WILEY

RESEARCH ARTICLE

Developing strategic innovation in large corporations—The dynamic capability view of the firm

Mitsuru Kodama 🆔

College of Commerce, Nihon University,
Tokyo, Japan

Correspondence
Mitsuru Kodama, College of Commerce, Nihon
University, 5-2-1 Kinuta, Setagaya-ku, Tokyo,
Japan.
Email: kodama.mitsuru@nihon-u.ac.jp

Strategic innovation dynamically brings about strategic positioning through new products, services, and business models and is a dynamic view of strategy that enables a large corporation to maintain its competitiveness and establish sustainable growth. For these reasons, large corporations have to be innovators that can reinforce their existing positions (businesses) through incremental innovation, while at the same time, constantly renew or destroy existing business through radical innovation.

From detailed reviews of existing dynamic capabilities theories and further theories deeply related to the characteristics of corporate or organizational capabilities, this article presents a theoretical model of a strategic innovation system as a corporate system capability to enable a large company to achieve strategic innovation. Furthermore, through in-depth longitudinal case studies, the article also discusses the importance of strategic innovation capabilities to achieve a dynamic spiral of the 2 completely different ordinary and dynamic capabilities on the capabilities map, skillfully use and combine to achieve swift or slow incremental innovation as exploitation, or radical innovation as exploration.

1 | SUSTAINABLE GROWTH THROUGH RADICAL AND INCREMENTAL INNOVATION

Here in the 21st century, changes in business circumstances surrounding large corporations are becoming more pronounced. Managers and business leaders face a wide range of challenges as businesses globalize and increasingly operate in emerging markets, as technologies innovative rapidly, networking permeates throughout societies and markets mature, as well as price wars and environmental problems, Although obviously, a large corporation must continuously create new products, services, and business models to maintain sustainable competitiveness and growth over the long term.

The creation of new business models that changes existing rules and radically revamp conventional products and services trigger major transformations in the corporate strategy of large corporations. For example, new value chains and business ecosystems in the information and communications technology (ICT) industry that originated in the United States with the creation of new music distribution system and smartphones with Apple's iPhone, iPod, and iTunes music store caused major shake-ups in both the music and mobile phone industries.

The collection of innovation research of recent years into radical innovation (e.g., Leifer et al., 2000), breakthrough innovation (e.g., Hargadon, 2003; G. O'Connor, 2008), discontinuous innovation

(e.g., Kaplan, Murray, & Henderson, 2003), and disruptive innovation (Christensen, 1997) has offered both theoretical and practical pointers for transforming strategies in large corporations to advance technologies and create new markets. The important implications put forth by existing research suggest it is not enough to just be able to respond quickly to environmental changes—Companies also need to acquire capabilities to develop business to create new environments (markets).

Thus, to swiftly respond to changing circumstances, companies have to continually polish their existing capabilities to fortify their main businesses. Incremental innovation (e.g., R. D. Dewar & J. E. Dutton, 1986; Ettlie, Bridges, & O'Keefe, 1984) through strengthening and utilization of company capabilities through regular, continuous, and cumulative upgrade and improvement activities is important. At the same time, to drive business for radical innovation to create new environments (markets; e.g., Henderson, 1995; McDermott & G. O'Connor, 2002), it is also necessary to seek out or create never-before-seen capabilities to drive business development. In these two innovation processes—incremental (exploitation) and radical (exploration) innovation—it is the former that entails strengthening and utilizing capabilities for a company's existing business (its main business) and pursuing greater operational efficiency. In contrast, it is the latter that involves a large corporation searching out or building new capabilities in pursuit of the creativity needed to pioneer the new business models and new

businesses of the future. However, large corporations have to manage these two totally different innovation processes simultaneously and incorporate them into the nuclei of their corporate strategies.

The traditional large corporations of the past found great competitiveness in reinforcing and utilizing path-dependent capabilities to incrementally innovate their existing products and profit by releasing newer versions of them. In contrast, radical or breakthrough innovations result in paradigm shifts accompanying new markets and technologies that bring big increases in product functionality, radical changes to existing markets, the creation of new markets, and substantial cost reductions (Leifer et al., 2000; C. O'Connor & Rice, 2001). In this way, as new breakthroughs, radical innovations are different in character to the incremental and path-dependent innovations of the large corporations of the past. To achieve radical innovation, large corporations need to seek out and create new capabilities that are different from their existing skills and know-how (e.g., R. D. Dewar & J. E. Dutton, 1986; Ettlie et al., 1984; Green, Gavin, & Aiman-Smith, 1995).

However, corporations taking on radical innovation and the various projects within themselves must face uncertainties and discontinuities in areas such as markets, technologies, organizations, and resources. Hence, although it may be possible for some projects to overcome these hurdles, many projects lose momentum and fail (e.g., Leifer et al., 2000). To seek out and create the new capabilities for radical innovation, large corporations must engage in management activities that are not the same as reinforcing and utilizing the capabilities they have nurtured through their incremental innovation histories (the business elements of strategy, organizations, resources, technologies processes, and leadership; e.g., Kodama, 2003; O'Reilly & Tushman, 2004; Vanhaverbeke & Peeters, 2005).

There is a dynamic relationship between the creation and utilization of these capabilities. Because strengthening and utilizing existing capabilities for incremental innovation means forging technical know-how and personnel skills within companies, as they accumulate, these capabilities can trigger the achievement of radical innovation through the searching and creation of new capabilities. Therefore, large corporations must understand their desired level (optimal level) of balance between creating and utilizing capabilities and must intentionally manage them. Companies face new challenges regarding the creativity and efficiency of their capabilities, in other words, "the combination of exploration and exploitation," to bring about radical innovation by seeking out and creating new capabilities, while at the same time, maintaining their competitiveness through incremental innovation in their main businesses by strengthening and utilizing existing capabilities (March, 1991).

Thus, leaders and managers of large corporations need a perspective on seeking out and creating new capabilities to pioneer new business and create new markets while strengthening and utilizing capabilities to maintain their core businesses. Simultaneously executing and combining these two substantially different innovation processes entails the pursuit and pioneering of new and highly individualized strategic positions and is thus a superior corporate strategy that also leads to the achievement of sustainable competitiveness and growth (e.g., Kodama, 2006; Markides, 1999).

Markides (1997, 1998) defined strategic innovation as the dynamic creation of creative strategic positioning from new products, services, and business models and emphasized that this framework was a dynamic view of strategy by which a company established sustained competitive excellence. To achieve this, companies must not adhere to existing positioning (existing business) but must always innovate in ways that destroy this positioning. Moreover, Govindarajan and Trimble (2005) defined strategic innovation as realizing strategically innovative new business models (including new products and services). This strategic innovation refers to business innovation that transforms established into new business and has a major impact on corporate performance. It is essentially different from incremental innovation.

However, obviously, incremental innovation is required to drive current business and is an important corporate activity needed to reap benefits in the immediate short term. Then, just as companies invest the revenues gained in the short term in research and development (R&D), they must also have initiatives in sight for radical innovation to ensure sustainable growth into the future. In other words, to grow sustainably, companies have to strengthen their incremental innovation activities, while simultaneously directing themselves toward the challenge of radical innovation (e.g., Burgelman & Leonard, 1986; Christensen, 1997; Goold & Campbell, 2002; Heller, 1999; Kodama, 2003, 2004; O'Reilly & Tushman, 2004; M. L. Tushman & O'Reilly, 1997). Accordingly, in this perspective, the strategic innovation implied by Markides (1997) and Govindarajan and Trimble (2005) must include the simultaneous pursuit of both incremental and radical innovation.

Although there are various classifications of radical and incremental innovation in existing research with diverse cases of new product development and reports on new R&D results, this article considers radical innovation in the broader sense of "radical and really new innovation" apart from incremental innovation, as described by Garcia and Calantone (2002). In short, incremental innovation refers to innovation based on continuous advancement of a company's unique existing path-dependent knowledge, whereas radical innovation is seen as innovation that requires processes to acquire knowledge accompanied by novelty and uncertainty unlike anything that the company has experienced in the past. G. O'Connor (2008) develops theoretical discussions on dynamic capabilities (DC) based on similar positions for the concept of this class of innovation process.

In this article, strategic activities or innovation processes that achieve a combination of radical and incremental innovation or, in other words, combine the exploration and exploitation mentioned earlier, the author calls "strategic innovation," and it is this strategic innovation that achieves sustainable growth in large corporations. However, questions remain—How do large corporations bring about strategic innovation, and what kind of strategic management in (and between) leading companies is needed to achieve sustainable growth? This article answers these holistic research questions from the perspective of academic research into strategic management and innovation.

Based on a number of major studies, in particular those done on DC (D. J. Teece, 2007, 2014), this article clarifies the dynamic innovation processes for establishing strategic innovation (incremental and radical) for sustainable growth. As new theoretical models, the article also presents a "strategic innovation system" and presents the concept of the "capabilities map" (the four domains of capabilities) created with the characteristics of capabilities responding to internal and external uncertainties and the speed of environmental change facing

companies. Then, using an in-depth longitudinal case study of a high-tech company verifies these theoretical models and presents new implications.

2 | RESEARCH METHOD

The author adopted a qualitative research methodology due to the need for rich data that could facilitate the generation of theoretical categories we could not derive satisfactorily from existing theory. In particular, due to the exploratory nature of this research and our interest in identifying the main people, events, activities, and influences that affect the progress of innovation, the author selected the grounded theory-based study of data interpretation, which was blended with case study design and ethnographic approaches (Locke, 2001).

The research data came primarily from longitudinal study during a 24-year period (1992–2015) examining strategic innovation processes with respect to new products, services, and business development at a large company in competitive high-tech fields. This research paradigm, which was based on in-depth qualitative study, has some similarity to ethnography (Atkinson & Hammersley, 1994) and other forms of research (Lalle, 2003) that derive their theoretical insights from naturally occurring data including interviews or questionnaires (Marshall & Rossman, 1989). Especially, the author of this article himself served as a project leader of new product and service development in Nippon Telegraph and Telephone (NTT) DOCOMO (2000–2003), Japan's largest mobile communications carrier. This experience provided the author with direct knowledge and detailed information that enhanced the accuracy of the empirical analyses in this research. Research data and insight are gained alongside or on the back of the intervention.

This article takes up the case study NTT DOCOMO not only because of the historic occurrence of the many great leaps in technology as generational transformation in the mobile telephone industry, such as the smartphones typified by the Apple iPhone and others, but also because of the dramatic changes in those markets and competitive environments accompanying the frequent creation of new business models. Put differently, just as the mobile phone industry is an industry in a dramatically changing competitive environment (in other words, rapidly changing corporate internalities and externalities), it is also conversely one that has brought forth new rules of competition and major technological innovations over a long period of time in sluggish environments in the past. Thus, it can be said that there is great significance in scholastic research in exploring how companies demonstrate DC to bring about strategic innovation (radical and incremental innovation) in these environments. At the same time, with 21 years of hands-on experience as a practitioner in the telecommunications industry including time at NTT DOCOMO, the author has been able to make contribution to existing research with new theories, based on valuable data obtained with a perspective on the internalities of a corporation (in particular the processes of microstrategizing and microorganizing).

The data collected over the 20 years of the intervention have derived from work with practitioners involved in a large number and variety of customers and outside partners as well as internal organization members. During these interventions, the expressed experiences,

views, action-centered dilemmas, and actual actions of participants were recorded as research data in a variety of ways, including notes and internal- and outside-rich documents. The theory that has emerged from this research has centered on the concepts of "strategic innovation capabilities."

The data analysis for the research consisted of three stages: (a) developing an in-depth case history of a big project's activities from the raw data that the author could gain all the information, (b) open coding and subsequent selective coding the in-depth case history for the characteristics and origin of strategic innovation, and (c) analyzing the pattern of relationships among the conceptual categories.

In the first stage of the data analysis, the author constructed chronological descriptions of the company's activities with respect to the strategic innovation process, describing how it came about, when it happened, who was involved, and major outcomes. Through this work, the author completed an in-depth case history of the company.

The second stage of analysis involved coding the in-depth case history with respect to its characteristics, origin, and effects. This was a highly iterative procedure that involved moving between the in-depth case history, existing theory, and the raw data (Glaser & Strauss, 1967). Data were subjected to continuous, cyclical, evolving interpretation and reinterpretation that allow patterns to emerge.

The grounded theory approach was adopted based upon our interpretation and description of phenomena based on the actors' subjective descriptions and interpretations of their experiences in a setting (Locke, 2001). This "interpretation of an interpretation" strives to provide contextual relevance (Silvermann, 2000). From the in-depth case history, the author initially advanced first-order descriptions based on broad categories that were developed from the existing theory and then refined these categories by tracing patterns and consistencies (Strauss, 1987). The analysis continued with this interplay between the data and the emerging patterns until the patterns were refined into conceptual categories (K. Eisenhardt, 1989). The third stage of data analysis was to examine the empirical in-depth case results across the selected categories and the theoretical literature and to develop the logic of the conceptual framework and generate a new theory.

Based on the data obtained from field studies, the author first produced an in-depth case concerning the company. Next, based on this study, the author performed analyses and observations from the viewpoint of strategic innovation and strategic innovation capabilities, and so forth. Various scholars (K. Eisenhardt, 1989; Pettigrew, 1990; Yin, 1994) have discussed the validity of case studies. Case studies make it possible to explain the relevance and cause-and-effect relationships of a variety of observations through deep and detailed insights with consideration given to qualitative information and subjectivity resulting from the peculiarities of individual cases and the difficulties of general analyses. Case studies not only compensate for the weaknesses of generalities but are also indispensable in new and creative theorization.

This article is structured as described below. First, the article reviews main existing research on DC and then discusses the theoretical background of the article. Second, the article presents the "strategic innovation model"—its theoretical concept. Third, the article verifies the relevance of the theoretical model through the in-depth longitudinal case study of NTT DOCOMO. Fourth, the article presents

theoretical implications extracted through case analysis and the theoretical model. Finally, the article offers a conclusion and discusses issues for future research.

3 | LITERATURE REVIEW AND THEORETICAL BACKGROUND OF THE ARTICLE

Resource-based theories that focus on independent capabilities for companies and organizations (e.g., Barney, 1991; Penrose, 1959; Richardson, 1972; T. R. Rumelt, 1984; Wernerfelt, 1984) have developed as strategy theory frameworks from the viewpoints of microeconomics and organizational economics. These resource-based theories and Porter's (1980) competition strategy theory enable a detailed analysis of strategic positioning and the relationship between competitive excellence and the internal resources already in companies in slowly changing environments and industries. However, it is difficult to analyze how companies in rapidly changing high-tech industries within competitive environments, such as the ICT and digital sectors, create new competitive excellence.

In recent years, the theory of DC (e.g., D. Teece, Pisano, & Shuen, 1997; D. J. Teece, 2007, 2014) has been developed and refined and has become a fundamental theory that clarifies the mechanisms for sustainable growth through corporate strategic innovation. D. Teece et al. (1997, p. 516) define DC as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Thus, they assert that DC thus reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions (Leonard-Barton, 1992). Moreover, D. J. Teece (2014, p. 332) suggests

that strong DC help enable an enterprise to profitably build and renew resources and assets that lie both within and beyond its boundaries, reconfiguring them as needed to innovate and respond to (or bring about) changes in the market and in the business environment more generally.

Describing the microcore functions of these DC, DC can usefully be broken down into three primary clusters: (a) identification, development, codevelopment, and assessment of technological opportunities in relationship to customer needs (sensing); (b) mobilization of resources to address needs and opportunities and to capture value from doing so (seizing); and (c) continued renewal (transforming). Engagement in continuous or semicontinuous sensing, seizing, and transforming is essential if the firm is to sustain itself as its customers, competitors, and technologies change (D. J. Teece, 2007, 2014).

On the other hand, in discussing the scope of DC application, D. Teece et al. (1997) claimed that DC are important for sustainable firm-level competitive advantage, especially in high-velocity markets. As well as that, strong DC allow the enterprise and its top management to develop conjectures about the evolution of consumer preferences, business problems, and technology, validate and fine-tune them, and then act on them by realigning assets and activities to enable continuous innovation and change (D. J. Teece, 2014).

In this perspective, DC can be thought of as a dynamic business process that should be demonstrated in business environments that are changing rapidly and/or in business environments that have high levels of uncertainty. Demonstrating DC in Domains I, II, and III (rapidly changing business environments and/or business environments with a high degree of uncertainty) in the capabilities map in Figure 1 described in Section 4 is of particular importance.

