

RECONCILING LEARNING PARADOXES THROUGH IMPROVISATION

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ABSTRACT

We present a systematic review of the literature that led to the identification of two categories of learning paradoxes: the “novelty-continuity” paradox and the “transfer-imitation” paradox. In the former, the dilemma faced by managers is: How to take advantage of existing capabilities and routines, while embracing the need to continually innovate? In the latter, the dilemma is: How to transfer learning within the firm, while impeding imitation from competitors? We describe the nature of the tradeoffs, the dysfunctional dynamics associated with an emphasis on extremes, and ways in which past research has proposed to balance the tensions. Furthermore, we acknowledge that the two paradoxes are connected in day-to-day life in organizations and propose the process of improvisation as a mechanism to transcend learning paradoxes in real time. In particular, we describe how in improvisation, the combination of minimal constraints, experimental culture, information resources, and teamwork skills allow the interaction of novelty, continuity, and tacit and explicit knowledge.

1 INTRODUCTION

The complexity and diversity of organizational life has increasingly motivated researchers to move beyond oversimplified and polarized notions of how firms work to recognize the need to accept and resolve paradoxes (Lewis, 2000; Poole & Van de Ven, 1989). Paradoxes are the simultaneous presence of contradictions (Sundaramurthy & Lewis, 2003). The organizational learning field can particularly benefit from this effort of acceptance and reconciliation of paradoxes since its theoretical development is rich in polar constructs. In making decisions about how and what a firm will learn, leaders face dualities such as single-loop and double-loop learning, internal and external learning, tacit and explicit knowledge, broad and narrow learning, and exploration and exploitation (Argyris & Schon, 1978; Bierly & Chakrabarti, 1996; March, 1991; Polanyi, 1967), to name just a few of the existing distinctions.

We shed light on two categories of learning paradoxes that we identified as the most predominant in the organizational learning field. The first category involves the tradeoffs

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between novelty and continuity, adaptability and control, flexibility and efficiency, and radical and incremental change. The dilemma faced by managers is: How to take advantage of existing capabilities and routines, while embracing the need to continually innovate? The second category lies at the core of resource-based strategies and involves the tradeoffs between tacit and explicit knowledge, knowledge stickiness and leakiness, and personalization and documentation approaches to learning. Tacit knowledge is causally ambiguous and hard to imitate, but it is also hard to replicate within the firm. The dilemma faced by managers is: How to transfer learning within the firm, while impeding imitation from competitors? While past research has discussed conditions under which firms should embrace one alternative or the other, we move one step beyond to suggest that today’s dynamic environments demand a more paradoxical approach to learning--an approach that builds on the process of improvisation to pursue the simultaneity of learning dualities.

Lewis’ (2000) framework for exploring organizational paradoxes guides our examination of learning tensions. Lewis (2000) argues that the management of paradoxes involves an understanding of (1) tensions as cognitively or socially constructed polarities that obscure the interrelatedness of contradictions, (2) reinforcing cycles as dysfunctional dynamics associated with an emphasis on one extreme of a polarity, and (3) practices that accommodate tensions through processes such as acceptance, confrontation, and transcendence. We seek to contribute to the organizational learning field by proposing the process of improvisation as a mechanism to transcend the tradeoffs between novelty and continuity and between the transfer and the imitation of knowledge.

Improvisation is the spontaneous and creative process of attempting to achieve an objective in a new way (Vera & Crossan, 2004, 2005); this process has been described as dialectical in itself (Crossan, Cunha, Vera & Cunha, 2005). Weick, for example, proposes that improvisation helps to reconcile organizational tensions, because “it is a mixture of the pre-composed and the spontaneous, just as organizational action mixes together some proportion of control with innovation, exploitation with exploration, routine with non-routine, automatic with controlled” (1998: 551). Crossan et al. (2005) also described improvisation as an organizational practice through which temporal synthesis between clock and event time and between linear and cyclical time can be achieved. We move this work forward by looking at the value of improvisation in resolving organizational learning tensions. Our work has important implications for managers because it provides them with specific guidance about the strategic decisions that determine how and what their firms will learn. While authors have suggested that some firms can “balance the trade-offs required to be successful” (Bierly & Chakrabarti, 1996: 129), we delve further into *how* firms do so.

We begin by describing our systematic review of the literature that led to the identification of the most predominant learning paradoxes. Then, we describe the nature of the tensions, the dysfunctional dynamics associated with an emphasis on extremes, and ways in which past research has proposed to balance the tensions. Next, we examine means of managing learning paradoxes through improvisation. Finally, conclusions are provided.

