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**Linking the unlinked:
knowledge-based perspective on non-routine change**

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Linking the Unlinked

– Knowledge-Based Perspective on Non-routine Change

Abstract

Purpose

Firms operating in contemporary hypercompetitive environments have to seek series of temporary advantages, sometimes requiring them to move beyond their current knowledge domains. The existing knowledge- and capability-based views have certain shortcomings in terms of explaining firm competitiveness in such situations. In order to narrow this gap, this study puts forward a “knowledge-based perspective on non-routine change” to explain how firms can generate innovative processes and outcomes that are disconnected from their current knowledge and capability base.

Design/methodology/approach

The study is a conceptual theory-development paper, which is based on the recent knowledge-based and capability approaches, and on other relevant literature related to non-routine change in organizations.

Findings

Non-routine change is defined here as a process and an outcome that is disconnected from the firm’s current knowledge and capability base. The process involves the detachment from firm’s current knowledge and capability base, the identification of certain types of disconnected knowledge (slack, unrelated, unused, or unknown), and the leverage and combination of such knowledge in the search for novel, non-routine change outcomes.

Originality/value

The novelty of this paper lies in its view on firm-level competitiveness in situations in which the existing knowledge and capability bases are of little value. The study proposes a categorization that explains what types of disconnected knowledge assets are particularly useful in such a process, and identifies where they are likely to be located. Thus, the study provides new insights into the management of knowledge related to non-routine change in organizations.

Keywords *Knowledge-based view, Knowledge, Non-routine, Change, Innovation, Management, Knowledge management, Change management*

Paper type Conceptual paper

1. Introduction

Managing organizational change and knowledge creation is a key challenge in contemporary organizations (Graetz, 2000). In this context, the knowledge-based view of the firm has given a solid theoretical basis on which to explain the existence of organizations as well as performance differences between them (Conner and Prahalad, 1996; Grant, 1996; Kogut and Zander, 1992; Spender, 1996). In particular, it underlines the role of knowledge as a strategic resource, suggesting that organizations hold complex bundles of valuable, heterogeneous, and hard-to-imitate knowledge that can serve as a basis of competitive advantage and as a means of creating new knowledge. In addition, the related stream of research on dynamic capabilities has proved useful in explaining change capabilities and innovativeness in firms (Eisenhardt and Martin, 2000; Teece *et al.*, 1997; Collins, 1994), suggesting that some firms master change more or less systematically – both reactively and proactively (e.g., Pandza and Thorpe, 2009; Zollo and Winter, 2002). In other words, firms are different in their abilities to sense and seize opportunities, and to modify their resources and capabilities accordingly (Teece, 2007).

These theories are quite strong in terms of explaining what types of knowledge assets and capabilities provide competitive benefits, especially with regard to utilizing current knowledge, and creating new knowledge through a recombination of organizational knowledge and related learning (e.g., Nonaka, 1994). However, in practice, firms sometimes encounter situations in which they would prefer to create new solutions without any backup from what they currently know or can do. These situations range from unexpected disturbances in operations that have to be taken care of immediately (the reactive approach) to experimentation on something completely new (the proactive approach). This kind of radical departure from the existing knowledge base has been called ad-hoc problem solving (Winter, 2003), which corresponds to radical innovation at its most extreme – creating solutions from seemingly thin air. This phenomenon is called *non-routine change* in this study, and is defined as a process and an outcome that is disconnected from the firm's current knowledge and capability base (see also Lillrank,

2003). Furthermore, it could be seen as a disruptive and discontinuous change, taking place within an organization's processes, activities, business models, products and services. Thus, such processes have the most potential in terms of creating revolutionary rather than evolutionary innovations and solutions.

It is recognized that the extant knowledge and capability literature lacks a theoretical basis for understanding these types of processes (Schreyögg and Kliesch-Eberl, 2007). One reason for this is that the literature, for the most part, views organizations as constituted of routinized, path-dependent knowledge and capabilities (see, for example, Nelson and Winter, 1982; Galende, 2006; Sun, 2010). Thus, existing theoretical approaches are not always fully applicable in contemporary business environments in which potential competitive advantages are mostly *temporary* rather than *sustainable* (D'aveni *et al.*, 2010).