In the dynamic environments of "hypercompetition" (D'Aveni, 1994) or "next-generation competition" (D. J. Teece, 2012b) gaining
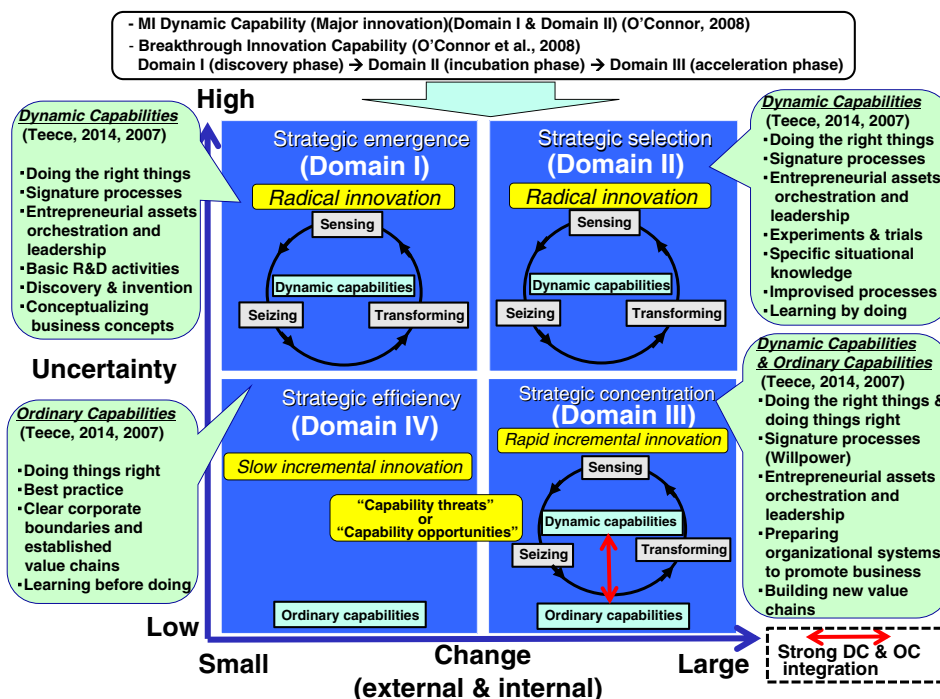
FIGURE 1 Capabilities map dynamic and ordinary capabilities view. DC = dynamic capabilities; OC = ordinary capabilities; R&D = research and development [Colour figure can be viewed at wileyonlinelibrary.com]

attention in recent years, the theoretical concept of DC is also a crucial concept for companies to drive their "ecosystems strategies" (D. J. Teece, 2014). In addition, the core DC function of "asset orchestration" (D. J. Teece, 2007) is reinforced by the three organizational processes of (a) coordination/integration, (b) learning, and (c) reconfiguration (D. Teece et al., 1997). Asset orchestration has effects on performance in the individual domains of the capabilities map (Figure 1), described later.

D. J. Teece (2007, 2014) clearly distinguishes these DC from "ordinary capabilities" (OC hereinafter). "Ordinary capabilities have also been called static (Collis, 1994), zero-level (Winter, 2003), first order (Danneels, 2002), and substantive (Zahra, Sapienza, & Davidsson, 2006). The zero-, first-, and second- typology is used by Easterby-Smith and Prieto, 2008 and Schilke, 2014. The more common usage seems to be equating first-order with ordinary" says D. J. Teece (2014, p. 330). He asserts that OC generally fall into three categories —administration, operations, and governance. Describing OC as specific details of corporate activity, OC enable a firm to perform an activity on an ongoing basis using more or less the same techniques on the same scale to support existing products and services for the same customer population. Hence, it is possible to express OC as ordinary in the sense of maintaining the *status quo* (i.e., not out of the ordinary; Helfat & Winter, 2011, Winter, 2003).

Nevertheless, OC that pursue efficiencies such as best practices and "doing things right" (D. J. Teece, 2014) should not be underestimated. They are often fundamental and can support competitive advantage for decade-long periods (D. J. Teece, 2014). In other words, in relatively stable environments where environmental change is gradual and there are low levels of uncertainty, OC function usefully in business but will not secure sustainable corporate growth over the longer term. However, in large traditional companies running many businesses, there will always be some greater or lesser amounts of these business domains in which these OC must be demonstrated. Demonstrating OC in businesses in relatively stable environments where environmental change is gradual and there are low levels of uncertainty is crucial. As described later, Domain IV (low uncertainty, sluggish environmental change) in Figure 1, OC are of particular importance.

Hence, companies must apply OC and systematically and analytically formulate and implement strategies under relatively stable or slow-moving conditions with little business uncertainty. "Learning before doing" (Pisano, 1994), that is, formulating and implementing detailed strategic planning and policies, is a key element of OC in market structures with clear corporate boundaries that also can clarify the players in value chains.

On the other hand, DC have been reinterpreted by many researchers. Among them, K. Eisenhardt and Martine (2000) describe 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. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die." (K. Eisenhardt and Martine, 2000). Hence, they recursively extract the concept of corporate DC required in both slow- and fast-moving business environments. They suggested the importance of "learning by doing" with simple rules to emphasize results rather than prior training and implementation processes, especially in fast-moving environments, where uncertainty rises and an industry's corporate borders become vague (K. Eisenhardt & Sull, 2001). However, in contrast, K. Eisenhardt and Martine (2000) claimed that DC are inherently unsuited to creating sustainable advantage and that they are likely to break down in high-velocity markets.

However, regarding the statement that "dynamic capabilities would break down in high-velocity environments because of the instability of the simple rules (basically, semi-improvised managerial actions)" by K. Eisenhardt and Martine (2000), D. J. Teece (2014, p. 339) asserts that "In high-velocity environments, the business enterprise may well be particularly reliant on the sensing and seizing instincts and actions of the CEO and the top management team. To the extent that this is so, the capabilities will, of course suffer from a degree of instability because their longevity depends logically on the tenure of entrepreneurs/ managers/leaders," which is a more reasonable interpretation that touches on the reality of actual business environments.

In rapidly changing environments that require the dynamic spiral of thought and action, DC can be said to be the agility of not only top management but also project leaders and their team members with front line processes to create new business, as they engage regularly in trial and error toward their strategic objectives (both prudent and bold —These are deliberate but sometimes emergent; e.g., Kodama, 2005b). The concept of "simple rules" is one standard of judgment that should be considered by practitioners in complex dynamic business processes, depending on the situation (not necessarily in all situations).

Regarding discussions by K. Eisenhardt and Martine (2000), D. J. Teece (2014, p. 432) states that "K. Eisenhardt and Martine's (2000) article misinterpreted (or reframed) the DC framework by claiming that all capabilities, including DC, can ultimately be characterized by best practice and hence imitated. In essence, K. Eisenhardt and Martin conflated two concepts that benefit from being analytically separated, namely OC and DC. OC and DC are quite distinct, both analytically and in practice." Thus, the interpretation of DC has attracted differing opinions from different researchers.

Moreover, according to other researchers, this interest in strategic theory has evolved toward a dynamic structure that reflects current corporate activity. For example, G. O'Connor (2008) respects the DC theory of K. Eisenhardt and Martine (2000) and mentions that a large number of major innovations, including radical innovations, developed gradually from slow (or very slow) market environments and were implemented over a period of several years to several decades. Thus, the concept of DC is described as a theory that can be evaluated and applied around the axes of both market speed and business uncertainty (including risk) characterizing radical innovation.

In addition, Helfat and Winter (2011) assert that slow changes, projects currently in progress and relatively peaceful external environments, should be incorporated into research on DC. This is because DC should not be limited to brand new businesses, environments moving rapidly, or radical changes. For example, there are plenty of cases of new product development such as the Intel Micro-processing unit (MPU) that are essentially cases of DC in ongoing businesses in relatively peaceful environments. However, many of these businesses appear to be demonstrating routine OC and ultimately expand the size and scope of their business resources, but at the same time, form

business ecosystems in the industry to achieve major economic effects with radical innovation. Technological innovations such as the MPU involve various scientists, engineers, and business partners in a wide range of different fields (electronic design automation (EDA) vendors, semiconductor processing equipment manufacturers, etc.) and are driven by R&D processes in high business uncertainty (including risk) and novelty. In other words, in these environments, DC are of particular importance in the Domains I ➔ II shift (business environment with high uncertainty), as described in the capabilities map in Figure 1.

G. O'Connor (2008) used the term "major innovation (MI) dynamic capability" for capability that promotes the exploration process (March, 1991) and realizes MI (radical and really new innovation) under conditions of uncertainty and high risk. MI dynamic capability differs from other capability theories (e.g., King & Tucci, 2002; Nelson & Winter, 1982; Winter, 2000) that emphasize the evolution of the original exploitation activity process (March, 1991). MI dynamic capability responds to highly uncertain situations, regardless of the speed of market movement, and embraces the concept of DC in the high-speed markets (also including high uncertainty) mentioned by K. Eisenhardt and Martine (2000).

Realistically speaking, however, and the author has experience as a project leader, many radical innovations are established through the stages of discovery or invention from slow- and very slow-moving basic scientific research to technological development environments. Later, the developed core technologies and provisional business models based on discovered or invented ideas are adopted and exploited in products and services through improvisation and trial-and-error processes (including the weeding-out process) involving trial manufacture, experiment, and incubation. Product and service markets are gradually established. Then the new products and services anticipated or forecast for the growth markets become the competitive markets for other companies (just when other companies enter the market depends on individual businesses). The market environment becomes fast moving, and companies accelerate their investment in necessary resources.

G. O'Connor and DeMartino (2006) also undertook long-term observation and analysis of radical innovation in major U.S. corporations and suggested the importance of three-phase management (discovery, incubation, and acceleration) as a radical innovation development framework. They then named the ability to implement these processes the "breakthrough innovation capability" and suggested that building this capability into the company is a key management system leading to successful radical innovation (O'Connor, Leifer, Paulson, & Peters, 2008).

This kind of three-phase management (discovery, incubation, and acceleration) is used in projects in large corporations (and venture enterprises) to develop various new products, services, and businesses. Different practitioner (and organizations such as project team) capabilities are required in the individual business processes in each of the three phases, depending on the degree of business uncertainty and environmental changes being faced. As mentioned, DC robustly function in response to these externalities (uncertainty and environmental change) and are also a framework for demonstrating difficult-to-imitate competitiveness. Hence, managing the phases with "MI Dynamic Capability (Major innovation)" (G. O'Connor, 2008) and "Breakthrough Innovation Capability (the 3 phases of discovery, incubation, and

acceleration)" (G. O'Connor, 2006, 2008) can be described with the three DC functions (sensing, seizing, and transforming), which can be applied in highly uncertain and rapidly changing environments. The DC concept also encompasses the theoretical concepts of MI dynamic capability (G. O'Connor, 2008) and "Breakthrough Innovation Capability (the 3 phases of discovery, incubation, and acceleration)."

Previous research, such as Teece's DC framework and MI innovation capability, positioned around the two axes of uncertainty and change led to the situation illustrated in Figure 1's capability map, which shows the relationship between those previous researches and the three development phases of G. O'Connor and DeMartino (2006), mentioned above. This article names the aforementioned three-phase management (discovery, incubation, and acceleration) as Domains I, II, and III, which lead to commercialization of new technologies and businesses from invention or proposal. These three domains are business fields in which DC are demonstrated (as well as that, OC are demonstrated in Domain III, discussed later). Conversely, OC function in pursuit of best practices (D. J. Teece, 2007, 2014) in slow and stable environments with low uncertainty and slow change (Domain IV). Here, strategic uncertainty beyond the four elements of markets, technology, organization, and resources mentioned by Leifer et al. (2000) also exists, and change is not limited to the external elements of market speed and industrial technology speeds but also corresponds to the internal elements of a company's own strategy, organization (organizational revamping), technologies, operation, and leadership.[1] Following, the author describes the characteristics of the capabilities in each domain and a capabilities system for integrating these domains.

4 | THE THEORETICAL MODEL OF THIS ARTICLE—THE STRATEGIC INNOVATION SYSTEM

In light of the theoretical concepts in the existing research discussed earlier, this section analyzes the various capabilities required of diverse organizations in large corporations (R&D organizations, new business development organizations, project teams, existing line organizations, etc.) as they face a range of business contexts from day to day and presents a strategic innovation system as a new theoretical framework.

4.1 | DC in Domain I

Slow or very slow environmental change with a highly uncertain domain (Domain I) observed at the initial stage of radical innovation is the technology creation stage arising from new ideas, business concepts, discoveries, and invention and corresponds to the "discovery phase" of G. O'Connor and DeMartino (2006). In this domain, the exploration process is advanced through the MI dynamic (or breakthrough innovation) capability mentioned above. Moreover, the sensing dynamic capability plays a major role in this domain. To achieve radical innovation, R&D organizations in large corporations (research and development centers, new business development organizations, etc.) must seek out and act on latent market potentials with sensing and continuously or semicontinuously set down and execute medium- to long-term R&D plans through the seizing and transforming processes.

The basic research and creation of ideas that are the source of new strategic innovation require (depending on the field) a longer period of time as the ratio of the scientific element and the degree of technological difficulty rises. Achievements in Domain I are largely due to the creative thinking and actions of middle managers and staff in company R&D departments and business development divisions (Kodama, 2005b; Nonaka, 1988), but there are also substantial commitments and strategic contributions made by top- and upper-level managers based on the policies of "doing the right things" (D. J. Teece, 2014). Moreover, there are important "signature processes" (Bruch & Ghoshal, 2004; Gratton & Ghoshal, 2005) in large traditional (leading) corporations that are difficult for other companies to copy. These signature processes also raise the quality of R&D. The author calls this domain "strategic emergence."

The asset orchestration process in Domain I entails practitioners' pursuit of reconfiguration/transformation through learning with hypotheses verification in line with R&D objectives and coordination/integration of a wide range of intangible assets. Hence, there are diverse patterns for asset orchestration. There are still many cases in many traditional companies under conventional hierarchical systems of closed innovation centered on internal laboratories and development divisions (Japanese manufacturing is a typical example; e.g., Kodama, 2009). To develop incremental innovation or sustaining innovation through path-dependent knowledge accumulated in the past (Christensen, 1997), closed innovation is still an important process. In traditional high-tech fields such as the heavy electrical, nuclear power generation, aviation, vehicle equipment, machine tool, medical machinery, and semiconductor processing equipment industries, closed innovation plays a critical role.

In contrast, in industries such as ICT, technologies are rapidly advancing, and the best technical achievements and know-how are becoming increasingly spread out across the globe. In these fast-moving environments, open innovation is adopted (Chesbrough, 2003), partial core intangible assets are incorporated from externalities, and hence processes to merge and integrate intangible assets both within and from the outside of companies are critical (e.g., Kodama, 2009). Here, in these processes, of particular importance is coordination and integration in asset orchestration of various resources performed by top and leading middle managers in an entrepreneurial fashion (D. J. Teece, 2007).

Specifically in Domain I, companies must explore ways to find their business models. With the aim of finally bringing about completed items such as products and services or core technologies such as devices, should a company adopt a vertical integration model or focus on its area of specialization through horizontal disintegration? While searching out strategic alliances (strong or weak ties) with other companies and reinforcing technologies, should a company build new value chains through coordination and integration of intangible assets—the strengths of the company and other companies—forged through strategic collaboration across different types of business? Thus, allowing for expanded diversification of asset orchestration, practitioners have to concentrate on learning through trial and error, experiments, and testing activities.

In strategic emergence Domain I, companies have to hypothetically test their corporate boundaries in response to strategic objectives or business environments and make attempts at reconfiguration/transformation as a variety of entrepreneurial asset orchestration through these processes of trial and error. If it is advantageous to develop or manufacture in house, then it is better to configure a vertical value chain model with a focus on creativity (Kodama, 2009). In contrast, if another company has achieved more with its developments than those in-house, there are many cases in which a company should abandon its development efforts and focus on efficiency not only through strategic outsourcing but also through strategic alliances, joint developments, and Merger and Acquisition (M&A) to access and acquire external intangible assets. The important thing with this kind of asset orchestration processes is "cospecialization" (D. J. Teece, 2007). Cospecialization is the way the levels of synergies of core technologies and so forth are raised in business, and the process of cospecialized assets orchestration is an important factor in raising a company's dynamic internal and external congruence in capabilities (Kodama, 2018).

4.2 | DC in Domain II

Next, the core technologies and business concepts that migrate from the slow-moving environment of Domain I, with rapidly changing of the in-house (or occasionally external) acquisition of human resources and the maintenance and upgrading of organizations oriented to business incubation to the dramatically transforming environment of Domain II with its sustained speed of change and uncertainty. In this domain, the exploration processes arising from DC (MI dynamic or breakthrough innovation) by G. O'Connor (2008) are promoted. This domain corresponds to the incubation phase of hypothetical setups, experiments, and assessments mentioned by G. O'Connor and DeMartino (2006). Learning through trials and experiments also leads to less risk and uncertainty of markets and technologies and greater probability of success for incubation aimed at realizing radical innovation (G. O'Connor, 2008).[2] Then top and middle management makes decisions aimed at selecting and bringing to market the rigorously tested and evaluated product, service, and business models.

