vehicle software will become networked and distributed, as vehicles communicate in real time with other vehicles, with surrounding infrastructure, and with distributed navigation and autonomous driving systems.

These changes will be enabled by network service platforms e.g., for autonomy. Such platforms deliver overwhelming returns to scale, which will likely drive market concentration down to regional duopolies, supporting large market capitalizations, earnings, and R&D expense. We have seen the kind of disruption that platform software brings before,

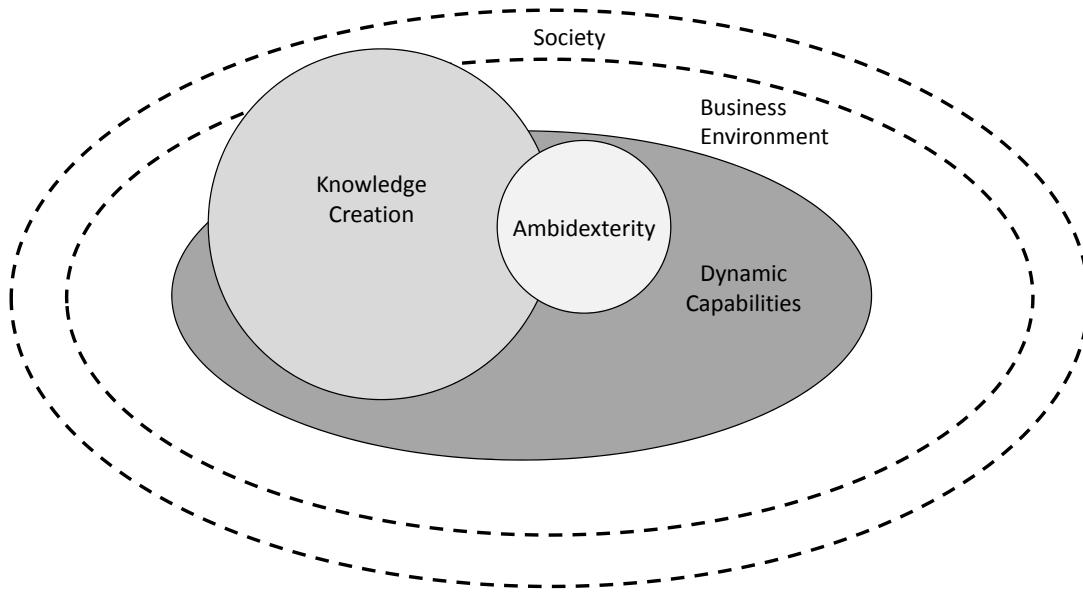


Figure 3: The Relationship of Dynamic Capabilities, Knowledge Creation, and Ambidexterity

e.g., in mobile phones. As with mobile phones, the new software-based platform ecosystems for transportation will fundamentally disrupt established companies that made the mistake of seeing software as just another component technology (see Figure 2).

In actuality, it's the hardware that becomes just another component. A large majority of car functionality is already being implemented by software applications, giving rise to the "software-defined vehicle." Platform providers may seek to commoditize the hardware platforms through which the software is presented to the user, as with Android being licensed to all phone companies on equal terms. Users find it most convenient to stay in the same ecosystem across all of their devices rather than using different platforms for different device classes. The risk then is not that automobile OEMs will be excluded from major new markets but rather, as with previous product categories, brand differentiation and product attributes will derive from the vehicle's software platform and related ecosystem. If the platform is owned by a third party, the profits will flow away from the automobile OEMs.

Established automobile OEM organizational capabilities are world-class for current purposes,

but this has not historically included software. The OEMs are scrambling to bring software development in-house. They are attempting to operate ambidextrously because their traditional engineering culture is not configured for the scope or speed needed to develop platforms. The challenge is considerable, because they are competing against software platform ecosystems for transportation fielded by digital native suppliers such as Google. Strong dynamic capabilities, including dynamic knowledge creation, will be needed if an OEM is to avoid losing industry leadership to the software platform providers.