In addressing the aforementioned shortcoming in the current literature, therefore, the purpose of this study is to *formulate a knowledge-based perspective on non-routine change*, specifically with a view *to investigating the types of knowledge that are useful in such activity* as well as the organizational and managerial means by which to utilize it. The main contribution of the paper lies in developing theoretical and conceptual premises concerning the knowledge assets involved in the organizational process of non-routine change. In this task, classic arguments from knowledge- and capability-based perspectives are integrated with research streams focused on crisis management, entrepreneurial bricolage, and organizational improvisation. The results of the study contribute to the ongoing debate on organizational change and dynamic capabilities, and complement the classic knowledge-based arguments concerning the type of assets needed in innovation and knowledge creation.

The remainder of the paper is organized as follows. Section 2 below discusses the theoretical background of organizational knowledge and capabilities, and defines non-routine change in more depth. Other relevant literature streams are drawn on in the subsequent discussion of the contexts in which non-routine change is likely to take place. The focus in the third section is on drafting a taxonomy comprising knowledge processes

and the sources related to non-routine change. The results are discussed and the conclusions drawn in the final section.

2. Theoretical background

2.1 Organizational capabilities, knowledge, and non-routine change

The central question in strategy and management research has been concerned with how firms gain competitive advantage over their rivals. When the organizational environment is in a constant state of flux it is important to understand how firms are able to bring about change and transformation in order to sustain their current competitive advantage for a reasonable time and also to create new advantages. In the early stages of the knowledge-based view, organizational capabilities such as integrating knowledge and creating new solutions were seen as a reason why firms exist in the first place (e.g. Kogut and Zander, 1992). Similarly, conceptualizations of dynamic capabilities have been used to identify the kind of capabilities a firm needs in order to operate in changing environments, and to proactively bring about change (Collins, 1994; Eisenhardt and Martin, 2000; Pandza and Thorpe, 2009; Teece *et al.*, 1997; Winter, 2003; Zollo and Winter, 2002). Specifically, a dynamic capability could be defined as “a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness” (Zollo and Winter, 2002, pp. 340). Thus, the concept of dynamic capabilities seems to give an intuitive answer as to how and why certain organizations differ from others in their ability to change their operational capabilities, and furthermore to gain and sustain competitive advantage in changing environments.

Related to capabilities on the micro-level is the concept of the firm’s *routines*, which have also been described as its archetypical *raison d’être* (Nelson and Winter, 1982). As Lillrank (2003: 217) states, “to explain the behavior of a firm is to explain its routines”. Routines are the basis on which both operational and dynamic organizational capabilities are built.

Indeed, dynamic capabilities, defined purely as a collection of different routines, have been perceived of as higher-level or “mega-routines” that affect change in organizations (e.g., Collins, 1994; Lillrank, 2003; Winter, 2000). Because routines are fundamentally repetitive and form recognizable patterns, they may help organizations to change successfully over time. However, embodied in organizational capabilities they are caught in a “rigidity trap” when unfamiliar changes are requested. Even though it is recognized that routines can change and evolve through iteration, adaptation and learning (see e.g., Feldman, 2000; Feldman and Pentland, 2003; Lillrank, 2003; Zollo and Winter, 2002), they are still heavily framed in the organization’s path-dependent history when a certain problem has to be solved in a limited time frame. Linking this issue back to the discussion on dynamic capabilities, Schreyögg and Kliesch-Eberl (2007) suggest that all types of organizational capabilities are rigid by nature in that they are characterized by path dependency, structural inertia, and commitment. These characteristics are burdensome for dynamic capabilities as well. Indeed, repeatability and rigidity can cause problems in certain non-routine change situations in which the demand for change is beyond the scope and framing of the organization’s current capability base.