In Domain II, the incubation phase, "seizing" in divisions involved in development for commercialization at the business side plays a major role in achieving radical innovation. Divisions developing for commercialization must use the sensing function to match technical innovations with markets (latent customer needs, etc.), while engaging the functions of seizing and transforming for radical innovation as the commercial development of new businesses, new technologies, and new processes. Thus, practitioners must pursue entrepreneurial strategies (Mintzberg, 1978), demonstrate commitment, and make strategic engagement based on the basic policy of doing the right things. As well as that, the quality of the signature processes unique to a company that were required in Domain I is more strongly reflected in Domain II. This is because there exists the so-called "valley of death" (Branscomb, Auerswald, & Chesbrough, 2001; Markham, 2002; Merrifield, 1995), which can be a serious impediment to commercializing the outcomes of R&D. The capabilities to surmount these hurdles are largely down to these rarified signature processes unique to companies.

Although G. O'Connor (2008) confines this incubation domain to trial experiment and assessment models, there are many cases of current business activities that go beyond trial experiments while coexisting with uncertainty and dramatically changing, fast-moving environments to the launch of commercial businesses that entail companies boldly undertaking risks with a high degree of uncertainty. In

this domain, numerous cases arise where the excessive trust and commitment of the leaders and managers lead to strategic activities, based on the creation of business through trial and error, but it is still unclear whether the newly developed ideas and prototypes are capable of building new business models and value chains.[3] Such cases are typical in the new online business world where products are both trialed and launched in dramatically changing domains of general high risk and uncertainty. A key point is how to select and implement promising, valuable business. Hence, the author calls this domain "strategic selection."

In this domain, the asset orchestration process entails selection and narrowing down of the diverse intangible and tangible assets trialed and experimented on in the strategic emergence domain. In this domain, through the processes of (a) coordination/integration, (b) learning, and (c) reconfiguration, the level of completeness of asset orchestration as products, services, and business models is raised. Depending on circumstances, there are cases where it is necessary for a corporation to rethink its corporate boundaries (both vertical and horizontal) or its relationships such as partnerships with other companies and realign or reconfigure its assets.

4.3 | DC and OC in Domain III

Next, the new businesses (including new products and services) chosen through strategic selection in Domain II to have prospects for the future and somewhat reduced uncertainty shift to Domain III, where uncertainty is reduced to some extent and external (environmental) and internal change is sustained. Domain III is the stage where the radical innovation incubated (or partially commercialized) in Domain II enters a growth orbit and corresponds to the "acceleration phase" mentioned by G. O'Connor and DeMartino (2006). According to G. O'Connor (2008), this is where the exploitation process is promoted by breakthrough innovation capability. This domain achieves the building and optimization of processes and value chains for the selected new businesses.

Then new business functions are wholly or partially transferred to the business divisions appropriate to accelerate commercialization (or else new business divisions are newly established or made independent as external ventures), and further resources are intensively invested through doing the right things and the strategic commitment of top and middle management. For this reason, the author calls this domain "strategic concentration." In the past, a large number of product and service development projects for major corporations (e.g., Kodama, 2005a, 2005b) invested management resources through asset orchestration in commercialization through this kind of shift from strategic selection to strategic concentration.

In Domain III, where environmental change is fast and the competition with other companies is fierce, the role of transforming at the business side plays an important role in surviving the so-called "Darwinian Sea" (e.g., Dismukes, 2004; Auerswald & Branscomb, 2003). Here, the Darwinian Sea illustrates a sea burgeoning with new organisms in competition with each other. Because competing amongst rough sea and being culled is the process of evolution of organisms, this metaphor was proposed because it similarly implies evolution in business. As time passes, newly developed products and businesses burst into competitive environments with other companies with this shift into Domain III. Nevertheless, although the degree of shift into a competitive environment depends on the industry or the features of a product, the actual birth of a competitive market means that uncertainty in the environment, in other words, the market, is low. In contrast, divisions such as product planning and technical development positioned upstream in the value chain at the business side (Head Quarters (HQ) and business units, etc.) also function to sense and detect changes in newly born markets and establish robust value chains through seizing and transforming for upgrades, improvements, and new versions, by quickly and incrementally innovating (sustainably advancing technologies) new products and services that have been successfully commercialized. For this reason, practitioners pursue entrepreneurial strategies (that include elements of both deliberate and emergent strategies) and demonstrate commitment and strategic engagement based on the basic policy of doing the right things.

Moreover, to win out over the competition in Domain III, there is significant dependence on the "willpower" (Bruch & Ghoshal, 2004) of a company's unique signature processes. Willpower is the energy and concentration of the thinking and action that come with a sense of purpose. Energy means vigor, and concentration directs energy toward a particular outcome. Practitioners paint clear scenarios of their intended strategy in their minds, with the most important factor being that they dedicate themselves to planning so as to consciously bring their strategy into being in the midst of stiff competition. In this domain, much of the burden is also carried by the unique and highly rarefied signature processes of a company through willpower. A strategy can be defined as "a coherent set of analyses, concepts, policies, arguments, and actions that respond to a high-stakes challenge" (R. Rumelt, 2011, p. 6) says D. J. Teece (2014, p. 341). The best strategic actions require preparation of the elements of (a) a diagnosis, (b) a guiding policy, and (c) a coherent action brought about by the unique signature processes of a company based on willpower (R. Rumelt, 2011). Currently, the smartphone market is also in this Domain III stage. In Domain III, the completion level of products and services is raised for upgrades, improvements, and new versions with rapid incremental innovation following commercialization, through the processes of asset orchestration promoted and concentrated to complete value chains.

However, in Domain III, to get new products, services, and businesses off the ground and win out over the competition, robust value chains must be configured to survive the Darwinian Sea. As mentioned, organization supervisors and staff in product planning and technical development divisions on the business side upstream in the value chain must demonstrate strong DC, however in contrast, staff and leaders in routine divisions downstream in the value chain (marketing and sales, technical management, procurement, manufacturing and after support, etc.) need thoroughly reinforced operations management enabled through strong OC. These downstream-positioned organizations require strong OC to get their current products (and their successor upgraded and improved versions) onto the market and win out amid stiff competition and turn a profit. Thus, the capabilities required in Domain III are essentially different from those required in Domains I and II—In Domain III, the strong integration of DC and OC is of particular importance (see Figure 1).

4.4 | OC in Domain IV

Meanwhile, a great deal of existing business is positioned in Domain IV, in slow-moving market environments with low uncertainty and a low rate of change. Here, incremental innovation is promoted with the aim of systematically enhancing business efficiency through the exploitation process, which comprises activities to improve existing business using mainstream organizations that demonstrate their inherent OC (D. J. Teece, 2007, 2014).

In Domain IV, the weight on DC diminishes, and the focus shifts to the demonstration of best practices through OC. For existing traditional line organizations (business units, etc.) slow changes in existing markets are observed, and existing operations in formal organizations are executed through path-dependent planning in business divisions and carefully considered deliberate strategies through strict, top-down centralized leadership (Kodama, 2004). Driving soft incremental innovation by strengthening OC in Domain IV requires bringing about higher performance by evolving routines through higher order learning for short-term gain, depending on internal and external changes (Benner & Tushman, 2003; King & Tucci, 2002; Nelson & Winter, 1982; Winter, 2000). Promoting this Domain IV process management accelerates an organization's speed of response to achieve incremental innovation (Benner & Tushman, 2003). However, there is always a danger that product lineups in Domain IV could be threatened by emergent technical innovations. Thus, the author calls this domain "strategic efficiency."

Mostly, businesses in Domain IV (products and services) are those that have survived the competitive environment of Domain III and come into Domain IV and that entail conversion of old and new businesses over long periods of time (Markides, 2001). In other words, this means the replacement of existing strategic efficiency business in Domain IV with strategic concentration business in Domain III, arrived at through the path of radical innovation (Domains I ➔ II ➔ III; in other words, conversion of new and old businesses). The simultaneous management of

existing and new strategic positions discussed by Markides (2001) is combined in Domains IV and III, respectively. In shifting from an old position to a new one, existing businesses initially positioned in Domain III are replaced by new businesses that have grown and accelerated in Domain III (though the Domains I ➔ II ➔ III shift), which means existing businesses in Domain III shift to Domain IV.

As above, in describing the dynamics of the shifts between domains in the capabilities map, of particular importance is the strategic actions in Domains III and IV that aim for ongoing corporate strategic innovation and sustainable growth. According to the "capabilities lifecycles" framework of Helfat and Peteraf (2003), companies uncover capabilities opportunities to achieve further radical innovation and drive new DC in Domains III and IV to handle capability threats as they arise and then achieve the shift into Domain I (see Figures 1 and 2). In other words, as discussed following, leading companies engage in a spiral of strategic activity through these four domains to achieve strategic innovation through the synergies with dynamic environmental change (Domains I ➔ II ➔ III ➔ IV ➔ I and/or III ➔ I ➔ ...).

4.5 | Strategic innovation loop and the strategic innovation capability

When considered from the viewpoints of corporate exploration and exploitation processes based on radical and incremental innovation and the time axis of business contexts, the four domains form a continuous domain loop (see Figure 2). The strategic emergence (Domain I) and selection (Domain II) domains, which are exploratory processes through DC (asset orchestration), are the core processes for radical innovation. Strategic concentration (Domain III) is the acceleration phase indicated by G. O'Connor and DeMartino (2006). This phase rapidly sets up new product, service, and business model markets through the exploratory processes of strategic emergence and selection and shifts the domain from exploration to exploitation. Strategic
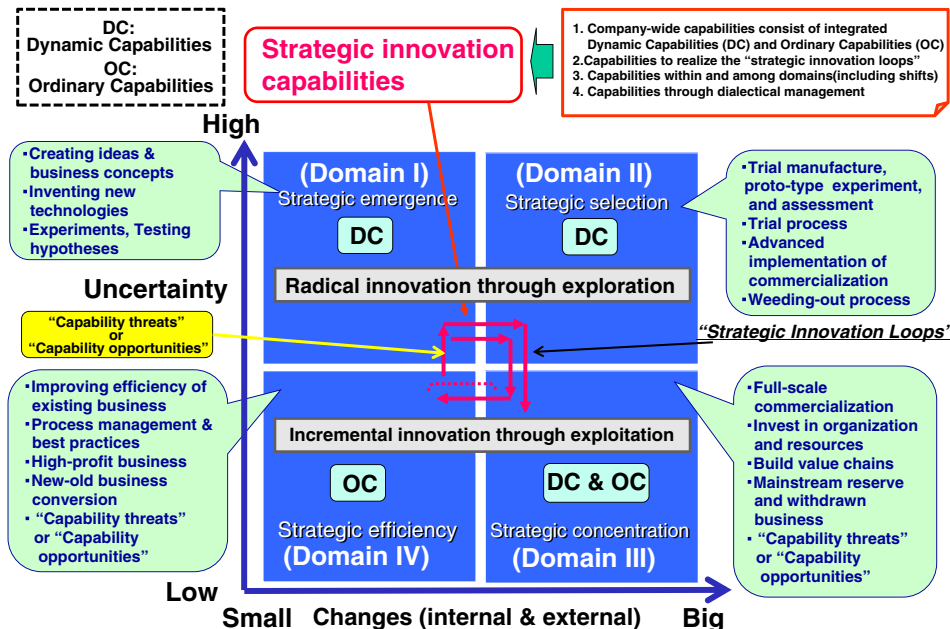
FIGURE 2 Strategic innovation system [Colour figure can be viewed at wileyonlinelibrary.com]

concentration becomes the origin of a new path of newly generated radical innovation that differs from the existing business of the strategic efficiency domain (Domain IV).

In this strategic concentration domain, newly generated business always undergoes major internal or external change in its initial phase. At this stage, it transforms internal elements aimed at building optimal value and supply chains in response to external change. As discussed, strong integration of DC and OC is required in this strategic concentration domain.

Among these strategic concentration businesses, which are subject to major change, businesses that succeed in establishing themselves in the market and achieving stability as mainstream operations shift to slow-moving (or small) strategic efficiency domain while promoting still greater operational and business process efficiency measures and either become part of the existing mainstream lineup or undergo business integration (which promotes still greater business process efficiency through strong OC).

However, businesses subject to major external change of markets and technologies following mainstream growth and major internal changes in areas such as strategy, organization, technology, operations, and leadership (e.g., the ICT industry involving broadband and smartphones, on-line businesses, and digital consumer electronics) always become positioned in this strategic concentration domain. Put another way, businesses growing in a mainstream direction become deployed in one or both of the strategic concentration and efficiency domains. Although new business in the strategic concentration domain is the "mainstream reserve," this does not mean that all business can grow in a mainstream environment subject to major changes, and some businesses have to withdraw. This is especially true of the ICT industry.

In this way, the flow of radical innovation for major corporations shifts from Domains I to II, then III (where some businesses undergoing major changes maintain their position) and finally to Domain IV (see Figure 2). Mostly, businesses in Domain IV (products and services) include those that have survived the competitive environment of Domain III and shifted into Domain IV and entail conversion of old and new businesses over long periods of time (Markides, 2001). In other words, this means the replacement of existing strategic efficiency business in Domain IV with strategic concentration business in Domain III, arrived at through the path of radical innovation (Domains I ➔ II ➔ III; in other words, conversion of new and old businesses). The simultaneous management of existing and new strategic positions discussed by Markides (2001) is combined in Domains IV and III, respectively, and in shifting from an old position to a new one, existing businesses initially positioned in Domain III are replaced by new businesses that have grown and accelerated in Domain III (though the Domains I ➔ II ➔ III shift), which means existing businesses initially in Domain III shift to Domain IV.

Realistically, however, although major corporations promote various strategically innovative projects, only some of them survive to become success stories after the natural selection process involved in the shift from Domains I to III. Amabile and Khaire (2008) note a number of cases where outstanding ideas and business models born in Domain I have been diluted and ended in failure after a major corporation employs a different managing organization to realize (commercialize) them.[4] This is one issue surrounding strategic innovation in a major corporation. Looking at the above domain shifts at the microlevel in organizations, there are feedback mechanisms through the interactions in each domain, whereas at the macrolevel, there are spiraling feedback loops, making this model a model that also covers the chain-linked model of Kline (1985).

The most important interdomain shift is that from Domains III and/or IV to I. This is the path that creates new radical innovation (see Figure 2). In the capabilities lifecycles of Helfat and Peteraf (2003), large corporations involved in businesses in Domains III and IV seek out new capability opportunities, and their direct facing of capability threats is also a strategic action enabled through the demonstration of DC. This corresponds to the process that accelerates environmental and internal interaction and creates new ideas and new technological inventions and discoveries based on high-quality tacit knowledge (Nonaka & Takeuchi, 1995). This knowledge is cultivated through the practice of researchers, engineers, marketers, and strategy specialists in shifting from Domains I to IV (accumulating and integrating new practice through existing business practice and incremental and radical innovation) via the "transformational experience" (Amburgey, Kelly, & Barnett, 1993; King & Tucci, 2002) of previously existing business routines and strategic innovation. King and Tucci (2002) suggested that the transformational experience of practitioners involved in the continual (Katz & Allen, 1982) and large-scale (M. Tushman & Romanelli, 1985) organizational innovation of product development teams leads to continuous new product innovation and resets rigid organizational inertia. Put another way, it enhances potential for embedding new capabilities in organization members aimed at creating new strategic nonroutines based on DC to transform organizations and realizing radical innovation.

Although excessive adherence to existing knowledge to create new knowledge integration (e.g., Kodama, 2009) becomes a hindrance, the absorption of knowledge from different sectors and industries from a scientific, technological, and marketing viewpoint and the knowledge integration process can trigger new radical innovations. Various innovation theories including the importance of shedding the "mental model" (e.g., Spender, 1990), the focus on "peripheral vision" (Day & Schoemaker, 2005) and "boundary vision" (Kodama, 2011), and the challenge of achieving "cross innovation" (Johansson, 2004) and "destructive innovation" (Christensen, 1997) confer precious insights as regards innovators, but more detailed theory building is yet to be undertaken. As discussed later, the author considers, as a proposition, that the evolution and diversification of high-level strategic nonroutines through the formation of "strategic communities (SCs)" (see Box-1) in Domains III and IV fundamentally promotes DC (asset orchestration) while inducing a shift from Domains III and/or IV to I arising from the incremental innovation and integrating new knowledge (assets) inside and outside the company (Kodama, 2009) raise the probability of achieving new knowledge integration as a radical innovation.[5]

The author would like to explain the following three new insights obtained from this framework and use them as a basis for explaining strategic innovation capabilities. The first point is that outstanding companies possessing the dynamic view of the capabilities deliberately (including some emergent elements) drive loops comprising continuous shifts among domains (termed "strategic innovation loops" [see Figure 2]) from Domains I ➔ II ➔ III ➔ IV ➔ I and/or III ➔ I. This dynamic view of capabilities coestablishes the different modes of the

exploratory and exploitative processes and secures long-term corporate growth (e.g., Benner & Tushman, 2003; March, 1996; M. L. Tushman & O'Reilly, 1997). These two processes (Holland, 1975; March, 1991) do not employ opposing strategic activities; rather, companies must implement strategy while skillfully balancing the strategic activities in a mutually complementary way (He & Wong, 2004).