2 SYSTEMATIC REVIEW OF LEARNING PARADOXES

We employed a keyword search to identify existing research on learning and knowledge paradoxes. We searched for the combination of the terms “learning” or “knowledge” with

the terms “paradox,” “tension,” “tradeoff,” “dichotomy,” and “dilemma” in the titles, abstracts and keyword lists. Additional sets of learning choices were identified through the expressions “learning strategy,” “knowledge strategy,” and “knowledge management strategy.” Our search yielded 419 articles in the business and management subject categories of the *Web of Science* database for the period 1990-2007.

We used two mechanisms to narrow the field of publications. First, for the papers between 1990 and 2004, we focused on papers that received an average of two or more citations per annum. Second, since our intent was to focus on articles that had some impact on the field, as measured by citations, we took into account that recent publications would not have been cited. We reasoned that articles published in the journals that contained highly-cited organizational learning research would be a suitable proxy for citation potential. Therefore, we incorporated articles that met the criteria of our keyword searches, and were published during 2005 and 2007 in a selected group of journals. In a recent review of the organizational learning literature, Bapuji and Crossan (2004) found these journals to contain 70 percent of the most highly-cited organizational learning research published in the 1990-2002 timeframe: *Academy of Management Journal*, *Academy of Management Review*, *Human Relations*, *Journal of Marketing*, *Management Science*, *Organization Dynamics*, *Organization Science*, *Organization Studies*, *Sloan Management Review*, *Strategic Management Journal*, and *Administrative Science Quarterly*. Our two criteria for selection resulted in 125 articles. Finally, examination of these articles’ abstracts led to the exclusion of 47 articles that despite including the search terms in the title, abstract, or keyword list, did not deal with our topic of interest, learning paradoxes. Consequently, our final total was 78 articles.

Our next step was to classify the articles according to the paradox they discuss. First, we grouped together 26 articles that dealt with the tension between continuity and novelty, control and adaptability, efficiency and flexibility, and incremental and radical change. We labeled this tension the continuity-novelty tension. Second, we created a group of 21 articles that described the tension between tacit and explicit knowledge, knowledge stickiness and leakiness, personalization and documentation approaches to learning, and the tradeoff between the transfer of knowledge within the firm and the imitation of knowledge by competitors outside the firm. We labeled this tension the transfer-imitation paradox. There was only one overlap between these first two groupings (Earl, 2001). The third grouping included eight articles on activity theory, and constructivist and strategy-as-practice perspectives of learning; these articles dealt with different aspects of the tension between the knowledge and doing paradigms. Other paradoxes identified were: learning by doing vs. learning by planning (five articles), cooperation vs. competition in alliances (three articles), shared knowledge vs. specialist knowledge (three articles), and the benefits and drawbacks of social capital (two articles). Finally, 10 articles were not grouped because they dealt with diverse topics such as the paradox of project-based enterprises (DeFillipi & Arthur, 1998) or the paradox of information supply in competitive information markets (Hansen & Hass, 2001). Given the predominance of the first two paradoxes over the others, we decided to focus on them in our analysis of paradox management. Table 1 and Table 2 present the most cited articles discussing the novelty-continuity and the transfer-imitation paradoxes. Next, we describe the two paradoxes in detail.

Table 1 “Novelty-continuity” paradox: publications with five or more citations per annum (1990-2007)

Paper Type	Authors and Source	Average Annual Citations
Empirical	Sorensen & Stuart, 2000, ASQ	11.57
Empirical	McGrath, 2001, AMJ	9.00
Practitioner	Zack, 1999, CMR	7.50
Theory	Robey & Boudreau, 1999, ISR	7.13
Empirical	Bierly & Chakrabarti, 1996, SMJ	7.00
Empirical	Lant & Mezias, 1992, OSC	6.13
Empirical	Rivkin & Siggelkow, 2003, MSC	5.50
Theory	Earl, 2001, JMS	5.33

Table 2 “Transfer-imitation” paradox: publications with five or more citations per annum (1990-2007)