An alternative way of bringing about change without utilizing existing capabilities is through “ad-hoc problem solving”. Ad-hoc problem solving is a functional equivalent of dynamic capabilities in terms of explaining how organizational change occurs, describing it as an activity that is non-routine, not highly patterned, and not repetitive (Winter, 2003, pp. 992-993). Thus an organization relies not only on structured and patterned dynamic capabilities, but also and more likely on the creative search for answers, or “fire fighting”. This type of activity typically happens when unpredictable and unfamiliar (i.e. non-routine) changes take place. One problem with this approach is that ad-hoc problem solving in organizations does not involve routinization, and thus cannot be used repeatedly in the same way as organizational capabilities are typically exploited. This study proposes a remedy in the form of *disconnected knowledge search*. In particular, it is suggested that the creative search for certain types of disconnected knowledge may be especially helpful when the aim is to facilitate effective non-routine change. This is because familiar sources of knowledge as well as familiar ways of utilizing such knowledge are not very useful

when the situation is beyond the scope of routines and capabilities. However, given the importance of knowledge integration in the creation of new knowledge in general (Kogut and Zander, 1992), it is likely that integrating certain types of unfamiliar, underutilized (i.e. disconnected) knowledge will help, especially in non-routine situations. For instance, Rerup (2001) describes how the NASA's Apollo 13 mission ran into unexpected disturbance in terms of an explosion which destroyed one of the oxygen tanks and damaged the other. Thus, the routine-based mission control faced a pressing need for action. NASA's engineers on earth collaborated with the astronauts to come up with a solution for a carbon dioxide cleaning system to keep the astronauts alive until landing. This was done by recombining previously disconnected ideas and materials together to build a novel solution for the non-routine situation at hand.

Given the underdeveloped current theoretical understanding of non-routine change it might be useful to explore other theoretical streams in order to find out more about the specific types of knowledge assets that are needed. Several such streams are discussed in the following sub-section.

2.2 Non-routine change and preconditions for disconnected knowledge search

As suggested above, the formulation of a theoretical basis on which to consider non-routine change requires insights from several fields that would extend current knowledge- and capability-related theories. In this case, the contributions on *crisis management*, *entrepreneurial bricolage*, and *organizational improvisation* are particularly useful. These theoretical perspectives are discussed below in order to examine the premises of non-routine change and the preconditions in the search for disconnected knowledge.

The literature on crisis management defines an organizational crisis as "...a low-probability, high-impact event that threatens the viability of the organization and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly" (Pearson and Clair, 1998, pp. 60). This definition comes close to the context of non-routine change, which is nevertheless more generic in

nature, whereas crisis management is mostly oriented towards high-impact threats (in a negative sense). In the context of this study, a “crisis” could be understood in general terms as a situation requiring a solution, and resolving it opens up the possibility of either reacting to it or developing a new solution in a unique manner. Thus, non-routine change may result in organizational change either as a (reactive) response to a critical problem or in the (proactive) pursuit of novel opportunities. Through this perspective, the context within which non-routine change is likely to take place and to add value could be identified as organizational change through a *crisis or an opportunity*.

Crisis or opportunity–type of non-routine change requires various preconditions, which are identified in the literature on crisis management. In particular, attributes related to crisis situations in organizations entail ambiguity with regard to the means of resolution, unexpectedness, the action that is required to bring about the change, and the time pressures in searching for a solution (for further discussion, see Pearson and Clair, 1998; Wooten and James, 2008). In terms of non-routine change, all of these elements are more or less relevant. For the purposes of this study, two issues effectively summarize the context: unexpectedness and time pressure. First, *unexpectedness* often leads to non-routine change because the organization has not been able to develop or learn the necessary capabilities and knowledge beforehand. There may, for example, be a lack of familiarity with the sudden change requirement, which might require searching beyond the firm’s current knowledge and capability base. Second, *time pressure* implies that a certain problem or opportunity needs to be acted upon within a given time if it is to be valuable. The pressure might change depending on the urgency of the problem or the ability to grasp an opportunity quickly. Furthermore, neglecting the problem might entail costs or a missed opportunity for the organization.