Meanwhile, Zollo and Winter (2002) propose a knowledge evolution process based on adjusted evolutionary theory. Continuous routine activity well-considered within this process can become a trigger to shift from the exploitation to the exploration process, and experiential knowledge accumulated from learning activities is also an element in creating new DC (corresponding to a shift from Domains IV and/or III to I). These authors explain how the recursive processes and coevolution of these different modes simultaneously promote corporate challenges and routine processes.

Also, regarding short- and long-term strategy and organizational reform, Dixon, Meyer, and Day (2014) present a theoretical framework of the "DC cycle" derived from an in-depth longitudinal case study on a Russian oil company. In this concept, they cite two capabilities demonstrated by the company in its development processes over the short and long term. Here, the first capability is the ability of a company to regularly polish its extant knowledge (i.e., OC) to respond to environmental changes and engage in "adaption DC" as exploitation activities to temporarily gain a short-term competitive edge. The second capability is the ability for "innovation DC" (i.e., DC)—exploration activities for a company to acquire sustainable, long-term competitiveness through unique creative ideas and action. These researchers named these patterns of execution of strategy the DC cycle in which leading companies cycle these two different capabilities through time (both asynchronously and synchronously) to execute strategies.[6]

In contrast to the DC theory of dynamic resources reconfiguration, divestment, and integration to handle environmental changes (D. Teece et al., 1997), the DC cycle offers a model that takes into account capabilities factors to achieve radical innovation, such as further exploration (March, 1991) or path creation (Garud & Karnoe, 2001).

The second point is that observing large corporations at selected times on a time axis indicates the constant presence of the different business contexts of Domains I to IV. With large corporations, multiple projects oriented to strategic innovation function as layered strategic innovation loops on different time axes. Top and middle management must therefore manage appropriately within and among these domains. Management to smoothly implement the domain shift through the strategic innovation loop is also key. Different strategies, organizational structures, technologies, operations, and leadership are required within each of these domains.

However, from these discussions, an especially important question is how the skills and expertise that create the strategic emergence (Domain I), which is the new discovery and invention domain, from accumulated experiential knowledge (which arises from diverse high-level strategic nonroutines through DC via the continuous strategic innovation loops) and absorb and integrate new knowledge outside the company can be created by the asset orchestration process.

Regardless, learning through higher order routines (Amburgey et al., 1993; Nelson & Winter, 1982; Winter, 2000) alone does not make it easy to shift from Domains III and/or IV to I. Although D. J.

Teece (2014, p. 338) states that "First, I reject the notion that dynamic capabilities reside *only* in high-level routines," he also states that "creative managerial and entrepreneurial acts (e.g., creating new markets) are, by their nature, often non-routine." In the same vein, D. J. Teece (2014, p. 332) quotes Steve Jobs, the late CEO of Apple, who said "Innovation has nothing to do with how many R&D dollars you have. When Apple came up with the Mac, IBM was spending at least one hundred times more on R&D. It's ... about ... how much you get it." Then, in an interview about product development at Apple (Burrows, 2004), Jobs described it as a blend of routine and creative acts: "Apple is a very disciplined company, and we have great processes. But that's not what it's about. Process makes you more efficient. But innovation comes from people meeting up in the hallways or calling each other at 10:30 at night with a new idea, or because they realized something that shoots holes in how we've been thinking about a problem."

That means, Apple's processes are based in OC. However, even if a new product development entails a number of routine components, Jobs said at least one thing has to be different. Those different things are the nonroutine establishment of strategy and activities of entrepreneurs. Hence, with his deep market understanding gained through his own sensing, Jobs was a driving force of new product development projects at Apple and the success of the company, as he prioritized the future based on his insatiable obsession to achieve easy-to-use products with attractive designs and advanced technologies (cospecialization through asset orchestration integrating hardware, software, applications, and contents). The creative acts of seizing and transforming brought about through diverse strategic nonroutine activities at Apple could also hint at exposing the secret of what Jobs described above as "get it" (D. J. Teece, 2012a). As a chain of creative actions, such asset orchestration itself can be described as the demonstration of DC themselves.

From the research we have conducted into organizations in corporations that achieve innovations as new products or businesses (including our own direct and indirect involvement; e.g., Kodama, 2002, 2003, 2004, 2005a, 2005b, 2006, 2007a, 2007b), the author would like to present the hypothesis that DC are generally demonstrated through strategic nonroutines in configurations of informal organizations (or informal networks), whereas OC are mainly enacted in formal organizations and main routine business.

Our accumulated research to date clarifies that depending on the characteristics of a business and environmental circumstances, the characteristics of informal organizations change in accordance with changes in boundaries (knowledge and organizational boundaries) in and between organizations (between practitioners at the microlevel) (Carlile, 2002, 2004; Kodama, 2014). Cited in the case study in details also, absorbing and integrating new knowledge assets or capabilities, in other words, promoting asset orchestration through DC, entails the formation of SCs with pragmatic boundaries to promote strategic nonrouting activities (see Box-1 The SC concept).

Point three is that analysis of the in-depth longitudinal case study in this article suggests that the exploration and exploitation processes are especially interactive. It has been argued that organizations within major corporations undertaking radical innovation should either be isolated both physically and organizationally from the mainstream organization or else operate as independent venture companies (e.g., Benner

& Tushman, 2003; Burgelman & Sayles, 1988; Hill & Rothaermel, 2003; Kanter, 1983). But an appropriate interface with existing organizations is also potentially significant for accelerating radical innovation from the viewpoint of strategy and resource integration (e.g., Heller, 1999; Kodama, 2003). Questions of organizational design (How much should a new business integrate with or separate from existing businesses? Is it better to have complete separation, complete integration, or something in between?; e.g., Burgelman & Sayles, 1988; Christensen, 1997; Goold & Campbell, 2002; M. L. Tushman & O'Reilly, 1997) are arguably more important in achieving strategic innovation.

Much of the previous research discussed management processes and organizations division, such as two distinct archetypes exploratory and exploitative, or incremental or radical (e.g., Greenwood & Hinings, 1993; M. L. Tushman & O'Reilly, 1997) and the ambidextrous organization (e.g., O'Reilly & Tushman, 2004). Little detailed analysis has appeared, however, of the interfaces and interaction among management elements such as strategy, organizational structure, technology, operation, and leadership, each of which differ for each of these two archetypes (e.g., Kodama, 2003 ; Kodama, 2004). Nevertheless, the coestablishment and coexistence of these two archetypes within the same large corporation and the skillful management of strategic contradiction (Smith & Tushman, 2005), creative abrasion (Leonard-Barton, 1995), and productive friction (Hagel & Brown, 2005) to create synergies are also important elements of successful strategic innovation. The coexistence of contradictions highlights the important roles not just of the top management (Smith & Tushman, 2005; M. L. Tushman & O'Reilly, 1997) but also of middle management and staff (Govindarajan & Trimble, 2005). The author calls this "dialectical management" (Kodama, 2003; Kodama, 2004).

Based on the insights above, strategic innovation capabilities is a concept that embraces the following four capabilities: entire corporate capabilities that integrate DC and OC; capabilities to implement the spiral strategic innovation loops; capabilities within and among domains, including shifts; and capabilities to achieve the coexistence of two different archetypes through dialectic management (see Figure 2). Moreover, strategic innovation capabilities embrace the existing dynamic and MI dynamic capability (or breakthrough innovation capability) concepts mapped in Figure 1 while aiming to expand the concept of DC and OC for individual product development projects at large corporations, in terms of innovation capabilities for a corporate or management system. This article calls the kind of management system that uses strategic innovation capabilities to activate the spiral of the strategic innovation loops and continuously coestablish existing business with strategic innovation business the strategic innovation system[7] (see Figure 2).

5 | IN-DEPTH LONGITUDINAL CASE STUDY OF NTT DOCOMO—NTT DOCOMO'S STRATEGIC INNOVATION SYSTEM

In this section, regarding the innovation process mechanisms that have enabled the major Japanese telecommunications carrier NTT DOCOMO to grow throughout its history, the article presents and analyzes the in-depth longitudinal case study of NTT DOCOMO's

strategic innovation based on the concept of the strategic innovation system, which is a corporate system capability for companies to achieve strategic change through strategic innovation mentioned in Section 4. It then suggests the mechanisms by which NTT DOCOMO acquired its strategic innovation capabilities, showing how it implemented spiral strategic innovation loops and dialectical management at each stage of its past, present, and future innovation processes.

The Japanese mobile telephone market is now a mature market supporting around 100 million units. In its growth period, getting new customers took priority, although now, as new customer acquisition is no longer the focus, NTT DOCOMO puts its efforts into providing its existing customers with new smartphone-centered services as well as pioneering other new businesses. This specifically entails "The Seven Challenges of DOCOMO," they being (a) service personalization, (b) development of social support services, (c) development of combined services, (d) advancing video services, (e) implementing the next generation network, (f) advancing terminals, and (g) global developments. Innovation strategies at NTT DOCOMO are currently in Phase 4, the action support phase, which mainly focuses on personalization, as shown in Figure 3.

In the past, the world-leading Japanese mobile phone services pioneered this market. As shown in Figure 3, NTT DOCOMO innovation processes involve four phases, chronologically from the past to the present (Phase 1, communications support; Phase 2, information support; Phase 3, living support; and Phase 4, operations support). This article describes and analyzes these phases in order, from the perspective of the strategic innovation system theoretical model discussed above.

5.1 | Phase 1: Communications support (pioneering the mobile telephone market)

In 1992, to ensure fair competition in the telecommunications market, the mobile communications arm of the Japanese largest telecommunications provider NTT Corporation was split off. This was the birth of NTT DOCOMO (DOCOMO hereinafter). DOCOMO's first CEO Koji Oboshi brought staff together and bred new value and unity to break out of the negative cycle of being unable to sell mobile phones. This enabled DOCOMO to raise and share awareness of creating new markets among staff and got DOCOMO's finances out of the red. By sharing a sense of crisis among staff, the company was able to raise their mentality to the level needed to take on a new business challenge.

At the time of its inception, DOCOMO was a small organization, and its staff always approached work by spanning organizational boundaries and sharing the knowledge and information that they had; hence, they created a culture of advancing business with common values and objectives. Staff with specializations, such as marketing, sales, technology, development, maintenance, after service, and planning, forms informal project teams and task teams across organizational boundaries to deal with a range of urgent issues and voluntarily and autonomously forms SCs across the whole company (see Box-1 The SC concept).

At the time, existing mobile telephone services were analogue and had emerged from car phones, but to break away from the negative cycle of being unable to sell analogue mobile phones, the company
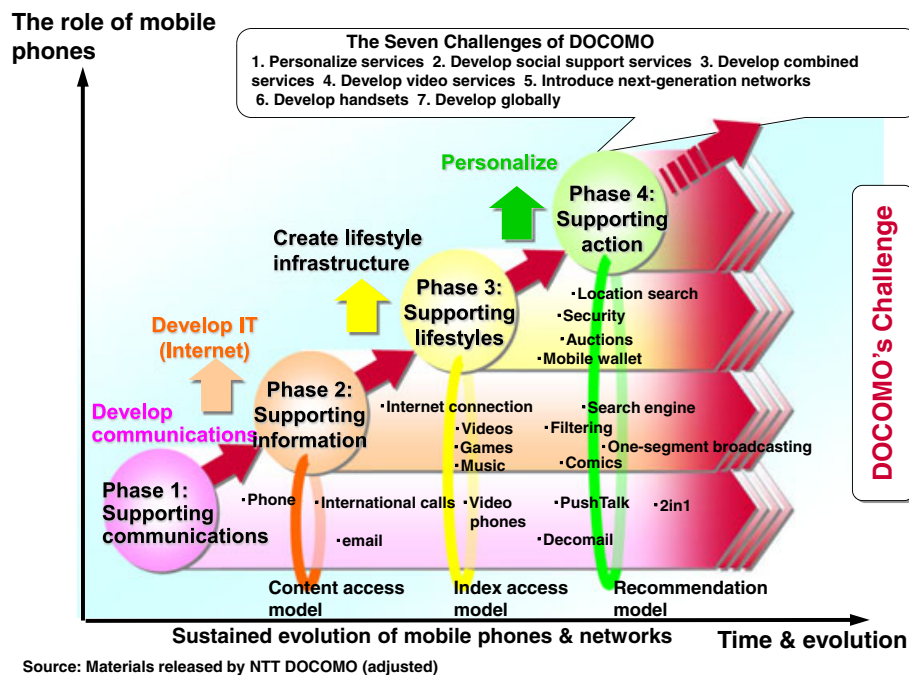
FIGURE 3 DOCOMO's challenge: evolving services [Colour figure can be viewed at wileyonlinelibrary.com]

formed SCs within itself and engaged in many discussions and much dialogue on a range of issues. Also, providing base mobile phones support, leaders and managers of the company's R&D and technical departments formed SCs with mobile telephone manufacturers to bring about the world's lightest digital mobile telephone development, surpassing the high functionality of those of Motorola, which they achieved commercialization of through joint development and repetitive trial and error.

As well as that, DOCOMO also created a sales network by outsourcing mobile telephone sales to existing dealerships and agencies such as electronics retailers. This enabled DOCOMO to expand its sales channels in a relatively short period of time, and as well as increasing its share, the company was also able to stimulate new demand. In this way, by strategically outsourcing its traditional line organizations and expanding its sales channels through the creation of SCs, DOCOMO brought about new demand creation all the way from its conventional business layers, through to markets expanded to the level of the individual consumers. Thus, DOCOMO had engaged in conversion of old and new core service businesses as the market shifted from the first generation analogue mobile telephone services to the second generation of high-quality, low-cost mobile communications with digital mobile telephone services. In Domain IV, as is illustrated by the analogue mobile services, compared to the analogue services that were in their heyday, this process shows the conversion of old to new business (see Phase 1 in Figure 4). In contrast, Domain III requires strong integration of dynamic and OC to bring about new versions of digital mobile phone services in the fast-moving competitive environments with other companies in the same business. At the same time, in the slow-moving environments in Domain IV, OC were demonstrated to maintain (and gradually retrench) the existing analogue business that was about to make a retreat (although later in Phase 2, analogue services were retired).

Nevertheless, as DOCOMO grew rapidly by expanding its share of the pie with demand creation, even though the company was right at the peak of its mobile phone sales in 1996, Oboshi quickly predicted the next danger the company would face, believing that not changing the *status quo* and becoming complacent would present a risk. Hence, Oboshi resolved to undertake bold strategy transformation and pioneer new markets. Then in July of 1996, the company took immediate decisive action with newspaper corporate advertising. This entailed DOCOMO launching its new vision, the conversion from volume to value. First, the company succeeded in developing radio packet communications as network infrastructure. Then, the company began providing services to connect mobile phones to small computers. In the same period, with the spread of the Internet, DOCOMO put a simple browser in its mobile phones and, with this Internet access, successfully created explosive demand leading to rapid increase in users with 20 million subscribers signing up in 2 years. This was Phase 2, or "information support" as discussed following, in which the company took up the challenge of making multimedia available through mobile telephones.

Phase 2 was triggered by the shift from Domains III (and/or IV) to I of the technical accumulation over many years in Phase 1 at DOCOMO, with its existing mobile communications services in Domains III and IV (both analogue and digital systems). In short, this was the beginning of the i-mode development. With the objective of achieving further radical innovation, DOCOMO uncovered capability opportunities (Helfat & Peteraf, 2003) with i-mode as packet communications, while at the same time, drove new DC in Domains III and IV to successfully shift to Domain I to handle capability threats (Helfat & Peteraf, 2003) from the saturated mobile telephone market (see Phase 1 in Figure 4).