Paper Type	Authors and Source	Average Annual Citations
Theory	Kogut & Zander, 1992, OSC	48.80
Empirical	Dyer & Nobeoka, 2000, SMJ	20.00
Empirical	Zander & Kogut, 1995, OSC	19.25
Theory	Brown & Duguid, 2001, OSC	17.50
Practitioner	Hansen et al. 1999, HBR	16.75
Empirical	Inkpen & Dinur, 1998, OSC	6.78
Theory	Coff, 1997, AMR	6.50
Empirical	King & Zeithaml, 2001, SMJ	5.83
Theory	Earl, 2001, JMS	5.33

3 THE NOVELTY-CONTINUITY PARADOX

The tension between novelty and continuity has been described as the tradeoff between exploration and exploitation (March, 1991), double-loop and single-loop learning (Argyris & Schon, 1978), distant and local search (Rosenkopf & Nerkar, 2001), revolutionary and evolutionary change (Tushman & O'Reilly, 1996), and feed-forward and feedback flows of learning (Crossan, Lane & White, 1999). The essence of this paradox is that exploiting existing competences may provide short-term success, but competence exploitation can become a hindrance to the firm’s long-term viability by stifling the exploration of new competencies and the development of radical innovations (Levinthal & March, 1993; March, 1991).

The articles in our review look at this tension from many different contexts. For example, Atuahene-Gima (2005) examines this dilemma in product innovation, arguing that firms need to simultaneously pursue incremental and radical innovations. Crossan and Berdrow (2003) position the need for firms to develop new competencies while concurrently exploiting existing ones as the fundamental tension of strategic renewal. This idea is consistent with Zack's (1999) description of a knowledge strategy in which firms compete by creating and acquiring new knowledge and by leveraging the knowledge that already exists within and across different competitive niches. Studying the change and stability of network structures, Beckman, Haunschild, and Phillips (2004) look at the tradeoff between adding new relationships and expanding relationships already in place. Another example comes from Danneels (2003), who examines the tension between tight- and loose-coupling with customers. A paradox exists because the same process that enables the firm to develop efficient transactions with its market--tight-coupling--restricts environmental inquiry and limits available options (Danneels, 2003). Similarly, Sorensen and Stuart (2000) test the consequences of aging for innovation and highlight the paradox that as firms improve the functioning of their routines and increase their innovation rates, they lose touch with environmental demands and their innovative outputs become obsolete.

3.1 Dysfunctional cycles

Balancing novelty and continuity, or exploration and exploitation is not easy because they have contradictory goals (innovation vs. reliability) and compete for scarce resources (March, 1991). Some firms resolve this tradeoff by emphasizing exploration over exploitation, or vice versa. Nevertheless, the risk of this approach is to fall into accelerating dynamics that self-destructively lead to excessive exploration or excessive exploitation. Excessive refinement of capabilities can lead to core rigidities (Leonard-Barton, 1992), while excessive variance seeking can lead to firms never capitalizing on their discoveries (McGrath, 2001). Levinthal and March (1993) call these dynamics the “failure trap” and the “success trap.” In the failure trap, “failure leads to search and change which leads to failure which leads to more search, and so on” (Levinthal & March, 1993: 106). In the success trap, as firms “develop greater and greater competence at a particular activity, they engage in that activity more, thus further increasing competence and the opportunity cost of exploration” (Levinthal & March, 1993: 106). While it is possible to break a trap, it is not necessarily easy. Ghemawat and Costa (1993) simulated the tradeoffs between static efficiency (improvements within a fix set of initial conditions) and dynamic efficiency (reconsideration of initial conditions), and described their irreversibility based on sunk costs, lock-out circumstances, and employee behavioral profiles.

3.2 Balancing the tension

Several approaches have been proposed to balance novelty and continuity. Two articles in our review test market orientation as a mechanism to support simultaneous exploration and exploitation (Atuahene-Gima, 2005; Kyriakopoulos & Moorman, 2004). Market orientation involves generating and disseminating information about current and future customers and competitors (Atuahene-Gima, 2005). It is described as a unifying belief emphasizing serving customers, a set of organization-wide processes of intelligence gathering, and a firm capability to anticipate market requirements ahead of competitors (Kyriakopoulos & Moorman, 2004). According to these authors, market-oriented firms are able to make judicious judgments in resources allocations for product innovation competencies based on market information. Furthermore, a firm's market orientation creates the context within

which project-level marketing strategies can cross-pollinate. Both articles find support for the positive relationship between market orientation, and exploration and exploitation. The articles differ, however, in the picture of what a balanced tension looks like. Atuahene-Gima (2005) finds a negative interaction of exploration and exploitation on radical innovation performance, which leads to the conclusions that “too much of both competence exploitation and exploration may have undesirable costs for the firm” (2005: 78), and that exploration will be more valuable when matched with a lower level of exploitation, and vice versa. In contrast, Kyriakopoulos and Moorman (2004) find synergies from the joint pursuit of exploration and exploitation.