In terms of unexpectedness, the literature on entrepreneurial bricolage gives suggestions related to how organizations could deal with such situations when their existing knowledge and capabilities are inadequate due to the unexpectedness of the required change. Entrepreneurial bricolage has been conceptually discussed as *creating something from nothing in resource-poor environments* (Baker and Nelson, 2005; Lévi-Strauss, 1967).

New entrepreneurial firms that are resource-constrained due to their entrant position, and which have been witnessed to be “making do with what is at hand” whilst creating new solutions from seemingly worthless and undetected inputs, often face such environments. However, given the applicability of the concept of non-routine change proposed here to organizations of all sizes and forms, the research on entrepreneurial bricolage could be useful in explaining how such change develops in organizations through “creating change from nothing”. Underutilized, disconnected knowledge sources are likely to be of value in this context. The impulse to seek non-routine change may be either reactive (e.g., a surprise or a lack of preparation) or proactive (a purposeful lack of preparation when novel solutions are sought).

In terms of time pressure, the literature on organizational improvisation gives suggestions for coping with the short timeframes required for activities and processes (such as non-routine change). In fact, several authors have developed frameworks of organizational improvisation that utilize the same logic as the theoretical formulation of non-routine change applied in this study (e.g., Crossan *et al.*, 2005; Vera and Crossan, 2005). Although the two concepts are different phenomena, some instances of the most radical end results documented in the literature as improvisation resemble non-routine change. In particular, organizational improvisation is typically needed when the necessary change or activity takes place within a very short timeframe (e.g., Crossan *et al.*, 2005). In the organizational context, improvisation means utilizing knowledge “on the fly”, and combining existing knowledge with something totally new and previously underutilized: under strict time pressure there is no time to build on and utilize previously known organizational processes. In support of this argument, it has been found recently that innovation speed and radicalness are positively correlated (Goktan and Miles, 2011). Time pressure may come from outside of the decision-making system (the reactive approach) or it may be a purposeful stimulus for improvisational activity (the proactive approach).

Table 1 summarizes the discussion so far in terms of unexpectedness and time pressure as facilitators of non-routine change.

Table 1. Situational preconditions leading to the search for disconnected knowledge and non-routine change

	<i>The role of the current knowledge base</i>	<i>The impulse leading to non-routine change</i>	<i>The role of disconnected knowledge search</i>
Unexpectedness	No or very little usable existing knowledge	Surprise and a lack of preparation (reactive approach) A purposeful lack of preparation (proactive approach)	Providing the means to deal with unexpected situations and developments
Time pressure	Lack of time to develop and build consistent organizational solutions	A “fire that needs to be put out” (reactive approach) Purposefully tight schedules (proactive approach)	Providing the means to deal with time pressure with an improvisational response or an initiative

3. Sources of disconnected knowledge search

In the context of this study, knowledge and capability detachment are definitive features in the process of non-routine change. It is notable that the change in objectives and impulses outside the framing of current capabilities and knowledge are not likely to be brought about by combining and leveraging knowledge in familiar ways. Instead, a firm needs to go beyond such patterned processes of linking and combining knowledge, and reach for “disconnected” knowledge that has thus far been underutilized. The definitive feature of such disconnected knowledge assets is that they are not connected with the current knowledge and capability base of the organization. However, the disconnectedness is only a categorical term for the several different types of knowledge that are valuable in non-routine change, especially when combined with each other and with more familiar sources of knowledge. These disconnected assets are divided in this study into four specific categories – slack, unrelated, unused, and unknown knowledge (see Figure 1 for an

illustration of the logic put forward here). The following sections describe these categories in detail.