The i-mode development was handled mainly by the "Gateway Business Department" (GBD hereinafter), which was an in-house
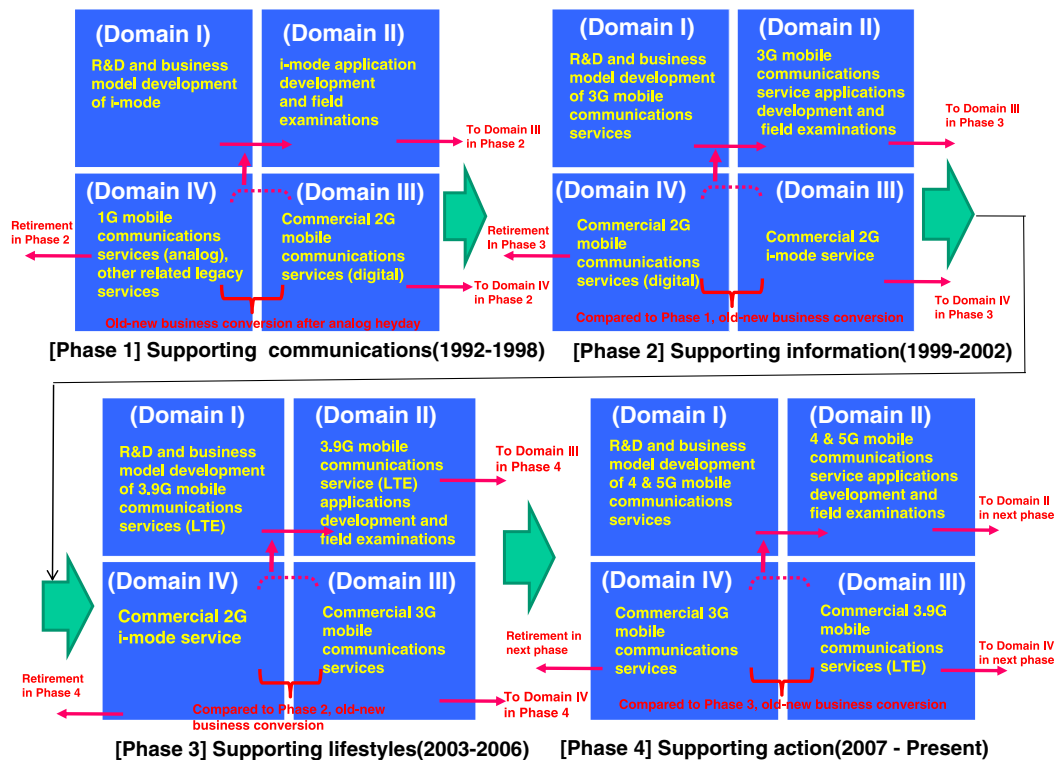
FIGURE 4 Strategic innovation system in NTT DOCOMO. R&D = research and development; LTE = long-term evolution [Colour figure can be viewed at wileyonlinelibrary.com]

R&D and business project, and that not only entailed a wide range of technical developments such as mobile telephones to handle packet communications, i-mode servers, and radio packet communication systems in Domain I but also involved the development of never-before-seen business models for new applications and content services. Then, the shift from Domains I to II entailed repeated trial and error and experimentation (see Phase 1 in Figure 4). Here, in Domains I and II, the R&D departments and GBD demonstrated DC. In particular, regarding the development of a business model, GBD achieved a brand new value chain in mobile telephone services with the mobile telephone terminals, the i-mode platform, and its applications and contents (see Box-2 Overview of the i-mode development).

Box-1 The SC concept

SCs have characteristics of "Ba" (Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995) and are defined as follows (Kodama, 2005b, p. 28).

> SCs are based on the concept of Ba as shared spaces for emerging relationships that serve as a foundation for knowledge creation. Participating in a Ba means transcending one's own limited perspective or boundary and contributing to a dynamic process of knowledge creation. In an SC, members (including customers) who possess different values and knowledge consciously and strategically create Ba in shared contexts that

> are always changing. New knowledge and competencies are formed by the organic merging and integration of communities to form new Ba to address multiple new eventualities. From a practical aspect, SCs are viewed as informal organizations possessing elements consistent with both the resource-based view of emergent shared context learning and the planned strategic-based view of planning for a target market position.

Furthermore, noting that SCs have characteristics of small-world structures in network theory, the author remarked as follows (Kodama, 2009, p. 469).

> SCs are groups forming small-world structures where practitioners in diverse specializations realize innovations aimed at solving the issues facing them and implement problem-searching and creative strategies. Short connections between nodes (people are the first unit nodes) and local clustering are features of small-world structures. For example, short paths among nodes of practitioners belonging to heterogeneous organizations enable easier access to other practitioners within a firm or based in other firms, including customers. Each node in a small-world structure is embedded in a local cluster. This clustering

then enhances the possibility of fostering reliable accessibility. A small-world structure can be formed by either randomly rewiring a portion of an existing regular network or attaching each new node to a "neighborhood" that already exists.

In this way, SCs have characteristics of Ba or small-world structures as networks, but in practice, they also have characteristics of pragmatic boundaries (Carlile, 2004). For example, the author asserted (Kodama, 2005a, p. 40) that in actual business activities SCs play the following role.

SCs provide pragmatic boundaries, allowing actors with different contexts to transform existing knowledge. A variety of problems or issues is posed on pragmatic boundaries, and actors need challenges that are aimed at solving these problems and issues and creating new knowledge. The actors of an organization thus require practical yet creative confrontations or conflicts and also political negotiating skills. Innovation or creativity emerges on the boundaries between the disciplines and specializations of different organizations.

On the other hand, Taifi and Passiante (2012, p. 2125), who discuss new products and service development through SC creation, note the following in regard to the importance of the formation of SCs in the automotive sector.

Their case study provides and analyzes the structural characteristics and success factors of an SC of after-sales services firms in the automotive sector. The study shows that it is important to have entities—more precisely SCs —dedicated to the after-sales services firms for the integration of their technical knowledge in the innovation process. The SC plays a key role, which is to contribute to the development of both the products and the services of the automaker. The article contributes to the literature on SCs, which is one of the most important entities of interorganizational collaboration and innovation.

Box-2 Overview of the i-mode development

In January 1997, Keiichi Enoki, who was the managing director of corporate sales and marketing department, was instructed by Oboshi to develop mobile multimedia service that ordinary people could access with their mobile telephones. Oboshi also told Enoki to form a new organization from personal scouted from outside the company and recruited in-house and gave Enoki full authority to start up the new service (both in terms of personnel and capital).

Enoki brought together conspicuously talented people from outside the company (contents specialist Mari Matsunaga from Recruit, Takeshi Natsuno from an IT venture, and others) and started the project initially with 10 people (supervising gateway), which grew to 70 people by August of 1997, which was the launch of the new GBD organization mentioned earlier. Then, with Enoki taking the lead, GBD undertook the development of the new i-mode service. Including Oboshi and Enoki, GBD staff shared visions and their individual ideas toward developing the new service.

Analyses of the success of the i-mode have been reported in a number of existing research articles (e.g., Kodama, 2002, 2009; Peltokorpi, Nonaka, & Kodama, 2007). The activity of the organization configured from dissimilar personnel from both inside and outside of the company played a major role in the success of i-mode. Many of the personal making up the new GBD organization were midcareer business people head hunted from outside the organization—There were not actually many from NTT. Although DOCOMO had inherited the NTT corporate culture, this new organization had members that brought a new organizational culture dissimilar to the DOCOMO corporate culture. GBD received strong support from the then president, Oboshi, and was also separated both physically and geographically from the DOCOMO headquarters at that time.

In the process of developing i-mode, this new organization, GBD, had many interactions with staff involved in existing organizations at DOCOMO (departments from R&D, network design and facilities through to marketing and sales and system design, etc.). However, heading this organization, Enoki had to field in-house opposition and suspicions and get the understanding and consent of the entire company. According to Matsunaga (2000), at one time, in a meeting of executives, there was opposition to the i-mode idea, because the small mobile phone LCD screen was supposedly too small to see properly. In response, Enoki said the following: "The mobile phone we are developing is not targeted at people like those sitting at this table. It is aimed at your children." There was also opposition heard by staff within GBD, but Enoki stood up to it and managed a variety of friction.

One of the factors of success of the i-mode development was the effect of "positive interactions between the capabilities" of GBD and existing organizations. Driving creative abrasion (Leonard-Barton, 1995) and productive friction (Hagel & Brown, 2005), by prioritizing (organizing

trade-offs) the positive collisions and conflicting elements and combining contradictions of various staff opinions, knowledge, capabilities, and strategic objectives, brought about the new i-mode innovation. These processes enable DOCOMO to convert various frictions into cooperation. This required understanding and sharing of strategic objectives, clarified decision-making processes, and open in-house discussions between GBD and existing organizations.

Thus, second, a major factor in the achievement of i-mode was the achievement of asset orchestration, an element of DC through the formation of SCs (SCs with GBD and line organizations, SCs with contents providers and IT ventures, SCs with mobile terminal manufacturers, and SCs between platform vendors and other different businesses). This requires mechanisms for "cospecialization" (D. J. Teece, 2007) for improving abilities of the company and its partners (strengthening the strengths) through creative friction and abrasion to share awareness of objective (visions) and build trust, motivate partner corporations, and build win–win relationships (see Figure 5).

## 5.2 | Phase 2: Information support (pioneering the mobile multimedia market)

In this section, the i-mode development that enables internet connection through the Domains I ➔ II shift in Phase 1 was commercialized in Phase 2 (the shift to Domain III). Then, the older type digital mobile telephone services mainly for voice communications (Domain III in Phase 1) shifted to Domain IV in Phase 2. This was DOCOMO's efforts to convert the old business to the new for its core services. In other words, there was a conversion from old business to the new, compared to the Phase 1, mobile telephone services of i-mode in Domain III and conventional digital voice services in Domain IV (see Phase 2 in

Figure 4). In Domain III, strong integration of DC and OC was required to upgrade packet communication services in the rapidly changing competitive environment with other companies in the same business (other companies had followed i-mode with similar commercial packet communications services), whereas in the slow-moving environments of Domain IV, in which the existing voice-centered digital mobile telephone business had to be maintained (and gradually retrenched), OC were demonstrated (although later in Phase 3, voice-centered digital mobile telephone services were retired).

Hence, in Phase 2, with the accumulation of technologies for existing digital mobile telephone services and i-mode communications, a shift was triggered in DOCOMO from Domains III (and/or IV) to I for R&D into the third generation of mobile communications systems. With the objective of achieving further radical innovation, DOCOMO uncovered capabilities opportunities with the third generation of mobile communications systems and drove new DC in Domains III and IV to achieve the shift to Domain I (see Phase 2 in Figure 4). Thus, DOCOMO simultaneously engaged in R&D for the third generation mobile communications services and business planning and development for new services of Phase 3 (Osaifu-Keitai, voice and video delivery services, mobile broadcast services, and others) and testing and verification of these businesses at the same time as shifting from Domains I to II (see Phase 2 in Figure 4). Here, in Domains I and II, DC were demonstrated, particularly in the company R&D divisions, GBD, and the new mobile multimedia development division (of which the author served as a project leader at the time).

5.3 | Phase 3: Lifestyle support (building daily life infrastructure using mobile telephones)

Once i-mode subscriptions had reached 40 million, the next issues and challenges for DOCOMO were, first, spreading i-mode from domestic markets to international ones and, second, shifting from the second generation to the third generation systems. Then third was DOCOMO's long-sought challenge of mobile commerce typified by the Osaifu-Keitai, which entailed converting mobile telephones into
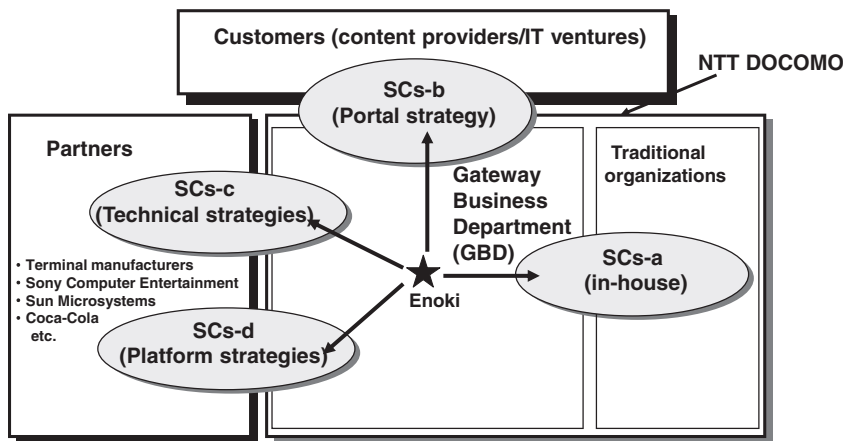
★: Business model configured through asset orchestration by forming strategic communities (SCs) around Enokiand GBD

SCs-a: Strategic communities of Gateway Business Department (a project organization) and traditional organizations (line organizations)
SCs-b: Strategic communities with content providers and IT ventures
SCs-c: Strategic communities with terminal manufacturers
SCs-d: Strategic communities with platform vendors and dissimilar businesses

FIGURE 5 Asset orchestration with dynamic capabilities to develop the i-mode business model

tools for daily life. The biggest issues in this phase were the growth of the domestic market with the current system, which had been bringing revenues, and the risks involved in new businesses in overseas markets and new generation systems. Nevertheless, DOCOMO was able to handle both of these aspects. An even bigger issue was how to set up new mobile telephone services as daily life infrastructure. Hence, DOCOMO set up strategic alliances with global partners to take up the huge challenge of globalizing and responding to the next generation systems and creating the tools for daily life.

First of all, the company developed i-mode and third generation systems with carriers in Europe, Asia and America. Second, DOCOMO formed SCs through strategic alliances with a range of different businesses, as new service strategies to create the mobile telephone daily life tools. Specifically, to achieve mobile commerce services, DOCOMO created SCs with a range of different businesses involved in the area of commercial transactions such as banks, credit card companies, convenience stores, and a variety of shops and railway companies. Particularly the collaboration with Sony was pivotal in the achievement of the Osaifu-Keitai, a device made possible by the inclusion of a noncontact IC card. Although Sony had already developed and released such an IC chip (called FeliCa), it had not been turning a profit. Nevertheless, Sony's strategic alliance with DOCOMO was a positive one to take risks for developing mobile commerce using mobile telephones. Thus, Sony and DOCOMO ended up establishing a joint business to set up the "FeliCa network." Then, by using the FeliCa network jointly developed by DOCOMO as the platform, DOCOMO was able to provide genuine mobile commerce services. After that in 2005, the company commenced services of its ID platform for credit services enabled for mobile phones through various credit card companies, and then in 2006, DOCOMO launched its own DCMX credit card.

Also, in the area of broadcasting, DOCOMO created SCs with major broadcasters with the aim of providing services combining terrestrial digital broadcasting with mobile telephone communications (mobile broadcast services). Not stopping there, DOCOMO set up strategic alliances and joint ventures in the content and Internet area and proactively formed SCs with development partners (for example, TI in the United States) for internal and external joint development of core mobile telephone technologies (hardware and software). In mobile phone developments, where short life cycles and high functionality are demanded, DOCOMO engaged in partnerships with semiconductor companies for rapid development of system large-scale integrated circuit (LSIs), which are core components. DOCOMO shared its mobile telephone development roadmap with mobile telephone developers and semiconductor manufacturers, so that DOCOMO could release mobile telephones with new functionality on to the market in a timely manner.

These SCs enabled the dialectic synthesis of various issues and problems and achieved i-mode (specifically, i-mode services commenced with licensing to carriers in Germany, Holland, Taiwan, Belgium, France, Spain, Italy, and the United States) and roaming services overseas and brought about the well-known Osaifu-Keitai daily life tool. Compared to the SCs of Phase 2, the SCs formed in Phase 3 were heavily characterized by their global nature and covered of a wide variety of industries and expanded technological scope. Thus, DOCOMO had embarked on development of new businesses and

services with the generations 3.9 services (long-term evolution [LTE]) for the next wave of innovations.

The achievements of these new service developments, such as the i-mode services enabling high-speed Internet connection with the 3G technologies, Osaifu-Keitai and video distribution services, which were shifted from Domains I → II, led to commercialization in Phase 3 (with the shift to Domain III). Hence, the conventional 2G i-mode services (Domain III in Phase 2) shift to Domain IV in Phase 3 with DOCOMO's efforts at conversion of its old core service businesses to the new. Thus, with the 3G i-mode services in Domain III and the 2G i-mode services in Domain IV, there was conversion of old business to new compared to Phase 2 (see Phase 3 in Figure 4). DC and OC must be strongly integrated in Domain III to provide upgraded versions of high-speed packet communication services in rapidly changing competitive environments with other companies (other companies following i-mode with 3G mobile services and similar service commercialization), whereas in Domain IV, in which the 2G mobile communications i-mode services were retreating in sluggish environments, OC were demonstrated to maintain existing business (however, later in Phase 4, the i-mode services for 2G mobile communications were retired).

In Phase 3, technologies accumulated with existing 3G mobile communications services and i-mode communications in Domains III and IV triggered the shift from Domains III (and/or IV) to I for R&D for the 3.9G mobile communications systems called LTE. With the objective of achieving further radical innovation, DOCOMO uncovered capabilities opportunities with the 3.9G mobile communications systems and drove new DC in Domains III and IV to achieve the shift to Domain I. Thus, DOCOMO simultaneously engaged in R&D for 3.9G mobile communications services, smartphone development to counter the Apple iPhone (which mostly ended in failure and retreat), business planning and development for new services and businesses of Phase 4, and testing and verification of these businesses at the same time as shifting from Domains I to II (see Phase 3 in Figure 4). Here, in Domains I and II, DC were demonstrated, particularly in the company R&D divisions, GBD, and the multimedia development division.