Another approach builds on Tushman and O’Reilly’s (1996) call for “ambidextrous” organizations, in which exploration and exploitation are separated in time and space, and the integration is realized at the top management level. The firm has internally inconsistent competencies, structures, and cultures, yet a single vision. For example, exploration has often been the focus of R&D departments, while production has focused on exploitation (Zack, 1999). Several firms also spin-off their new businesses so that exploration efforts are not blocked by the exploitation of established products. Evidence of the coexistence of exploration and exploitation comes from innovation in manufacturing firms (He & Wong, 2004), concurrent feedback and feed-forward learning in the mutual fund industry (Bontis, Crossan, & Hulland, 2002), innovation in financial services (Jansen, Van den Bosch & Volberda, 2006), product development at Toyota (Knott, 2002), and drug discovery at Celltech (McNamara & Baden-Fuller, 1999). Also, Gibson and Birkinshaw (2004) discuss “contextual ambidexterity” and argue that firms can develop a context that encourages individuals to decide as to how to best allocate their time and resources to the two processes in their day-to-day work. Nevertheless, in a recent special issue on the interplay between exploration and exploitation, Gupta et al. conclude that answers to basic questions on these processes “remain incomplete, at times contradictory, and at best ambiguous” (2006: 693).

Among the studies in our review, Danneels (2003) recommends that in order to supplement the natural process of tight coupling with customers and deliberate efforts at loose coupling, the best way to conduct experimental actions would be to set up a separate unit to do so. Firms also balance exploration and exploitation across time, alternating between periods of radical and incremental change. For example, Beckman et al. (2004) argue that the nature of the uncertainty facing the firm will drive network partner selection. When firm-specific uncertainty is high, the more likely the firm will broaden its set of ties; when market uncertainty is high, the more likely a firm will strengthen the ties it presently has. Lant and Mezias’ (1992) learning model also support the account of change as punctuated equilibrium where episodic radical change follows periods of incremental change.

Several researchers deal with the role played by organizational structure. In new product development projects, McGrath (2001) finds that at high levels of exploration, organizational learning is more effective when the projects operate with autonomy with respect to goals and supervision; as degree of exploration decreases, better results are associated with less autonomy. Siggelkow and Levinthal (2003) discuss the combination of centralized and decentralized structures with decomposable and non-decomposable decision problems. Challenging conventional wisdom, they conclude that if decision problems are non-decomposable, temporary decentralization with subsequent reintegration is recommended, and if problems are decomposable, it is better not to decompose from the beginning but to allow some temporary unnecessary interdependencies. In both scenarios,

the authors suggest temporal balance by stating that “an initial phase of exploration, enabled by an appropriate organizational structure, followed by refinement and coordination, enabled by a different structure, leads to high performance” (Siggelkow and Levinthal 2003: 652). In another study, Gosain, Malhotra, and El Sawi (2004) find support for several design variables associated with the interaction between “offering flexibility” (support changes in product offerings with current supply chain partners) and “partnering flexibility” (changing supply chain partners). From a temporal balance perspective, Gosain et al. conclude that “at design time, enterprises need to carefully structure their interconnected processes, information flows, and content repositories to improve coordination. At execution time, enterprises need to make sure that they maintain communication pathways to share rich information with their partners and understand how their partners’ actions need to trigger their own adaptive responses” (2004: 34).

Finally, the role of leadership and culture has also been examined. Rivkin and Siggelkow (2003) associate search and stability with design elements including active and passive vertical hierarchy, and managerial ability. Through a simulation, they found that “it can be helpful to couple an active, stabilizing CEO with a rich vertical flow of information that promotes search. Similarly, the broad search generated by smarter managers, by firm-wide incentives, or by an incomplete decision decomposition can be harnessed if it is balanced by the stability of an active CEO” (Rivkin & Siggelkow, 2003: 308). Finally, Robertson and Swan (2003) describe a case study of a knowledge-intensive firm, in which resolving the efficiency-flexibility dilemma lends itself to a form of control based around normative processes and cultural control rather than around hierarchy and structure. The authors describe the company’s culture as one of “responsible autonomy” and as a “strong ambiguous” culture, in which high levels of ambiguity (in roles, power relations, organizational routines and practices) had the joint effects of sustaining fluid, flexible forms and effective forms of working over time and of mediating potential tensions between autonomy and control” (Robertson & Swan, 2003).