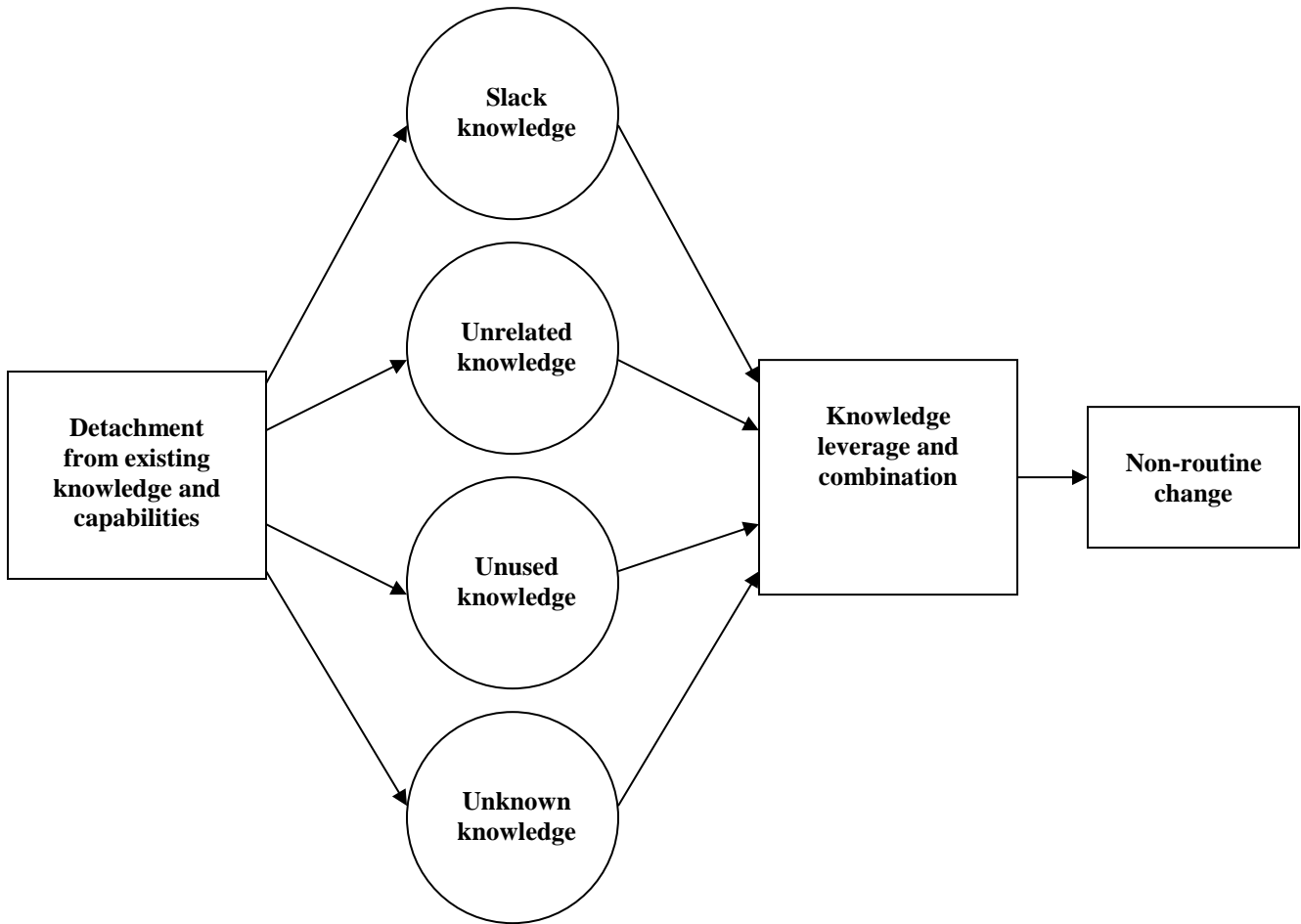


Figure 1. Firm-specific knowledge processes of non-routine change

3.1 The utilization and availability of slack knowledge

When an unfamiliar situation needs to be resolved the organization first tries to make sense of it, utilizing the various capabilities it already has, typically by linking known intangible and tangible resources. If it is efficient, all of its knowledge is in use, or is distributed externally through licensing or alliances (Grant and Baden-Fuller, 2004). However, some

amount of slack knowledge is useful in bringing about new types of change in that resources tied to current processes cannot be utilized very swiftly or easily. Slack knowledge is defined here as *purposefully underutilized knowledge possessed by the firm or its stakeholders*. According to the literature on entrepreneurial bricolage, such knowledge resources are held “on the principle that they may always come in handy” (Baker and Nelson, 2005; Lévi-Strauss, 1967). Thus, the knowledge and resources at hand, which are available because they are “slack”, sometimes help in finding innovative solutions and potentially creating the premises for non-routine change.