5.4 | Phase 4: Action support (building social infrastructure using mobile phone)

Although mature markets were ongoing, in Phase 4, DOCOMO needed to engage in strategic new business to respond to the Apple iPhone released in 2007. DOCOMO's executives had reached a conclusion that for the company to develop and drive sales of smartphones and grow sustainably into the future, it needed strategies that were essentially about moving from the competitive aspect of garnering new customers, to building longer term relationships with existing customers and deepening the company's ties with their daily lives.

Hence, in April of 2008, DOCOMO announced its "new DOCOMO declaration." At the root of this new strategy lays a condensed form of DOCOMO's strong determination for reform. Also, the company's brand renewal displayed DOCOMO's determination to radically rethink business operations to respond to market changes, rather than just a simple logo change. That new DOCOMO declaration entailed DOCOMO engaging in reforms with 25 projects based on

customer demands (enhanced DOCOMO shops, raising network quality, better pricing systems, etc.).

However, with the advent of smartphones, DOCOMO was coming to a major shake-up as the market shifted away from conventional mobile telephones to smartphones, an area that DOCOMO had led development. In the Japanese mobile telephone market, with its more than 100 million subscribers and high levels of maturity, many opportunities for growth appeared with the diversification of people's lifestyles and values, which offered new business potentials for DOCOMO, as opposed to merely raising the level of intensity to garner subscribers.

Thus, it became crucial to properly respond to diversifying customer values, as it had become difficult to differentiate from other companies merely with technologies and functionality in this market, due to the advanced functionality of smartphones and the fact that they could provide for most of the basic demands of customers. Recognizing this, DOCOMO set down new marketing strategies to apply to this new business environment, which it defined as its target corporate image of "a relation services company deepening the bonds between people, and people and their lifestyles." Unbound to the conventional mobile phone business area, DOCOMO now showed itself to be in pursuit of hospitality with its service businesses as basic policy. For example, with the evolution of the smartphone, a range of new services merged with smartphones appeared, and hence, it has become standard to take initiatives to innovate to make peoples' lives more convenient and comfortable.

To achieve this, in 2010, DOCOMO built a high-speed, high-capacity, low-latency network to drove mobile broadband through its LTE 3.9G mobile services, its main business, and provide advanced various mobile broadband services. Second, the company took initiatives with advanced mobile telephone terminals such as smartphones. These two initiatives were also part of the ongoing technological innovation roadmap at DOCOMO.

Third is personalization (see Figure 3), which entails enriching peoples' lives with initiatives to personalize services and functions to suit the needs and lifestyles of individual customers. For example, as mobile phones evolved from having specific functions to having things that they will do for the user as the need to be able to select and extract personalized information from among the huge range of services, products, and information available, DOCOMO aimed for ultimate "Aladdin's Lamp" such as mobile phones.

Fourth, the company developed new businesses (social support services) in the areas of environment, ecology, safety and security, and health management to produce value in new areas and achieve sustainable growth of society. Currently, issues are surfacing such as the environment and health care that must be solved for the sustainable growth of society. In this regard, with its 54 million subscriber base, DOCOMO is working toward solving social issues by advancing its strengths in networking, mobile terminals, and services to widen areas in which personalized mobile telephones are used for mobility and in real time, and aims to enable individuals to more efficiently act and consume, and hence, contribute to raising the productivity of society.

Hence, using its ability to build social infrastructure and promote alliances, DOCOMO is a company that has major social significance as it works to build social platforms to more efficiently distribute information and promote horizontal alliances with others in the area of mobile telephones, where its level of contribution is greatest. Developing these social support services involves linking solutions by individuals, corporations, and associations to social problems through mobile phones, which comes back to contributing to the sustainable growth of society by promoting efficiency and vitality in various activities.

The fifth point is providing comfortable and convenient combined services in a range of usage scenes by linking mobile telephones with various daily life tools. Specifically, this entails linking information appliances, automobiles, broadcasting devices, mobile terminals, and so forth and providing services to match customer usage scenes and provide an environment in which customers can use mobile, fixed, broadcast, and home networks seamlessly (advancing the so-called Internet of things services). As described above, compared to Phase 3, Phase 4 is largely characterized by even greater spreading across different types of business and new combined technological areas for new and social support businesses.

The 3.9G mobile communications system (LTE) that had shifted from Domains I to II in Phase 3 and new smartphone-centered service developments were commercialized in Phase 4 (shift to Domain III). Hence, the conventional 3G i-mode services (Domain III in Phase 3) shifted to Domain IV in Phase 4. Strong integration of DC and OC is required in Domain III for upgrading versions of high-speed packet communication services in rapidly changing competitive environments with other companies (other companies have also pursued 3.9G mobile communications services and commercialized them), whereas in the slow-moving business environments of Domain IV, OC were demonstrated to maintain (and gradually retrench) the existing 3G mobile communications i-mode service businesses. Thus, compared with Phase 3, this was conversion of old business to new with the new smartphone and LTE-centered businesses in Domain III and the 3G i-mode services in Domain IV (see Phase 4 in Figure 4).

In contrast, with technical accumulation over many years with the existing 3G and 3.9G mobile communications services in Domains III and IV, DOCOMO was thus induced to shift from Domains III (and/or IV) to I for R&D into the coming 4th and 5th generations of mobile communications systems. With the objective of achieving further radical innovation, DOCOMO uncovered capabilities opportunities with the 4G and 5G mobile communications systems and drove new DC in Domains III and IV to achieve the shift to Domain I. Thus, DOCOMO simultaneously engaged in R&D for the 4G mobile communications services with roughly 10 times the communications speed than LTE (4G compliant with IMT Advanced) of Phase 5 and 5G mobile communications services to be commercialized by 2020, and new service and business planning and development using these mobile communications services, and trial and error and verification of these businesses at the same time as shifting from Domains I to II (see Phase 4 in Figure 4). Notably, DOCOMO is engaging in experiments and technical developments with major global vendors to achieve 5G (joint developments such as experimental trials of chip sets required for 5G terminals with Intel, developing devices to measure the results of 5G experiments with Keysight Technology and Rohde & Schwarz, efficient communication systems technologies with

Panasonic, and 5G communications technologies with Qualcomm). Here, in Domains I and II, DC were notably demonstrated in the multimedia development divisions such as the R&D departments and GBD.

6 | DISCUSSION AND IMPLICATIONS

Here, the author discusses research implications newly extracted from the case study and the strategic innovation model discussed in Section 4.

6.1 | Strategic innovation capabilities by forming a strategic innovation loop

Regarding the historical changes in NTT DOCOMO's business strategies, with analysis of this case, the author has described shifts between domains in four historical phases, they being the shift from discovery of new technologies and businesses in the strategic emergence Domain I to incubation in the strategic selection Domain II, then to acceleration in the strategic concentration Domain III, and then stabilized business in the strategic efficiency Domain IV, through the strategic innovation capabilities described in Figure 2. Development of mobile communications systems and new services in each respective phase in this case study illustrates the strategic innovation loop (Domains I ➔ II ➔ III and/or IV ➔ I; see Figure 4).

In Phase 1 in Figure 4, in Domains III and IV, DOCOMO provided both its existing analogue and digital mobile phone services, and at the same time, demonstrated DC to develop, experiment, and test new business with i-mode service (shift from Domains I to II), which was then commercialized in Phase 2 (Domain III). Moreover, in Phase 2, at the same time as providing existing digital and i-mode mobile phone services, DOCOMO demonstrated DC to develop, experiment, and test new business with 3G mobile communications services (Domains I ➔ II), which were commercialized in Phase 3 (Domain III). The company then followed similar innovation processes in Phases 3 and 4.

As also described in the detailed case study, the strategic innovation capabilities bring about this strategic innovation loop—The shifting between domains were acquired through the tireless radical innovation activities of accumulation of time and patience in R&D processes that stretch back over more than 60 years—processes of R&D into mobile communications technologies that have lead to commercialization at DOCOMO. As cited in the theoretical framework discussed in Section 4, realistically much of radical innovation is basic scientific research or technological development that comes from the stages of discovery or invention in sluggish environments. Even though not a fast-moving environment, Domain I is an important stage in which DC are demonstrated over a long period of time to finally bring about major technical innovations and economic benefits.

K. Eisenhardt and Martine (2000) point out the importance of DC in moderately dynamic environments. This is because DC are not necessarily limited to brand new businesses, environments moving rapidly, or radical changes. In this case study of the R&D processes for mobile communications systems, novel technological changes brought about over many years finally come to be completely established as completely new communications technology and bring about major economic and social change like that of any radical innovation, just as analyzed in the case study of wireless telephony done by Levinthal (1998). Hence, it can be interpreted that DOCOMO's existing mobile communications business has been supported by DC (Helfat & Winter, 2011).

As the initial stage of radical innovation, in Domain I, slow environmental changes and high uncertainties are observed, and new ideas, business concepts, and new technologies are created from new discoveries and inventions. Hence, as the wellspring of new radical innovation, although basic research and generation of new ideas depends on the area of technology, long periods of time are required in fields where there is gravitation toward scientific factors (those involving such things as physics, mathematics, materials engineering and electronics for semiconductors, etc.), and the degree of technical difficulty is high, as seen in Phase 1. In achieving new mobile communications technology, DOCOMO invested considerable time and expense in the most basic and important research themes of hardware and software to develop its new products. DOCOMO's achievements in Domain I were mainly left up to the creative thinking and action of middle managers in R&D and business development departments, whereas the strategic engagement and commitment of top management including CEO Oboshi and high-class managers to simultaneously manage project teams in new organizations such as the GBD i-mode organization and R&D organizations at the same time as existing line organizations (traditional organizations) were also important factors.

Also, at DOCOMO, in Domains I and II, not only were R&D activities important but also developing new business models. This entailed the configuration of a business ecosystem (e.g., Kodama, 2009) enabled by bringing about consistency with the i-mode ICT platform development and the application and contents businesses that would use it. For a platform business to be successful, orchestration of a diverse range of assets is required, which is a central DC function including the process of open innovation taking place within and between companies (Chesbrough, 2003). Historically, most traditional large corporations have mainly driven closed innovation with in-house research laboratories and development departments under hierarchical systems. Closed innovation is an important process for incremental innovation with path-dependent specific knowledge built up over the years. However, in contrast, for the new DOCOMO organization GBD to develop that new i-mode business model, asset orchestration with DC through collaboration with partners both inside and outside of the company, including customers, was an important process (see Figure 5).

Moreover, by the demonstration of DC in DOCOMO R&D departments, DOCOMO achieved testing in Domain II across a wide range of fields related to new mobile communications systems (i-mode, 3G, 3.9G, etc.), by developing and testing prototype systems based on core technologies developed in Domain I. In Domain II, by upgrading and improving prototype systems, the prototype systems were drawn closer to completion as a commercially viable service in the R&D departments. Then, through processes in Domain II, the new mobile communications services moved toward genuine commercialization in Domain III. Notably in Domain III, the competition with other carriers quickened the pace of the market environment; hence,

DOCOMO accelerated its investments of resources necessary for rapid incremental innovation of its mobile communications services through strong integration of DC and OC. In contrast, services running on the previous generation of mobile communications technologies shifted to Domain IV, and their businesses were maintained efficiently through demonstration of OC.

As described above, it is clear that DOCOMO has the three factors of strategic innovation capabilities described in Section 4. First, these are the capabilities to achieve the strategic innovation loop that shifts domains from I ➔ II ➔ III and/or IV to I. In each phase of strategic innovation, DOCOMO enable this loop. Second is the capability to manage shifts within and between each domain. DOCOMO achieved shifts within and between domains in each phase of strategic innovation (new service discovery phase [strategic emergence Domain I] ➔ incubation phase [strategic selection Domain II] ➔ stable businesses [strategic efficiency Domain IV] ➔ new business development [Domain I]). Third, as shown in Figure 4, DOCOMO demonstrated strategic innovation capabilities to achieve dialectical management (Kodama, 2004) by combining (as an ambidextrous organization) different archetypes of R&D organizations (including new business development organizations) and existing line organizations (traditional organizations) with the different innovation processes of exploration and exploitation in each phase of strategic innovation.

6.2 | Driving strategic innovation by combining exploration and exploitation

An organizational characteristic that brings about DOCOMO's strategic innovation capabilities is the integration (synthesis) of the existing line organizations (traditional organizations) charged with exploitation as development of existing business and agile project organizations (e.g., Kodama, 2007b) charged with exploration to develop new technologies and businesses (see Figure 6). Project organizations mainly demonstrate DC and specialize in R&D, service planning, and new business development, whereas other related business is done by in-house line organizations with their existing OC. For example, in the i-mode case (Kodama, 2002), these were project organizations such as R&D departments and GBD that developed elemental and practical technologies, come up with new ideas and business models for services, and formed networks (SCs) with external manufacturers, software developments, and contents providers to repeatedly undertake experiments. In contrast, it was the line organization technology, maintenance, and facility departments that were charged with building and maintaining i-mode servers and packet communications networks, whereas it was the sales and service department line organizations that were responsible for selling the products. In other words, through DOCOMO's demonstration of DC, project teams, who were good at creating knowledge, were responsible for driving R&D activities and conceiving, planning, and developing new business, whereas through the company's demonstration of OC, existing line organizations, who were good at using existing knowledge efficiently, were put in charge of specific service operations, which together brought about optimization of the overall business value chain. In particular, strong OC and DC integration is required in the high-speed markets in Domain III where competition is fierce.

For radical innovation, in uncertain environments, project organizations inspire and create new knowledge based on creativity and imagination and bring about concepts for new technical developments and business models (new products, services, business frameworks, etc.) through trial and error. These corporate capabilities induce the Domains III and/or IV ➔ I shift. Here, companies drive radical innovation by practicing emergent and entrepreneurial strategies that entail the formation of multiple multilayered SCs with strategic business partners outside of the company and the uptake of knowledge from
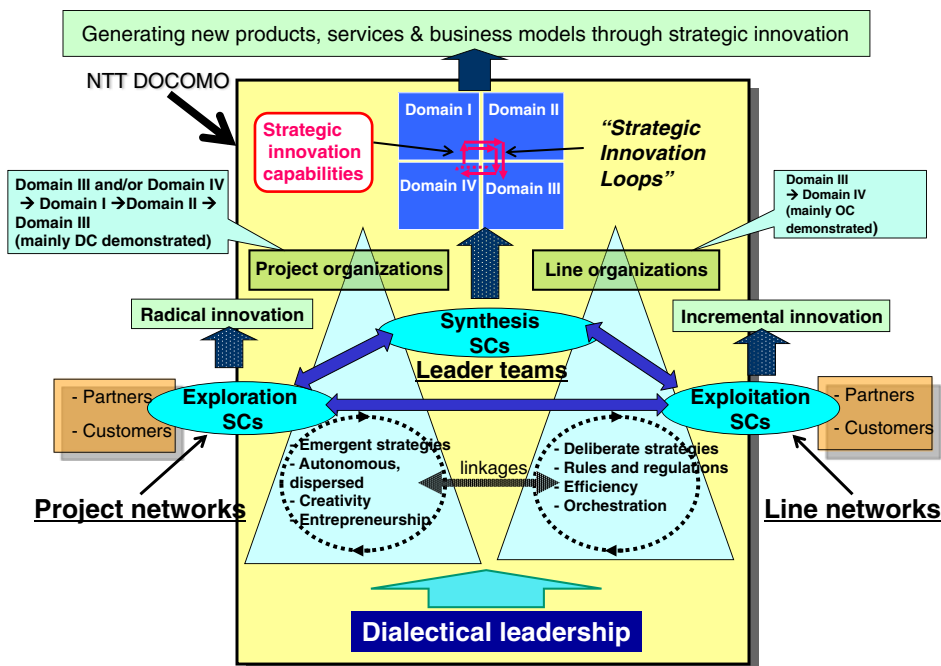
FIGURE 6 Leader teams, project and line networks in NTT DOCOMO. DC = dynamic capabilities; SCs = strategic communities [Colour figure can be viewed at wileyonlinelibrary.com]

both inside and outside the company in high-risk environments. Individual projects in project organizations as networked organizations (Kodama, 2003) act autonomously and are dispersed, but business activities are always monitored by an organizational chief, and the direction and objectives of business are controlled across entire project organizations. These project organizations demonstrate DC to bring about new product and service concepts and prototypes one after the other and then incubate a range of these to achieve commercialization (in other words, the Domains I → II → III shift).