4 THE TRANSFER-IMITATION PARADOX

The transfer-imitation paradox is at the core of resource-based views of strategy arguing that a firm’s key resources, including knowledge resources, must be protected from imitation, since imitation threatens the sustainability of competitive advantage (Barney, 1991). This tension has been also described as the knowledge-leveraging paradox (Coff, Coff & Eastvold, 2006) and the causal-ambiguity paradox (King & Zeithaml, 2001; Lado, Boyd, Wright & Kroll, 2006).

The knowledge-leveraging paradox emphasizes the tradeoffs between explicit and tacit knowledge. Explicit knowledge is articulated verbally or in writing, while tacit knowledge is unarticulated, intuitive, and non-verbalizable (Nonaka & Takeuchi, 1995; Polanyi, 1967). Tacit knowledge is strategic because it can be valuable, rare, and hard to imitate (Barney, 1991). However, once valuable tacit knowledge is identified, firms must replicate it within the firm (Kogut & Zander, 1992). The dilemma firms face is that increasing the scale of tacit knowledge may require codification, which may make it imitable (Coff et al., 2006). Furthermore, codification rarely occurs without a transformation in the nature of the knowledge (Kogut & Zander, 1992); a software package may capture and transfer the “know-how” of a capability but not its “know-why.” Similarly, the crux of the causal

ambiguity paradox is that “ambiguity as to what factors are responsible for superior (or inferior) performance acts as a powerful block on both imitation and factor mobility” (Lippman & Rumelt, 1982: 420). On the one hand, the difficulty of deciphering causal relationships between firm capabilities and outcomes is a significant barrier to imitation (Lado et al., 2006). On the other hand, the opacity of resources and the difficulty of deciphering cause-effect relationships can frustrate the leveraging of knowledge within the firm to gain competitive advantage (Szulanski, 1996).

The transfer-imitation paradox is also related to the “people-to-documents” and “person-to-person” knowledge management approaches (Hansen, Nohria & Tierney, 1999). Firms emphasizing knowledge codification invest once in a knowledge asset and then reuse it many times; they rely heavily on information technology to codify, store, and disseminate explicit knowledge. In contrast, firms emphasizing knowledge personalization create highly-customized solutions to unique problems and develop networks for linking people so that tacit knowledge can be shared. According to Hansen et al. (1999), although it is tempting to think that the two knowledge management models can coexist in different business units within one corporation, companies with tightly integrated business units should either focus on only one of the strategies or spin off units that don’t fit the mold. Contrary to this perspective, Earl (2001) describes seven knowledge management schools and mentions that they are not mutually exclusive; some can be complementary, some exist side by side, and some are promoted over time in most firms.

4.1 Dysfunctional cycles

Balancing the need to replicate tacit knowledge internally with the desire to keep the knowledge tacit so that rivals cannot imitate it is not easy. At very high levels of tacitness, firms fail to replicate the knowledge internally and cannot realize a significant competitive advantage; at low levels of tacitness, rivals are able to imitate the knowledge fairly easily, and any advantage is temporary (Coff et al., 2006). Similarly, a tradeoff between codification and personalization strategies exists, because the two styles are supported by different cultures, systems, and structures. Too much codification may lead to documents that are blindly applied to situations for which they are ill-suited, while too much personalization may lead to a lack of background materials to support conversations (Hansen et al., 1999).

4.2 Balancing the tension

The articles in our review look at the transfer-imitation paradox from different perspectives. Several articles deal with the role of technology in enabling the transfer or leverage of tacit knowledge. For example, Brown and Duguid (2000, 2001) describe the tension experienced by customer service representatives fixing Xerox machines between process (the explicit way matters are formally organized) and practice (the tacit way things are actually done). Xerox’s approach to solving this tension is to foster best practice among a particular group of employees and then to circulate their expertise using the organizational support that process can provide (Brown & Duguid, 2000). Practices are produced through improvisation, shared through storytelling, and embedded in tacit community knowledge. When dissemination needs to occur beyond a small group, it is supported through a database of tips; tips are entered by reps, and go through “centralized review” (peer-review process of acceptance, revision, and rejection) before being shared. This system guarantees that the database remains relevant, reliable, and not redundant.