The relationships of Dynamic Capabilities, Nonaka-Takeuchi Knowledge Creation, and Ambidexterity are presented in Figure 3. Knowledge creation underpins the cognitive and managerial aspects of dynamic capabilities, while ambidexterity provides structural and organizational guidance.

B. A Ba-Dynamic Capabilities Approach

The creation of *Ba* and the application of Dynamic Capabilities principles can enable the OEM to create a new greenfield software platform initiative. Software development should be organized as a *Ba* team outside the OEM's established design and manufacturing structures, but informed by the

Table 1: Sensing and Sensemaking Activities

Sensing	Continuously collect data from members of the organization about technology, market, and regulatory developments
Building Narratives	Use abductive logic to generate three or four scenarios based on different assumptions about the future of technology, markets, and regulation
Testing Hypotheses	Pursue small-scale tests of key assumptions to determine likely scenario path
Sensemaking	Use inductive logic to build a mental model of the market's most likely direction from available facts

same corporate vision. The team would be tasked with bringing a new vehicle philosophy and ecosystem to market by inverting the existing model, using the OEM's vehicle components as infrastructure for a new personal and commercial transport ecosystem.

The team must have a clear sense of purpose—to enable the transition to a new vehicle architecture, with the understanding that differentiation, performance, and quality in commercial and passenger vehicles is now driven by services and systems that require an advanced, unified software platform. The team must be cross-disciplinary and bring in expertise from outside the organization because distributed system software is not a core competence of today's OEMs.

Dynamic Capabilities provides a framework for the necessary strategy development (Teece, Rospin, and Cox, 2020). Table 1 shows some of the activities involved in sensing and making sense of uncertain technological, market, and regulatory signals. Top management should be sensing signals (data, facts, impressions) on an ongoing basis from throughout the organization. In order to move forward under uncertainty, management must task an elite team with developing a small number of narratives, each describing a possible evolution of the market. Based on these, hypotheses can be developed and tested, narrowing the range of possibilities and providing the basis for a mental model of the business environment. SECI processes are implicit in (and critical to) the activities listed.

Additional steps must also be taken. Activities in the seizing cluster include developing and refining a business model, e.g., a user-facing platform; filling capability gaps, e.g., software; and scaling the business. Transforming activities include adapting the organizational design to enable ambidexterity and creating new structures necessitated by the

business model.

Pursuing such an approach will help the OEMs find their way in the dark. As the options are winnowed to one or two most-likely scenarios, business models and strategies can be developed with increasing levels of certainty. As the firm moves to implementation (seizing) activities, middle managers must creatively address the contradictions between the vision of top management and the knowledge of frontline employees by building *ba* (shared contexts) where the necessary new knowledge will be created (Nonaka, Hirose, and Takeda, 2016, p.175).

VI. A COMMON VIEW ON THE LIMITS OF AGILITY

In uncertain environments, agility is necessary but not sufficient for long-term competitive advantage, despite the fact that some business gurus (e.g., Yves Doz, Gary Hamel) from time to time appear to advance the notion that agility is the essence of business survival and growth. Certainly, agility is good to have when you need it. The world of innovation and uncertainty is one where there are “punctuated equilibria,” with periods of calm (equilibrium) before a storm (disequilibrium that requires rapid action).

Today's business environment is more volatile than at any time in living memory. In the past, large incumbent firms only needed to watch each other to understand the evolution of technology and markets. New disruptive factors have emerged. So-called “activist” investors are one kind of distraction for incumbents, sometimes reducing their flexibility and creativity rather than enhancing it.

Small firms can also disrupt incumbents, and they are now perhaps even better funded than incumbents thanks to massive amounts of capital

flowing into venture or private equity firms. This allows “small” firms to scale rapidly as they find commercial acceptance. This disruption phenomenon certainly requires firms to be poised to move, but as Mitchell’s (1991) “dual clocks” analysis shows, incumbents need not always adjust at the same tempo as startups.

It is also important to remember that agility needs to be coupled to strategy. An army that is fast on its feet but going into battle in the wrong place at the wrong time isn’t likely to win. Too much emphasis on maintaining agility—without attention to strategy, capability, and the nuts and bolts of knowledge creation—is not likely to build long-term competitive advantage. With the proper motivation from its (top and middle management) leaders, an organization should be able to move with alacrity when necessary.