This issue is also relevant with regards to opportunities, and not just in solving critical problems or situations. Google, for example, is known to allow its employees to use some portion of their weekly hours (a slack resource / knowledge) for personal projects, which may or may not end up as new innovations. When employees encounter signals from markets to which the official organization cannot react, they might use their personal project time and knowledge to solve a particular problem and possibly to sow the seed of an innovation. Moorman and Miner (1998) describe another similar example, when two members of the case firm’s design-and-support team used the free time between official projects to find a solution to a customer’s problem. They utilized new scientific knowledge, and combined old and new parts to build a novel solution. Indeed, it has been noted that an organizational culture that facilitates knowledge sharing and gives space for creativity by providing encouragement, support, and a suitable environment is needed in order to create novel solutions (e.g., Amabile, 1997; Amabile *et al.*, 1996). In the context of non-routine change, the availability of slack resources (including time, materials, and legitimacy) allows space for creativity and knowledge utilization, which potentially extends beyond the current framing of the organization’s capabilities.

3.2 The utilization and availability of unrelated knowledge

Winter (2003) argues that maintaining (dynamic) capabilities ties up extensive amounts of resources and creates costs, whereas non-routine change carries virtually no costs apart from those incurred in the given activity at the given time. Thus, he suggests that an

organization is well advised in some instances to assess whether to invest in building up and maintaining of expensive change capabilities or engaging in non-routine change. However, if the firm has reserved some slack resources and knowledge for non-routine change, as suggested in the previous section, it also implies some additional cost over time, given that the slack knowledge has no other use. In order to also reach situations with “virtually no costs” it is important for the organization to be able to leverage knowledge that is used, but is unrelated to the problem domain. Unrelated knowledge is defined here as *knowledge in the use of the firm or its stakeholders that is intended for a different, unrelated purpose than for the solution at hand.*

As noted above, unrelated knowledge is knowledge that is currently in use elsewhere in the execution of various organizational routines and tasks for various purposes. In general, it has been found that when a great diversity of (unrelated) skills and capabilities are combined in making decisions and solving problems the resulting solutions are more innovative than when they are used in isolation (Bantel and Jackson, 1989; Wanous and Youtz, 1986). Such knowledge is visible in the organization, but its utilization in an unrelated domain involves the potential creation of a high-value solution. Vera and Crossan (2005, pp. 211) give a relevant example from facilities management, when a sprinkler system (unrelated resource/knowledge) was used to resolve an unfamiliar problem (a breakdown in the air-conditioning system) and thus to create a valuable solution: “There was mechanical breakdown of an air-conditioning system during a wedding reception in the summer. Everybody was sweating to death. It was so hot outside that the actual unit on the roof was overheating. We came up with the idea to set up a sprinkler system to cool the unit down so that it would actually run”. In the context of non-routine change, unrelated knowledge can be combined in this way with other resources in order to reach a certain type of innovative solution or process. Another example is presented by Miner *et al.* (2001), where an engineering team did fix a malfunctioning robotic arm with a small nylon washer, which was not a part of any official product design or specification. This example also shows that the utilization of unrelated resource/knowledge did help to solve a non-routine situation.