In contrast to Xerox’s approach, Coff et al. (2006) describe how information technology can be applied, not to transfer tacit knowledge within the firm, but to leverage specialized tacit knowledge without transferring, codifying, or even engaging in face-to-face communication. The authors provide an example in the context of yield management in silicon wafer manufacturing. Instead of constant trips to the sites, highly specialized engineers resolve problems by monitoring tools remotely to identify patterns associated with reduced process integrity. The system involves minimal codification of knowledge. Expert tacit knowledge remains in the minds of the engineers, but the technology makes it available to more customers. Interestingly, this application has increased the firm-specific component of employees’ knowledge, potentially reducing demand for them and reducing their bargaining power (Coff et al., 2006).

Balance between IT-based and socialized approaches to knowledge management can also be achieved across time. Birkinshaw and Sheehan (2002) argue that firms do not need to choose between knowledge codification and personalization, but that they should pursue different approaches depending on the stage of the knowledge in the knowledge life cycle. Four stages are identified--creation, mobilization, diffusion, and commoditization--which vary in the degree to which knowledge is accessible to one firm, many firms, or the external public (Birkinshaw & Sheehan, 2002). In the creation stage, systems for codifying knowledge have little value. Knowledge creation is most nourished by informal and heterogeneous interactions, and contacts with outsiders. In the mobilization stage, firms try to keep the knowledge hidden from outsiders by keeping it proprietary or relatively uncoded. Personalization approaches such as communities of practice and yellow-pages databases are used. In the diffusion stage, the company accepts that leakage and imitation are bound to occur and begins to standardize knowledge in such a way that it can be disseminated widely. A fine balance must be struck between hoarding knowledge in stage two and sharing it in stage three. Finally, in the commoditization stage the knowledge is already well known and the codification approach is the most valuable. Birkinshaw and Sheehan (2002) argue that no company can realistically aim to be active in more than one or two stages of the life cycle.

While the previous authors tend to emphasize the transfer or the imitation side of the paradox, King and Zeithaml (2001) seek to resolve the transfer-imitation paradox by opening the black box of causal ambiguity and testing the relationships between linkage ambiguity and characteristic ambiguity, managers’ perceptions of ambiguity, and firm performance. Linkage ambiguity is ambiguity among decision-makers about the link between a competency and competitive advantage; characteristic ambiguity focuses on the characteristics of resources (e.g., tacitness) that can be simultaneous sources of advantage and ambiguity (King & Zeithaml, 2001). The authors recommend firms to develop resources with high characteristic ambiguity (e.g., competencies that are tacit and located in the organizational culture) and low linkage ambiguity. Low linkage ambiguity, particularly by middle managers, on the core competencies can help a firm to recognize, appropriate, and transfer competencies. The benefits of middle managers agreeing on the competencies that lead to competitive advantage offset the potential harm associated with imitation.

Another example of balance between transfer and imitation in a context of inter-organizational networks is that of Toyota’s network, which motivates members to participate and openly share valuable knowledge, while preventing undesirable spillovers to

competitors (Dyer & Nobeoka, 2000). Toyota’s solutions are (1) creating a network “identity” through network-level knowledge-sharing routines, (2) establishing network “rules” for knowledge protection and value appropriation, and (3) creating multiple knowledge-sharing processes and sub-networks in the larger network. A highly interconnected strong tie network is good for the diffusion of tacit knowledge because the redundant ties make it easier for network members to locate potentially valuable knowledge and the strong ties produce the trust (social capital) necessary to facilitate the transfer of tacit knowledge.

Kogut and Zander reconcile the transfer and imitation of technology by arguing that they are not mirror processes--“Whereas technology transfer is concerned with adapting the technology to the least capable user, the treat of imitation is posed by the most capable competitors” (1992: 392). Firms learn new skills by recombining their current capabilities. Thus, the ability to build on current technology is instrumental in the deterrence of the imitation of a firm’s knowledge by competitors; that is, imitation is impeded by the possession of at least one bottleneck capability such as reputation, patent protection, or monopoly restrictions (Kogut & Zander, 1992). In an empirical test, Zander and Kogut (1995) found that capability codifiability, teachability, and parallel development by competitors were associated with faster transfer times. However, none of these factors affected the risk of imitation. The authors conclude that imitation of innovations does not necessarily involve imitation of capabilities; transfer does. Certain aspects of manufacturing capabilities are common knowledge to a group of competitors; consequently, successful imitation is often determined more by the access to a bread range of capabilities. Consistent with the idea that bottleneck capabilities deter imitation, Zander and Kogut (1995) find that key employee turnover is associated with faster imitation times. To deal with the management dilemmas (e.g., turnover, adverse selection, and moral hazard) associated with key human assets, Coff (1997) proposes a series of retention, rent sharing, organizational design, and information coping strategies.