Firm size need not be a barrier to agility. Alphabet (Google), Microsoft, Apple, Facebook, and Amazon are all examples of agile companies operating at scale. But it is not just their agility which is the foundation of their success. It is their ambidexterity, their outstanding ability to create knowledge, and their dynamic capabilities.

When mission-critical activities need to be performed quickly, agility matters. At the beginning of World War II, the Allies needed to build ships quickly, and the American Merchant Marine Act was passed in 1936 to subsidize the annual construction of 50 commercial merchant vessels to be used in wartime. The number was doubled in 1939 and again in 1940 to 200 ships per year and scaled still further in 1941.

In this example, agility was critical, while innovation was less important. In fact, the “liberty ships,” as they came to be called, were based on old British designs and technology going back decades. Even though steam turbines were the advanced marine engine technology of the era, steam turbines were eschewed in favor of older and simpler reciprocating oil-fired steam engines. Liberty ships were welded rather than riveted and built in modular form. Agility was enhanced by knowledge creation. The first ships required 240 days to build but the average dropped to 42 days, and then the SS Robert Perry was built in 4 days and 15.5 hours after the keel was laid. This was a great demonstration of

agility. It was also a story of “new combinations”: an old British design and new methods of manufacturing (modulization) advanced by Henry Kaiser in Oakland, California.

In short, while agility is sometimes about doing regular things faster, that’s not what dynamic capabilities are about. Ordinary capabilities are where agility is more critical.

Dynamic capabilities require innovation and strategizing. They are aided by agility; but agility is not enough. In fact, innovation and agility require a sort of managerial ambidexterity. As David Francis (2020, pp.20-21) notes:

...agility and innovation have different clock speeds. Innovation requires finding and exploiting new ideas and is frequently time consuming, uncertain, expensive, and difficult... agility has a rapid heartbeat... many organizations, like the ancient roman god Janus, must look two ways and be both agile and innovative.

VII. CONCLUSION

Organizational agility is a much-touted attribute and usually considered virtuous. However, there are associated costs. Agility is usually unnecessary in business environments exposed merely to risk. On the other hand, it is essential when confronting the deep uncertainty and associated threats and opportunities characteristic of today’s innovation economy.

By viewing agility within the dynamic capabilities framework and focusing on the role of the Nonaka-Takeuchi model of knowledge creation, we advance the notion that agility should be sought only to the degree that it is in harmony with the requirements of the business environment, the firm’s strategy, and the understanding of its workforce. The Nonaka and Teece frameworks provide complementary insights into the path to knowledge creation and strategy development in times of disruptive change.

Ba describes the necessary environment—the place, the team structure, mission, and authority—that allows companies to synthesize the tacit knowledge of both frontline employees and senior

executives, make it explicit, and incorporate it into new technologies and products (Nonaka and Konno, 1998). Within that *Ba* environment, Dynamic Capabilities provides the analytic framework for the team to build new knowledge and strategy. Dynamic capabilities also determine the firm's ability to adjust the organizational design as needed, and to pursue implementation of the business model to capture value.

The Japanese term *Kaizen* refers to the continuous improvement that is necessary for success. *Kaizen* advances Ordinary Capabilities, but these, though necessary, are not sufficient for leadership and for effectively responding to disruptive change. In contrast, the Japanese term *Kaikaku* refers to the process of implementing fundamental and radical changes to business systems, i.e., gaining Dynamic Capabilities. It seems to be in short supply in Japan.

The type of agility that (entrepreneurial) managers choose to build into their organizations and maintain should depend on their strategy and positioning in the market and on the desire to prepare for surprises on both the downside and upside. If firms have strong dynamic capabilities, they will be better at sensing emerging developments; moreover, they will achieve agility with less sacrifice of efficiency, along with making better use of whatever agility they possess. This is because they will, by definition, be better at sensing, seizing, and transforming.