3.3 The utilization and availability of unused knowledge

Unused knowledge is defined here as *knowledge that is not used but is potentially available to the firm or its stakeholders*. This category differs from the previous one in that such knowledge is not owned or controlled by the organization at the time the problem is identified, presumably because the organization and its stakeholders do not see it as valuable input in terms of its current operational and dynamic capabilities. Baker and Nelson (2005) found that entrepreneurs operating in resource-poor environments utilized various inputs such as “single-application” materials, the labor force of customers and suppliers, and amateur skills in order to create valuable applications, products, and services. Such resources are sometimes even considered “worthless” from the point of view of firms in the industry, until they have been valuably applied. Similarly, in the case of non-routine change, unused knowledge may yield surprising value when it is utilized either solely or in combination with other resources. Baker and Nelson (2005, pp. 341) give the example of a billing manager who was assigned to do whatever he could to improve the firm’s current billing system, which involved a great deal of manual work and thus caused costs and delay. His solution was to use his self-taught programming skills and a spreadsheet-based system used in another company he had worked for earlier to create a new system that made the billing much more fluent and automated. His self-taught programming skills clearly constituted unrelated (and potentially unappreciated) knowledge, which he used to create a highly valuable and novel solution. As in this example, such unused knowledge is typically tacit by nature, and therefore the organization might not be aware of it (see also Alwis and Hartmann, 2008). In the context of non-routine change, focusing on unused knowledge facilitates the harnessing of underutilized domains of knowledge that might prove to be valuable.

3.4 The utilization and availability of unknown knowledge

Unknown knowledge is defined here as *knowledge that the firm and its stakeholders do not possess or know about at the time when a change situation is identified*. In order to identify such resources the organization has to explore solution landscapes outside its

current capabilities, given that the knowledge it currently utilizes does not yield a viable solution. This knowledge category is potentially the most challenging one to leverage in that there is no linkage whatsoever in the organization in the form of knowledge possession or availability. Thus, given the lack of awareness of its existence in the organization and among its stakeholders, successful leveraging might require stimuli from external parties. The development of mechanical tomato harvesting in California between the 1940s and the 1960s serves as a classic and illustrative example of this. During this time tomatoes were harvested solely by hand, mechanical harvesting being considered impossible due to the delicacy of the tomato's skin. One can only imagine the trial-and-error process of engineers trying to develop a machine able to harvest the fragile-skinned fruit. Eventually, during the 1960s, the whole Californian tomato industry changed to mechanical harvesting. However, the solution to the problem came not from the domain of engineers, but from a biologist, Jack Hanna, who managed to develop a tomato variety that could withstand mechanical handling. Hanna was also very active in promoting his tomato variety to engineers, eventually starting a fruitful collaboration that in turn revolutionized tomato farming. The important lesson from this example is that although the engineers (analogous to "the organization" here) had the necessary capabilities for improving their machinery, they needed an outsider perspective and an unknown solution (until Hanna proposed it to them) in order to solve the problem.

4. Discussion and implications

The current study formulates *a knowledge-based perspective on non-routine change*. This is a novel contribution in that current knowledge- and capability-based theories do not fully explain how non-routine changes take place in organizations, given their focus on more structured, path-dependent approaches (Schreyögg and Kliesch-Eberl, 2007). Non-routine change is defined here as a process and an outcome that are disconnected from the current knowledge base of the firm. The main argument is that if organizations want to achieve non-routine change outcomes, they need to search beyond and outside their current knowledge and capability base. Doing this requires a clear disconnection from current ways of operating and alignment with unfamiliar and disconnected knowledge sources. The

study proposes a typical organizational context for such phenomena (unexpectedness and time pressure), and identifies the sources of disconnected knowledge that are related to the effective execution of non-routine change (slack, unrelated, unused, and unknown knowledge). Recognizing the context in which non-routine change is needed could help organizations and managers to prepare for such processes, and recognizing the disconnected knowledge sources will help them to find the means. Table 2 summarizes the main conceptual suggestions put forward in this study.