A final approach to reconciling the tension is one based on searching synergies across knowledge acquisition, leverage, and protection activities (McEvily, Eisenhardt & Prescott, 2004). Investments made to leverage competencies can also help to protect them if the two activities use common inputs or contribute to complementary dynamics. For example, Oxley and Sampson (2004) examine tensions between leveraging technological competencies and protecting them in the context of international R&D alliances and illustrate how alliance scope and governance mechanisms may alternatively be used to safeguard technologies.

5 IMPROVISATION AND LEARNING PARADOXES

In this section we move beyond the description of learning tensions to the management of paradoxes. For Lewis, managing paradox means “capturing its enlightening potential” (2000: 763), and implies a need to “recognize, become comfortable with, and even profit from tensions and the anxieties they provoke” (2000: 764). Lewis describes three approaches to managing paradox: acceptance (learning to live with paradox), confrontation (openly discuss the tensions), and transcendence (critically examining entrenched assumptions to construct a more accommodating perception of opposites). Through

transcendence, the reframing of paradoxes enables them to be viewed as complementary or interwoven.

Many of the studies we reviewed that describe the novelty-continuity and the transfer-imitation paradoxes suggest balancing them in time and space. First, the tensions can be managed across time in a sequential fashion, emphasizing one aspect of the tension, then the other. In this way, balance is achieved across a specific time period. Second, the tensions can be managed in a parallel fashion by separating them in space with one group emphasizing one side of the tension and another group complementing with the opposing side. In this way, balance is achieved at the firm level. Nevertheless, firms that attain balance through time or space separation lose the benefits that come from the interaction of opposites; they miss the opportunity to see how one opposite can actually inform the other. We suggest that separating the tensions in time and space may be a fall-back position for firms who have difficulty managing the learning tradeoffs simultaneously. The challenge in managing the tensions increases as the separation in time and space decreases. Also, the need to separate processes, such as exploration and exploitation, or personalization and codification, in time and space assumes a negative correlation between the two. In contrast, managing paradox is about enacting possibilities for a synergistic cycle (positive correlation) between them.

In the spirit of acceptance, confrontation, and transcendence, we propose improvisation as a dialectical process in which the novelty-continuity and transfer-imitation paradoxes are intertwined. Furthermore, if transcendence implies the capacity to think paradoxically (Lewis, 2000), then it is necessary to accept and confront the reality that the two paradoxes we have discussed are not independent from each other. The learning processes of exploration and exploitation and the two types of knowledge, tacit and explicit, are all closely interconnected and coexist within day-to-day action in firms.

Novelty results from exploration, which “includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation” (March, 1999: 71). Tacit knowledge is at the heart of innovation because new learning is commonly sparked from individual intuition, experiences, metaphors, and trial and error (Crossan et al., 1999). At the same time, novelty builds on explicit knowledge captured in the firm’s memory (e.g., rules, procedures, and systems) because the larger and the more diverse the set of routines the more alternatives for developing new combinations of ideas (Amabile, 1996). The interaction between tacit and explicit knowledge is also critical to exploration because when a new practice or product is developed, this competence needs to be learned and transferred throughout the firm without it being leaked to competitors.

Similarly, continuity results from exploitation, which “includes such things as refinement, choice, production, efficiency, selection, implementation, execution” (March, 1999: 71). Explicit knowledge is at the heart of stability because existing knowledge is communicated to individuals and groups through institutionalized non-human repositories such as strategy, culture, systems, systems, and procedures (Crossan et al., 1999). At the same time, exploitation builds on tacit knowledge because as routines are replicated in novel contexts, they do not stay the same. Individuals make continuous sense of existing routines, and use their intuition to interpret and adapt them as contexts shift. Thus, tacit knowledge fills the gap that routines and explicit knowledge leave out. The interaction between tacit and explicit knowledge is also critical to exploitation because a firm’s best practice (e.g.,

alliance creation or product development) can be well-known to competitors and still remain inimitable if it builds on tacit firm-specific factors such as social networks, collaboration, organizational culture, or structure.