However, one should not conflate agility and dynamic capabilities. The latter has far more dimensions and, when practiced well, provides the enterprise greater robustness. While firms with strong dynamic capabilities are likely (if facing deep uncertainty) to be agile, firms may perform well in stable or even predictably volatile (i.e., risky) environments without having made costly investments in maintaining agility. The dynamic capabilities framework helps wise managers understand the costs and payoffs to agility, when to build agility into a business model, and when not to.

ACKNOWLEDGMENT

I would like to thank John Blair and Greg Linden for helpful contributions.

NOTES

- 1) The term adaptability is used in similar fashion (e.g., Sorenson, 2003; Reeves and Deimler, 2011; Weigelt and Sarkar, 2012), although Stigler (op. cit.) argued that adaptability is not the same as flexibility for firms.
- 2) This section is based on Teece, Peteraf, and Leih (2016).
- 3) Benchmarking involves identifying "best of breed" or peerless performers of particular business functions, such as order entry, shipping, or assembling well-defined components.
- 4) Teece and Pisano (1994) was the first peer-reviewed dynamic capabilities publication.
- 5) The Panmure House declaration "urges international leaders to base their policies and decision-making on a set of common principles, as espoused and formulated by Adam Smith, which cherish the required values of an ethically-based liberal democratic system, a moral commitment to the well-being of our communities and affirms responsibility to protect economic, political and social freedoms and use resources wisely, avoid unintended consequences, follow the rule of law, favour markets and prices as guides to resource allocation and a long term view of private and public investment, to support inclusive economic growth and prosperity for all."
- 6) "Phronetic organizational research is an approach to the study of management and organizations focusing on ethics and power. It is based on a contemporary interpretation of the Aristotelian concept phronesis, usually translated as 'practical wisdom,' sometimes as 'prudence.'" (Flyvbjerg, 2008, p.153)

REFERENCES

- Adner, R. & Helfat, C. E. (2003). Corporate effects and dynamic managerial capabilities. *Strategic Management Journal*, 24(10), 1011-1025.
- Bloom, N. & Van Reenen, J. (2010). Why do management practices differ across firms and countries? *Journal of Economic Perspectives*, 24(1), 203-24.
- Deutschman, A. (2004). *Inside the mind of Jeff*