Table 2. Disconnected knowledge search and non-routine change

	<i>Type of disconnection from the current knowledge base</i>	<i>Typical sources and availability</i>	<i>Inputs into non-routine change processes</i>
Slack knowledge	Redundant knowledge, not in active use	Available from the organization's personnel and stakeholders Availability depends on the amount of organizational slack	Non-restrained utilization of the current knowledge domain
Unrelated knowledge	Knowledge that is in use elsewhere	Available from the organization's current personnel and stakeholders Availability depends on how well knowledge can be transferred within the organization	Uncommon approach to the utilization of the current knowledge domain
Unused knowledge	Knowledge that is not used	Available from the organization's current personnel and stakeholders Availability depends on the specialist knowledge that is currently in use elsewhere	Tapping into underutilized knowledge domains
Unknown knowledge	Potentially valuable knowledge not currently known of	Sources not known Availability depends on the sensitivity to explore the organization's current or future personnel and stakeholders	Utilization of new, unexpected knowledge domains

4.1 Theoretical implications

This study proposes several implications to the current theories. First, in the context of the knowledge-based view, it is suggested that competitiveness-enhancing knowledge is valuable, hard-to-imitate, and highly heterogeneous (Conner and Prahalad, 1996; Grant, 1996; Kogut and Zander, 1992). In line with this viewpoint, this paper identifies distinct types of knowledge categories that are especially useful in bringing about non-routine changes (slack, unrelated, unused, and unknown knowledge). Some of this “disconnected knowledge” might reside within the organization’s boundaries, but some of it may be outside, requiring an even broader knowledge search. Second, in terms of the dynamic capabilities view (Eisenhardt and Martin, 2000; Teece *et al.*, 1997; Teece, 2007), the approach presented in this paper provides complementary insights into how organizations change, innovate and achieve (temporary) competitive advantage. The study thus adds value to the dynamic-capabilities framework in overcoming the so-called “rigidity trap”, which is inbuilt in all organizational capabilities (Schreyögg and Kliesch-Eberl, 2007): for example, it is suggested that organizational knowledge management is a routine-based capability (Sun, 2010). The views presented here complement routine-based perspectives in explicitly recognizing the value of ad-hoc, non-routine processes (see also Winter, 2003). Third, in contributing to the literature on innovation, this study identifies potential central drivers for discontinuous/revolutionary, and even competence-destroying innovation (see e.g., Abernathy and Clark, 1985). Indeed, organizations seeking knowledge in areas that are clearly disconnected from their current ways of operating increase their potential to find impulses for innovative solutions and processes that will be more revolutionary than evolutionary. The recent findings reported by Kao *et al.* (2011) support this in showing that a goal-free knowledge-creation mode is most likely to be adopted by organizations that seek the most novel ideas.

4.2 Practical implications

This study carries significant implications for practicing managers and decision makers seeking to achieve non-routine change and innovativeness in their companies. Consciously

taking into account various types of disconnected knowledge within and beyond the organization will make it easier to identify sources of non-routine change. It is also worth noting that this approach can be utilized both reactively and proactively. For instance, organizations encountering unforeseen problems or difficulties in its processes are likely to find the search for underutilized or unused knowledge particularly fruitful. On the other hand, conscious alignment towards facilitating the use of the slack knowledge and resources possessed by employees or the organization's external stakeholders could increase the chances of finding completely new types of solution. For instance, Google uses this type of proactive approach in explicitly providing its employees with free time to engage in their own projects, and not constraining them in any way. These and other practices could be useful to firms searching for novel solutions and innovativeness in their management and organizational practices. It should be remembered, however, that tensions are likely to arise during the adoption of management practices supporting the use of disconnected knowledge sources and innovation, and constant revisiting of innovative practices is thus needed (see Hotho and Champion, 2011).

4.3 Limitations and further research directions

The limitations of this study lie in its conceptual nature. Further research is needed in order to test and validate the proposed framework presented here. For instance, qualitative in-depth studies could investigate cases in which organizations pursue non-routine change, and examine whether or not the proposed knowledge categories play a major role. On the other hand, quantitative studies could test the effect of the organization's usage of various types of "disconnected knowledge" on its innovation and change performance. On the conceptual level, the framework could be further developed to include discussion about organizational boundaries. Non-routine change is likely to not only happen within a single organization, given that valuable innovation-related knowledge is increasingly available through inter-organizational relationships. This issue is worth more detailed conceptual and empirical examination in the future.

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