Currently, DOCOMO is working toward the creation of new markets with a focus on smartphones to carve out the next i-mode "S-curve." For this, the company must simultaneously optimize its vertical boundaries, while redefining the horizontal boundaries of the business areas to move into new business domains (e.g., Kodama, 2009). The Osaifu-Keitai and mobile phone credit businesses were stepping stones for the company's move into the finance business. DOCOMO is also executing strategies to create new convergence knowledge (Kodama, 2014) for never-before-seen markets, by inducing and creating new knowledge through the formation of project networks (exploration SCs) with different businesses across different industries such as the medical and health care industries, environment, ecology businesses, and safety and security, and for new businesses such as combined broadcast and communications businesses, automotive Telematics, ubiquitous businesses (Internet of things services), and personalized and social services.

These kinds of organizational activities will continue to spread out DOCOMO's horizontal boundaries into the future and will trigger the forging of new business models. Not only does the company optimize its smartphone and high-speed i-mode value chains through vertical integration for its stakeholders but also placed the utmost importance on presenting new mobile business visions on its horizontal boundaries and creating business ecosystems that enable win–win relationships with stakeholders (e.g., Kodama, 2014).

Nevertheless, the business processes of facilities construction, maintenance, sales, distribution and after support, and so forth are crucial for efficiently marketing and popularizing new products and services in a timely manner. Line organizations are in charge of these business processes (technology, facility, maintenance and sales departments, etc.). Line organizations drive the spiraling of popularization and embedding in new markets, by releasing new services on to the market in Domain III that have been confirmed for marketability through the processes of concept making, marketing, elemental, practical and trial technology development, incubation, and commercialization done by project organizations (Domains I → II → III).

Line organizations drive efficient business process management cycles including the establishment of nationwide sales, maintenance, and aftercare systems by setting efficient and precise capital expenditure programs to meet projected demand of new services, setting up new network operating systems to maintain high service quality and creating "line networks" (exploitation SCs) for collaboration with group companies and shops and strategic outsourcing.

Based on knowledge assets built up over many years, line organizations, as bureaucratic organizations, engage in incremental innovation to make improvements and upgrades by forming line networks (exploitation SCs) as multilayered SC networks with group companies and

strategic outsourcing partners, and so forth. Well-thought-out draft strategic plans based on strategic rules are adopted by line organizations, and they proceed with routine business activities to pursue efficiency in executing business processes and incremental improvements and upgrades of existing businesses in Domains III and IV, by demonstrating OC. Practice in line networks in this way requires thorough productivity and efficiency. These organizations then take the innovative new products and service concepts brought about through the project organizations, and efficiently and quickly get them onto the market, popularize and expand them. This is then the interlocking of exploration SCs and exploitation SCs (or the shift from exploration to exploitation).

6.3 | "Leader teams" achieving interdomain shifts and the strategic innovation loop

Roughly classified, these two types of organizations (project organizations vs. line organizations) and multilayered SC networks (project network exploration SCs vs. line network exploitation SCs) have the contradictory elements of one practicing creativity and autonomy, whereas the other practices efficiency and control, which means there is always paradoxical conflicts and tugs of war occurring between these two types of organizations (e.g., Lewis, 2000; Schad, Lewis, Raisch, & Smith, 2016), which can inhibit synthesis of the knowledge of practitioners in organizations, because line organizations and project organizations differ in many respects such as their ways of thinking, priorities, values systems and the degree of uncertainty that they allow, and so forth. However, through creative abrasion (Leonard-Barton, 1995) and productive fiction (Hagel & Brown, 2005) through dialectical dialogue (Kodama, 2004), it is possible to "sublate" these contradictions. Driving this synthesis are "leader teams," which are "synthesis SCs." At DOCOMO, these leader teams are formed at all management levels (this means top, middle management, and staff layers in project and line organizations, management teams, informal cross-functional teams, and task forces consisting of top, middle management, and staff layers in project and line organizations), from the executive (the CEO, executives, and division directors) and senior management (department chiefs and directors), through to managers (section chiefs and assistant section chiefs) and staff.

At DOCOMO, various leader teams formed from leaders in the company's business organizations such as R&D, marketing, service planning and development, sales, technology, facilities, after support, and maintenance services between the project and line organizations debate and make judgments to make decisions about the timing, strategies, tactics, mechanisms and resources for executing emergent and entrepreneurial strategies, and services to respond to these strategies. Through thorough dialectical and creative dialogue, the leaders in leader teams select strategies and tactics to enable genuine radical innovation to blossom and execute selected strategies and tactics through their "dialectical leadership" (Kodama, 2004, 2005a, 2005b).

The leader teams play the role of improving R&D and new business development performance by strengthening the characteristics of the cross-functional or intercorporate integration of the exploration and exploitation SCs. This means that leaders in leader teams are required to have dialectical leadership. Not only the participative

leadership style and a flexible approach discussed in the literature to date on new product development (e.g., Dougherty, 1996; McDonough & Barczak, 1991) but also creativity combined with efficiency and participative and directive control (e.g., K. M. Eisenhardt & Tabrizi, 1995; Shenhar & Dvir, 1996) are required. However, there remains the issue that the behavior and dialectical management of and between leaders themselves has not been discussed much in the research on cross-functional teams and project management in past New Product Development (NPD). Nevertheless, Lewis, Welsh, Dehler, and Green (2002) argue that combining various paradoxes is necessary for successful product development. They clarify the frequent but ambiguous calls for subtle control, that is, effective managers to provide strong leadership to keep teams focused and on schedule while empowering team members to foster motivation and creativity. The author also gained rich data relating to the dialectical thinking and actions of leaders through dialogue and discussions in his field studies. More than ever, it has become clear that dialectical thinking and actions are required of leaders.

The synergies of dialectical leadership enabled by collaboration among leaders at all management levels including the CEO and executives drive dialectical dialogue and promotes careful deliberate strategy in response to carefully selected emergent or entrepreneurial strategies and achieves synthesis of knowledge and strategy through the formation of multilayered SC networks. These multilayered SC networks form a triad model of SCs from exploration SCs, exploitation SCs, and synthesis SCs.

In analyzing DOCOMO's organizational systems and strategies from the perspective of the strategic innovation process, the multilayered SC networks as the SC triad model are due to the existence of the Ba triad model. The Ba triad model was presented from case studies of the leading companies and organizations of Toyota, Fujifilm, and Apple, as "dynamic fractal organizations for promoting knowledge-based transformation"—a new paradigm for organizational theory of Nonaka, Kodama, Hirose, and Kohlbacher (2014). For example, the case of the Prius new product development at Toyota was a radical innovation (exploration) involving the convergence of a wide range of technologies and required incremental innovation (exploitation) to continually upgrade and improve this new product, which is a dynamic synthesis of exploration and exploitation. For these reasons, Toyota's various project teams and existing line organizations had to form multilayered networked Ba both horizontally and vertically within and between organizations to simultaneously pursue the creation and utilization of knowledge.

What draws attention, in this case, is that Ba to drive exploration activities for the knowledge creativity of radical innovation (called exploration Ba) are responsible for processes to share tacit knowledge and convert it to explicit knowledge, whereas in contrast, Ba that drive exploitation activities to commercialize the products and continually upgrade and improve commercialized products with knowledge efficiency (called exploitation Ba) are responsible for processes of synthesis of explicit knowledge and internalization through personal experience. In other words, exploration Ba strongly leaned toward tacit knowledge and exploitation Ba strongly leaned toward explicit knowledge. Nevertheless, both tacit knowledge and explicit knowledge are intrinsically linked in the spirals synthesis of the third type

of knowledge, practical knowledge (phronesis; Nonaka's so-called Socialization-Externalization-Combination-Internalization (SECI) process). Driving this spiral process to simultaneously achieve the creation and accumulation of knowledge is the "synthesis Ba." In actual fact, D. J. Teece (2014) sites DC as complementary to "phronetic" leadership (Nonaka & Toyama, 2007), where is in contrast, phronesis is in the background of source factors of dialectical leadership that manages different strategies and organizational characteristics at the same time in simultaneous pursuit of exploration and exploitation.

Hence, synthesis Ba that dynamically synthesize exploration Ba and exploitation Ba are mutually connected, which forms the Ba triad model. Then, the Ba triad model also brings about the SC triad model that is multilayered network of SCs with characteristics of Ba. Accordingly, because the Ba triad model forms the basis for the SC tried model, the SC tried model is also a framework to achieve strategic innovation.

Thus, the author offers the following new perspectives on the similarities of the SC triad model with the "ambidextrous organization" (O'Reilly & Tushman, 2004; M. L. Tushman and O'Reilly, 1997). In ambidextrous organizations, it is asserted that clear strategic objectives are set down for new business development organizations and organizations developing existing business, and the interaction between these organizations is heavily restricted at the operational level whereas upper management is responsible for both. In contrast, in the SC triad model, close collaboration and interaction of exploration SCs consisting of project networks aiming to pursue new R&D and build new business development and exploitation SCS consisting of line networks that continually improve and upgrade commercialized products and services are driven by synthesis SCs centered around leader teams. Practitioners at levels of management (top, middle, and staff) drive smooth shifting between the domains with the SC triad model and combine exploration and exploitation. This perspective also contributes a new theoretical framework for the ambidextrous organization.

At DOCOMO, leader teams synthesize the knowledge of these organizations (project networks and line networks) and play the role of bringing about strategic innovation capabilities throughout the entire company. To achieve strategic innovation capabilities, it is important that leader teams simultaneously combine and synthesize the apparently contradictory creative and planned strategic methods. Thus, for leader teams, the configuration of the SC triad model to combine both incremental and radical innovation is key.

From the perspective of network theory, (e.g., Barabasi, 2002; Watts, 2003) the leader teams as synthesis SCs formed internally in DOCOMO act as hubs and nodes in network space (in other words, connections) and act to network multiple SCs both inside and outside of the company and configure the SC triad model with project networks (exploration SCs) and line networks (exploitation SCs). Then, the new contexts and knowledge that are brought about through the SC triad model promotes strategic innovation (see Figure 6).

As described above and is shown in Figure 6, through the formation of the SC triad model, DOCOMO built an ambidextrous organization, allowed the two different archetypes to coexist within the company, skillfully managed new technologies and services and existing services, and created synergies between both types of

organizations through dialectical management that is an important factor of strategic innovation capabilities. This is a major factor in the success of strategic innovation in this large corporation.

7 | CONCLUSION AND FUTURE RESEARCH ISSUES

In light of detailed existing research on DC, this article has presented a theoretical model of a strategic innovation system to achieve strategic innovation in a large corporation and has presented the concept of strategic innovation capabilities, which are the core factors that drive this system. Furthermore, the article has verified this theoretical model through the in-depth longitudinal case study of NTT DOCOMO. This case study has presented a time series of the details of the innovation process at DOCOMO, a company that exhibits strategic innovation capabilities to maintain its competitiveness in the mobile communications service field.

This article has also presented the importance of leader teams that include top management intentionally forming project and line organizations with different characteristics and forming SC triad models to simultaneously manage the exploration and exploitation processes through the organizational business activities of project and line organizations to achieve strategic innovation and has presented the strategic innovation capabilities used by large corporations to skillfully use both DC and OC on the capabilities map, to execute a dynamic spiral in time with both these completely different capabilities to achieve incremental innovation for exploitation and radical innovation for exploration.

In this article, although one end of the theoretical framework for strategic innovation capabilities is presented, numerous research issues remain. Specifically, theory on strategic innovation capabilities in large corporations at the macrolevels and microlevels need to be further elaborated. First, there is the quest for both theoretical and empirical research at the macrolevel into achieving sustainable growth by bringing about strategic innovation systematically and continuously in large corporations. For this reason, from this perspective, research must be promoted of corporate and management systems that achieve sustainable growth.

For example, taking strategic innovation to mean "corporate system innovation," the individual subsystems that affect strategic innovation must be identified, the characteristics of the subsystems, the interactive relationships between the subsystems (e.g., organizations in charge of radical innovation vs. organizations in charge of incremental innovation and new organizations vs. existing organizations and their relationships), and the dynamically changing conditions of entire (corporate) systems and their individual subsystems (e.g., individual business units) responding to changes in the environment (uncertainties and speed) must be deeply analyzed.

One of the analytical approaches to this is the capabilities map presented in Figure 1. This is because there are multilayered, multiple, and dissimilar capabilities maps for each individual enterprises within a large corporation, and it is the interactive relationships between these numerous capabilities maps that are the subject of analysis at the macrolevel. In short, there is a relationship between the capabilities map of the entire system of a large corporation and capabilities maps

of the subsystems—those of its individual enterprises (business units). How do these individual subsystem capabilities maps (capabilities in individual domains and strategic innovation capabilities) affect the capabilities map of an entire corporation (the entire system) and its strategic innovation capabilities?

The second research issue is theorizing the capabilities in each domain at the microlevel that make up strategic innovation capabilities. First, what kinds of capability characteristics are required at the microlevel? Second is clarification (theorizing) related to the process of changing capabilities that accompanies shifts in domains in response to factors of dynamically changing environments (uncertainty and speed). In particular, large corporations that achieve sustainable growth through strategic innovation are run by a multilayered strategic innovation loop enabled by acquiring new capabilities.

However, how are strategic innovations capabilities achieved and changed within and between (including shifts) the domains in Figure 2, and what changes should be made to organizational structures and strategic actions at the microlevel both inside and outside organizations? Furthermore, what is the optimum pattern for acquiring capabilities to achieve strategic innovation? Regarding organizational forms in particular, there are very deep relationships with the SCs described in the article. Therefore, more detailed research at the microlevel into strategic innovation capabilities from a theoretical, empirical, and practical standpoint should be promoted, including relationships with organizational forms.

The third research issue is the approach from the knowledge-based theory of the firm (Grant, 1996; Nonaka & Takeuchi, 1995). Companies that achieve sustainable strategic innovation can be said to be implementing a new knowledge creation (or integration) chain through a layered strategic innovation loop (see Figure 2). However, research is required into "knowledge integration dynamics" that asks such questions as how strategic innovation capabilities can change or realize this knowledge integration process occurring within and among domains (including shifts; see Figure 2); how strategic behavior and organizational structure change; and what patterns form the optimal knowledge integration process for realizing strategic innovation. This research, which needs to progress from a theoretical, actual, and practical viewpoint, forms the true theme of this article.

ENDNOTES

[1] Transformational elements involve external and internal change and affect management elements that build corporate systems, such as

strategy, organization, technology, operations, and leadership. See Kodama (2018).

[2] Cambell and Park (2005) indicate that because reducing organizational and resource uncertainty is difficult, projects that are high risk in terms of organization and resources should be rejected after screening.

[3] The likelihood of experiencing a certain amount of failure in the strategic selection domain rises with outstanding leaders and managers. This is also a working hypothesis from my own office experience. See Kodama (2018).

[4] This is due to the existence of the knowledge boundaries between the product planning divisions that supervise the creation of business concepts and ideas, the development divisions that realize them, and the production and manufacturing divisions. See Kodama (2007b).

[5] Numerous studies (e.g., Kodama, 2007b; Nonaka & Takeuchi, 1995) exist regarding the theoretical frameworks relating to the creation of knowledge such as breakthroughs or new ideas. Analysis from various viewpoints will be the subject of future research topics. One such example relates to the creative process for business concepts arising from the synthesis of market and technology paradigms.

[6] However, Dixon et al. (2014) do not provide details on when a company demonstrates adaption dynamic capability and innovation dynamic capability asynchronously or synchronously.

[7] The author would like to note the points of difference between the "strategic innovation system" and the "management system" arising from "breakthrough innovation capability" (O'Connor, 2006, 2008). One such point is that because O'Connor's model is sequential—It shifts from discovery through cultivation to acceleration—It is weak on the positive feedback process of reflection on, and practical application of, the practical knowledge and accumulated transformational experience of in-house expertise, skills, and routines acquired through executing breakthrough innovation and existing business. Another is that the sequential model provides a weak framework for shifting to a strategic emergence domain that gives rise to discovery, invention, and creativity. Third, it provides a weak dynamic strategy view framework for a company to acquire and sustain new strategic positions over many years. With regard to this, the strategic innovation system in this article (see Figure 2) comprehensively considers the three points above, while creating corporate and management system models for sustainable strategic innovation.On the other hand, Kline (1985) and Kline and Rosenberg (1986) offered one of the first alternatives to the linear framework. They presented a chain-linked model with feedback loops to describe the relationships and iterations among research, invention, innovation, and production. In this strategic innovation system, the sensing, seizing, and transforming loop operates continuously or semicontinuously in Domains I to III, while at the same time, feedback loops are formed with the shift from Domain IV and/or Domain III to Domain I (see Figure 2). Moreover, at the microlevel, this also means there is feedback in interactions between each domain. Hence, this strategic innovation system also encompasses Kline's (1985) chain-linked model.

ORCID

Mitsuru Kodama http://orcid.org/0000-0003-0393-7520

REFERENCES

Amabile, T., & Khaire, M. (2008). Creativity and the role of the leader. *Harvard Business Review*, October, 100–109.

Amburgey, T., Kelly, D., & Barnett, W. (1993). Resetting the clock: The dynamics of organizational change and failure. *Administrative Science Quarterly*, 38(1), 51–73.