- Bezos. Fast Company, August 1, pp. 52-58.
- Dosi, G., Faillo, M., & L. Marengo, L. (2008). Organizational capabilities, patterns of knowledge accumulation and governance structures in business firms: An introduction. *Organization Studies*, 29(8-9), 1165-1185.
- Doz, Y. & Kosonen, M. (2008). *Fast Strategy: How Strategic Agility Will Help You Stay Ahead of the Game*. Harlow, England: Pearson/Longman.
- Flyvbjerg, B., (2008). Phronetic organizational research. In R. Thorpe & R. Holt (Eds.), *The Sage Dictionary of Qualitative Management Research*. Los Angeles: Sage Publications, pp.153-155.
- Francis, D. L. (2020). *Exploiting Agility for Advantage: A Step-by-Step Process for Acquiring Requisite Organisational Agility*. Berlin: De Gruyter.
- Gerstner Jr, L. V. (2002). *Who Says Elephants Can't Dance? Inside IBM's Historic Turnaround*. New York: HarperBusiness.
- Harreld, J. B., O'Reilly, C. A. III, & Tushman, M. L. (2007). Dynamic capabilities at IBM: Driving strategy into action. *California Management Review*, 49(4), 21-43.
- Ignatius, A. (2015). How Indra Nooyi turned design thinking into strategy: An interview with PepsiCo's CEO. *Harvard Business Review*, 93(9), 80-85.
- Mitchell, W. (1991). Dual clocks: Entry order influences on incumbent and newcomer market share and survival when specialized assets retain their value. *Strategic Management Journal*, 12(2), 85-100.
- Nonaka, I. (1988). Toward middle-up-down management: accelerating information creation. *MIT Sloan Management Review*, 29(3), 9.
- Nonaka, I. (1991). The knowledge creating company. *Harvard Business Review*, 69(6), 96-104.
- Nonaka, I., Hirose, A., & Takeda, Y. (2016). 'Meso'-foundations of dynamic capabilities: Team-level synthesis and distributed leadership as the source of dynamic creativity. *Global Strategy Journal*, 6(3), 168-182.
- Nonaka, Ikujiro, and Konno, N. (1998). The concept of "Ba": Building a foundation for knowledge creation. *California Management Review*, 40(3), 40-54.
- Nonaka, I. & Takeuchi, H. (1995). *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. New York: Oxford University Press.
- Nonaka, I., & Takeuchi, H. (2011). The wise leader. *Harvard Business Review*, 89(5), 58-67.
- Nonaka, I., & Takeuchi, H. (2021). Humanizing strategy. *Long Range Planning*, 54(4). <https://doi.org/10.1016/j.lrp.2021.102070>
- Nonaka, I., & Toyama, R. (2002). A firm as a dialectical being: Towards a dynamic theory of a firm. *Industrial and Corporate change*, 11(5), 995-1009.
- Nonaka, I., & Toyama, R. (2005). The theory of the knowledge-creating firm: Subjectivity, objectivity and synthesis. *Industrial and Corporate Change*, 14(3), 419-436.
- Nonaka, I., & Toyama, R. (2007). Strategic management as distributed practical wisdom (phronesis). *Industrial and Corporate Change*, 16(3), 371-394.
- O'Reilly, C. A. & Tushman, M. L. (2004). The ambidextrous organization. *Harvard Business Review*, 82(4), 74-83.
- Reeves, M. & Deimler, M. (2011). Adaptability: The New Competitive Advantage. *Harvard Business Review*, 89(7-8), 134-141.
- Schoemaker, P. J. H., Heaton, S., & Teece, D. (2018). Innovation, dynamic capabilities, and leadership. *California Management Review*, 61(1), 15-42.
- Sorensen, O. (2003). Interdependence and adaptability: Organizational learning and the long-term effect of integration. *Management Science*, 49(4), 446-463.
- Stigler, G. (1939). Production and distribution in the short run. *Journal of Political Economy*, 47(3), 305-327.
- Takeuchi, H., & Nonaka, I. (1986). The new new product development game. *Harvard Business Review*, 64(1), 137-146.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319-1350.
- Teece, D. J. (2016). Dynamic capabilities and entrepreneurial management in large organizations: Toward a theory of the (entrepreneurial) firm. *European Economic Review*, 86, 202-216.
- Teece, D. J. (2020). Hand in glove: Open innovation

- and the dynamic capabilities framework. *Strategic Management Review*, 1(2), 233-253.
- Teece, D. & Leih, S. (2016). Uncertainty, innovation, and dynamic capabilities: An introduction. *California Management Review*, 58(4), 5-12.
- Teece, D., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, 58(4), 13-35.
- Teece, D., & Pisano, G. (1994). The dynamic capabilities of firms: An Introduction. *Industrial and Corporate Change*, 3(3), 537-556.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533.
- Teece, D. J., Raspin, P. G., & Cox, D. R. (2020). Plotting strategy in a dynamic world. *MIT Sloan Management Review*, 62(1), 28-33.
- Thiel, P. (2014). Lecture 5: Business strategy and monopoly theory. Genius.com. <<http://genius.com/Peter-thiel-lecture-5-business-strategy-and-monopoly-theory-annotated>>.
- Weber, Y. & Tarba, S. Y. (2014). Strategic agility: A state of the art. *California Management Review*, 56(3), 5-12.
- Weigelt, C. & Sarkar, M. B. (2012). Performance implications of outsourcing for technological innovations: Managing the efficiency and adaptability trade-off. *Strategic Management Journal*, 33(2), 189-216.
- Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 24(10), 991-995.
- Worley, C. G., Williams, T. D., & Lawler III, E. E. (2014). *The Agility Factor: Building Adaptable Organizations for Superior Performance*. San Francisco, CA: Jossey-Bass.

David J. Teece is the Thomas W. Tusher Professor in Global Business and Director of the Tusher Center for The Management of Intellectual Capital at the Haas School of Business, University of California, Berkeley, USA. Email: teece@haas.berkeley.edu