Atkinson, P., & Hammersley, M. (1994). Ethnography and participant observation. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105–117). Thousand Oaks, CA: Sage Publications.

Auerswald, P. E., & Branscomb, L. M. (2003). Valleys of death and Darwinian seas: Financing the invention to innovation transition in the United States. *The Journal of Technology Transfer*, 28(3–4), 227–239.

Barabasi, A.-L. (2002). *Linked: The new science of networks*. Boston: Perseus.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.

Benner, M., & Tushman, M. (2003). Exploitation, exploration, and process management: The productivity dilemma revisited. *Academy of Management Review*, 28(2), 238–256.

Branscomb, L. M., Auerswald, P. E., & Chesbrough, H. W. (2001). *Taking technical risks*. Cambridge, MA: MIT Press.

Bruch, H., & Ghoshal, S. (2004). *A bias for action: How effective managers harness their willpower, achieve results, and stop wasting time*. Boston, MA: Harvard Business Press.

Burgelman, R. A., & Sayles, L. R. (1988). *Inside corporate innovation*. New York: Simon and Schuster.

Burrows, P. (2004). *The seed of Apple's innovation Business Week, 12*.

Cambell, A., & Park, R. (2005). *The growth gamble*. US and Canada: Nicholas Brealey Publishing.

Carlile, P. (2002). A pragmatic view of knowledge and boundaries: Boundary objects in new product development. *Organization Science*, 13(4), 442–455.

Carlile, P. (2004). Transferring, translating, and transforming: An integrative framework for managing knowledge across boundaries. *Organization Science*, 15(5), 555–568.

Chesbrough, H. (2003). *Open innovation*. Boston, MA: Harvard Business School Press.

Christensen, C. M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston, MA: Harvard Business School Press.

Collis, D. J. (1994). Research note: How valuable are organizational capabilities? *Strategic Management Journal*, 15(S1), 143–152.

D'Aveni, R. A. (1994). *Hypercompetition: Managing the dynamics of strategic maneuvering*. New York: Free Press.

Danneels, E. (2002). The dynamics of product innovation and firm competences. *Strategic Management Journal*, 23(12), 1095–1121.

Day, G., & Schoemaker, J. (2005). Scanning the periphery. *Harvard Business Review*, 83(11), 135–148.

Dewar, R., & Dutton, R. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management Science*, 32(11), 1422–1433.

Dewar, R. D., & Dutton, J. E. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management Science*, 32(11), 1422–1433.

Dismukes, J. P. (2004). Accelerate radical innovation-now! *Research-Technology Management*, 47(5), 2.

Dixon, S., Meyer, K., & Day, M. (2014). Building dynamic capabilities of adaptation and innovation: A study of micro-foundations in a transition economy. *Long Range Planning*, 47(4), 186–205.

Dougherty, D. (1996). Organizing for innovation. In S. R. Clegg, C. Hardy, & W. R. Nord (Eds.), *Handbook of organization studies* (pp. 424–439). Thousand Oaks, CA: Sage. (1996)

Easterby-Smith, M., & Prieto, I. M. (2008). Dynamic capabilities and knowledge management: An integrative role for learning? *British Journal of Management*, 19(3), 235–249.

Eisenhardt, K. (1989). Building theories from case study research. *Academy of Management Review*, 14(3), 532–550.

Eisenhardt, K., & Martine, J. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121.

Eisenhardt, K., & Sull, D. (2001). Strategy as simple rules. *Harvard Business Review*, 79, 106–116.

Eisenhardt, K. M., & Tabrizi, B. N. (1995). Accelerating adaptive processes: Product innovation in the global computer industry. *Administrative Science Quarterly*, 40(1), 84–110.

Ettlie, E., Bridges, P., & O'Keefe, D. (1984). Organization strategy and structural differences for radical versus incremental innovation. *Management Science*, 30(6), 682–695.

Garcia, R., & Calantone, R. (2002). A critical look at technological innovation typology and innovativeness terminology: A literature review. *Journal of Product Innovation Management*, 19(3), 110–132.

Garud, R., & Karnoe, P. (2001). Path creation as a process of mindful deviation. In R. Garud, & P. Karnoe (Eds.), *Path dependence and creation* (pp. 1–38). London: Lawrence Erlbaum.

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine.

Goold, M., & Campbell, A. (2002). *Designing effective organizations: How to create structured networks*. London: Jossey-Bass.

Govindarajan, V., & Trimble, C. (2005). *Ten rules for strategic innovations*. Boston, MA: Harvard Business School Press.

Grant, R. M. (1996). Toward a knowledge-based theory of the firms. *Strategic Management Journal*, 17(Winter Special Issue), 109–122.

Gratton, L., & Ghoshal, S. (2005). Beyond best practice. *MIT Sloan Management Review*, 46(3), 49–57.

Green, S., Gavin, M., & Aiman-Smith, L. (1995). Assessing a multidimensional measure of radical technological innovation. *IEEE Transactions on Engineering Management*, 42(3), 203–214.

Greenwood, R., & Hinings, C. (1993). Understanding strategic change: The contribution of archetypes. *Academy of Management Review*, 36(5), 1052–1081.

Hagel, J. III, & Brown, J. S. (2005). Productive friction. *Harvard Business Review*, 83(2), 139–145.

Hargadon, A. (2003). *How breakthroughs happen: The surprising truth about how companies innovate*. Boston, MA: Harvard Business School Press.

He, Z., & Wong, P. (2004). Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organization Science*, 15(4), 481–494.

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal*, 24(10), 997–1010.

Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (n)everchanging world. *Strategic Management Journal*, 32(11), 1243–1250.

Heller, T. (1999). Loosely coupled systems for corporate entrepreneurship: Imaging and managing the innovation project/host organization interface. *Entrepreneurship: Theory and Practice*, 24(2), 25–31.

Henderson, R. (1995). Of life cycles real and imaginary: The unexpected long old age of optical photolithography. *Research Policy*, 24(3), 631–643.

Hill, C., & Rothaermel, F. (2003). The performance of incumbent firms in the face of radical technological innovation. *Academy of Management Review*, 28(2), 257–247.

Holland, J. (1975). *Adaption in natural and artificial systems*. Ann Arbor, MI: University of Michigan Press.

Johansson, F. (2004). *The medici effect*. Boston, MA: Harvard Business School Press.

Kanter, R. (1983). *The change masters*. New York: Simons & Schuster.

Kaplan, S., Murray, F., & Henderson, R. (2003). Discontinuities and senior management: Assessing the role of recognition in pharmaceutical firm response to biotechnology. *Industrial and Corporate Change*, 12(4), 203–233.

Katz, R., & Allen, T. (1982). Investigating the not invented here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R & D project groups. *R&D Management*, 12(1), 7–12.

King, A., & Tucci, L. (2002). Incumbent entry into new market niches: The role of experience and managerial choice in the creation of dynamic capabilities. *Management Science*, 48(2), 171–187.

Kline, S. J. (1985). Innovation is not a linear process. *Research Management*, 28(4), 36.

Kline, S. J., & Rosenberg, N. (1986). An overview of innovation. *The positive sum strategy: Harnessing technology for economic growth*, 14, 640.

Kodama, M. (2002). Transforming an old economy company through strategic communities. *Long Range Planning*, 35(4), 349–365.

Kodama, M. (2003). Strategic innovation in traditional big business. *Organization Studies*, 24(2), 235–268.

Kodama, M. (2004). Strategic community-based theory of firms: Case study of dialectical management at NTT DoCoMo. *Systems Research and Behavioral Science*, 21(6), 603–634.

Kodama, M. (2005a). How two Japanese high-tech companies achieved rapid innovation via strategic community networks. *Strategy & Leadership*, 33(6), 39–47.

Kodama, M. (2005b). Knowledge creation through networked strategic communities: Case studies on new product development in Japanese companies. *Long Range Planning*, 38(1), 27–49.

Kodama, M. (2006). Knowledge-based view of corporate strategy. *Technovation*, 26(12), 1390–1406.

Kodama, M. (2007a). Innovation and knowledge creation through leadership-based strategic community: Case study on high-tech company in Japan. *Technovation*, 27(3), 115–132.

Kodama, M. (2007b). *Project-based organization in the knowledge-based society* (Vol. 12). UK: Imperial College Press.

Kodama, M. (2009). Boundaries innovation and knowledge integration in the Japanese firm. *Long Range Planning*, 42(4), 463–494.

Kodama, M. (2011). *Interactive business communities*. UK: Gower Publishing.

Kodama, M. (2014). *Winning Through Boundaries Innovation –Communities of Boundaries Generate Convergence*. U.K.: Peter Lang.

Kodama, M. (2018). *Sustainable growth through strategic innovation: Developing congruence in capabilities (forthcoming)*. UK: Edward Elgar Publishing.

Lalle, B. (2003). The management science researcher between theory and practice. *Organization Studies*, 24(7), 1097–1114.

Leifer, R., McDermott, M., O'Connor, C., Peters, S., Rice, M., & Veryzer, W. (2000). *Radical innovation: How mature companies can outsmart upstarts*. Cambridge, MA: Harvard Business School Press.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13(2), 111–125.

Leonard-Barton, D. (1995). *Wellsprings of knowledge: Building and sustaining the source of innovation*. Cambridge, MA: Harvard Business School Press.

Levinthal, D. (1998). The slow pace of rapid technological change: Gradualism and punctuation in technological change. *Industrial and Corporate Change*, 7(2), 217–247.

Lewis, M. W. (2000). Exploring paradox: Toward a more comprehensive guide. *Academy of Management Review*, 25(4), 760–776.

Lewis, M. W., Welsh, M. A., Dehler, G. E., & Green, S. G. (2002). Product development tensions: Exploring contrasting styles of project management. *Academy of Management Journal*, 45(3), 546–564.

Locke, K. (2001). *Grounded theory in management research*. Sage: Thousand Oaks, CA.

March, J. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), 71–87.

March, J. (1996). Continuity and change in theories of organizational action. *Administrative Science Quarterly*, 41(2), 278–287.

Markham, S. K. (2002). Moving technologies from lab to market. *Research-Technology Management*, 45(6), 31–36.

Markides, C. (1997). Strategic innovation. *Sloan Management Review*, 38(1), 9–23.

Markides, C. (1998). Strategic innovation in established companies. *Sloan Management Review*, 39(3), 31–42.

Markides, C. (1999). *All the right moves: A guide to crafting breakthrough strategy*. Boston, MA: Harvard Business School Publishing.

Markides, C. (2001). Strategy as Balance: From "Either-Or" to "And". *Business Strategy Review*, 12(3), 1–10.

Marshall, C., & Rossman, G. (1989). *Designing qualitative research*. London: Sage.

Matsunaga, M. (2000). *i-mode affair*. Tokyo: Kadokawa. (in Japanese)

McDermott, C. M., & O'Connor, G. C. (2002). Managing radical innovation: An overview of emergent strategy issues. *Journal of Product Innovation Management*, 19(6), 424–438.

McDonough, F. E., & Barczak, G. (1991). Speeding up new product development: The effects of leadership style and source of technology. *Journal of Product Innovation Development*, 8(2), 203–211.

Merrifield, B. D. (1995). Obsolescence of core competencies versus corporate renewal. *Technology Management*, 2(2), 73–83.

Mintzberg, H. (1978). Patterns in Strategy Formation. *Management Science*, 24, 934–948.

Nelson, R., & Winter, S. (1982). *An evolutionary theory of economic change*. Cambridge, MA: Belknap Press.

Nonaka, I. (1988). Toward middle-up-down management: Accelerating information creation. *Sloan Management Review*, 29(3), 9–18.

Nonaka, I., Kodama, M., Hirose, A., & Kohlbacher, F. (2014). Dynamic fractal organizations for promoting knowledge-based transformation—A new paradigm for organizational theory. *European Management Journal*, 32(1), 137–146.

Nonaka, I., & Konno, N. (1998). The concept of 'Ba': Building a foundation for knowledge creation. *California Management Review*, 40(1), 40–54.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company*. New York: Oxford University Press.

Nonaka, I., & Toyama, R. (2007). Strategic management as distributed practical wisdom (phronesis). *Industrial and Corporate Change*, 16(3), 371–394.

O'Connor, C., & Rice, P. (2001). Opportunity recognition and breakthrough innovation in large established firms. *California Management Review*, 43(2), 95–116.

O'Connor, G. (2006). Open, radical innovation; Toward an integrated model in large established firms. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), *Open innovation; Researching a new paradigm* (pp. 62–81). New York: Oxford University Press.

O'Connor, G. (2006, 2008). Major innovation as a dynamic capability: A systems approach. *Journal of Product Innovation Management*, 25(2), 313–330.

O'Connor, G., & DeMartino, R. (2006). Organizing for radical innovation: An exploratory study of the structural aspects of RI management systems in large established firms. *Journal of Product Innovation Management*, 23(2), 475–497.

O'Connor, G., Leifer, R., Paulson, P., & Peters, P. (2008). *Grabbing lightning: Building a capability for breakthrough innovation*. San Francisco, CA: Jossey-Bass.

O'Reilly, C., & Tushman, M. (2004). The ambidextrous organization. *Harvard Business Review*, 82(4), 74–82.

Peltokorpi, V., Nonaka, I., & Kodama, M. (2007). NTT DoCoMo's launch of I-mode in the Japanese mobile phone market: A knowledge creation perspective. *Journal of Management Studies*, 44(1), 50–72.

Penrose, E. T. (1959). *The theory of the growth of the firm*. New York: Wiley.

Pettigrew, A. M. (1990). Longitudinal field research on change: Theory and practice. *Organization Science*, 1(1), 267–292.

Pisano, G. (1994). The governance of innovation: Vertical integration and collaborative arrangements in the biotechnology industry. *Research Policy*, 20(3), 237–249.

Porter, M. (1980). *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.

Richardson, G. B. (1972). The organisation of industry. *The Economic Journal*, 82(327), 883–896.

Rumelt, R. (2011). *Good strategy/bad strategy: The difference and why it matters*. New York: Crown Business.

Rumelt, T. R. (1984). Toward a strategic theory of the firm. In R. Lamb (Ed.), *Competitive strategic management* (pp. 556–570). Englewood Cliffs, MD: Prentice Hall.

Schad, J., Lewis, M. W., Raisch, S., & Smith, M. K. (2016). Paradox research in management science: Looking back to move forward. *The Academy of Management Annals*, 10(1), 5–64. Academy of Management Annals paper "Paradox Research in Management Science: Looking Back to Move Forward."

Schilke, O. (2014). Second-order dynamic capabilities: How do they matter? *Academy of Management Perspectives*, 28(4), 368–380.

Shenhar, A. J., & Dvir, D. (1996). Toward a typological theory of project management. *Research Policy*, 25(4), 607–632.

Silvermann, D. (2000). *Doing qualitative research*. Thousand Oaks, CA: Sage.

Smith, S., & Tushman, M. (2005). Managing strategic contradictions: A top management model for managing innovation streams. *Organization Science*, 16(5), 522–536.

Spender, J. C. (1990). *Industry recipes: An enquiry into the nature and sources of managerial judgement*. Oxford: Basil Blackwell.

Strauss, A. (1987). *Qualitative analysis for social scientists*. New York: Cambridge University Press.

Taifi, N., & Passiante, G. (2012). Speeding up NPSD through strategic community creation: Case of automaker after-sales services partners. *The Service Industries Journal*, 32(13), 2115–2127.

Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(3), 509–533.

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. (2012a). Dynamic capabilities: Routines versus entrepreneurial action. *Journal of Management Studies*, 49(8), 1395–1401.

Teece, D. J. (2012b). Next-generation competition: New concepts for understanding how innovation shapes competition and policy in the digital economy. *Journal of Law, Economics and Policy*, 9(1), 97–118.

Teece, D. J. (2014). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (economic) theory of firms. *The Academy of Management Perspectives*, 28(4), 328–352.

Tushman, M., & Romanelli, R. (1985). Organizatinal evolution: A metamorphosis model of convergence and reorientation. *Research in Organizational Behavior*, 7(2), 171–222.

Tushman, M. L., & O'Reilly, C. A. (1997). *Winning trough innovation*. Cambridge, NA: Harvard Business School Press.

Vanhaverbeke, W., & Peeters, N. (2005). Embracing innovation as strategy: The role of new business development in corporate renewal. *Creativity and Innovation Management*, 14(3), 246–257.

Watts, J. (2003). *Six Degrees: The Science of a Connected Age*. New York: W. W. Norton and Company.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171–180.

Winter, S. (2000). The satisficing principle in capability learning. *Strategic Management Journal*, 21(10–11), 981–996.

Winter, S. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 24(10), 991–995.

Yin, K. (1994). *Case study research: Design and methods* (2nd ed.). London: Sage.

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: A review, model and research agenda. *Journal of Management Studies*, 43(4), 917–955.

Zollo, M., & Winter, G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13(3), 339–351.