5.1 Improvisational practices for managing paradox

Improvisation is the spontaneous and creative process of attempting to achieve an objective in a new way (Vera & Crossan, 2004, 2005). Weick (2001) calls improvisation “just-in-time strategy” and explains that “Just-in-time strategies are distinguished by less investment in front-end loading (try to anticipate everything that will happen or that you will need) and more investment in general knowledge, a large skill repertoire, the ability to do a quick study, trust in intuitions, and sophistication in cutting losses” (2001: 352).

The relationship between improvisation and learning is still an emergent area of research. Crossan and Sorrenti (1997) argue that, given that organizational learning implies changes in cognition and changes in behavior, improvisation is a route to “experimental learning” where changes in behavior precede changes in cognition. In a qualitative study, Miner, Bassoff & Moorman (2001) studied improvisation in product development teams and concluded that “improvisational learning” is a type of real-time, short-term learning distinct from “experimental learning” and “trial-and-error learning.” They propose that improvisation influences long-term organizational learning when, for example, the outcome of the improvisation becomes a permanent organizational feature. Also, improvisation impacts organizational memory by permitting the development of an organizational competency in improvisation (Moorman & Miner, 1998a, Miner et al., 2001).

Improvisation has often been associated with exploration, heterogeneity, and learning by doing; there is, however, much preparation and study behind effective improvisation (Vera & Crossan, 2005; Weick, 1998). While the spontaneous facet of improvisation tends to be overemphasized, there is considerable evidence of a more holistic view of the process. Improvisation combines intuition and expertise, novelty and routine, freedom and structure. Through improvisation firms can explore and develop novel solutions to problems or opportunities by exploiting and recombining current routines. When improvising, organizational members rely on tacit and explicit knowledge in the form of storytelling (shared stories about what works and what does not), expert intuition (in-depth experience frozen into habit), entrepreneurial intuition (the ability to recognize gaps and to generate create ideas to fill those gaps), expertise, real time-information, and organizational memory (Vera & Crossan, 2004, 2005).

As a mechanism of knowledge transfer, the ability to improvise enables the replication of knowledge within the firm and is costly to imitate outside the firm. In the 4I framework of organizational learning, Crossan et al. (1999) assert that learning occurs at the individual, group, and organizational levels, each informing the others, and that the three levels of learning are linked by four social and psychological processes: intuiting, interpreting, integrating, and institutionalizing (4I). Improvisation is critical in the flow of learning across levels. At the individual level, novel ideas frequently arise from trial and error and experimentation. When engaging in discovery, people often improvise by acting first and then making retrospective sense of their experience in order to act again (Crossan et al., 2005). At the group level, individuals share their intuitive insights and team members build on the ideas of others. As a result of team level improvisation and experimentation, shared

understanding and collective learning are developed. Finally, new products or processes become institutionalized and captured in the firm’s strategy and routines.

Once an innovation has been created, it needs to be scaled up and transferred within the firm. As new practices are communicated and replicated across the organization, improvisation plays a role in enabling individuals to learn and adopt the new routines. For example, Dalton (1984) positions improvisation in his model of induced change as part of the “internalization and reality-testing sub-process” and argues that when a new cognitive structure is introduced, guidelines are general enough that individuals are forced to improvise to integrate that structure into their thought patterns. In the context of technology adoption, Orlikowsky also finds that improvisation plays a role when people “use the technology to experiment with and implement new ways of working and organizing, and to adapt/customize aspects of their tool and its data content” (2000: 423).

Firms that develop an improvisational capability can take advantage of the benefits of improvisation as an enabler of exploration and exploitation, and of knowledge transfer within the firm. This capability is not easy to develop, but once developed, it is difficult to imitate by competitors because of its highly idiosyncratic nature. An organizational level capability to improvise not only depends on a critical mass of individuals and teams with this ability but also on team and organizational level characteristics that foster it. In the next sections, we discuss four specific improvisational practices and how they transcend learning paradoxes. The first two practices, minimal constraints and experimental culture, provide the boundaries for improvisation to occur. The last two practices, information resources and teamwork skills, enrich the creative and spontaneous process inherent in improvisation. A discussion of these practices highlights the idiosyncratic aspects of improvisation as closely intertwined with its team and organizational context.

5.1.1 Minimal constraints

In improvisation, a little structure goes a long way, explaining why jazz musicians rely on a few specific rules, such as who plays first and who follows whom, to provide an overarching framework within which they can be both creative and consistent (Vera & Rodriguez-Lopez, 2007). In organizations, the notion of “minimal constraints” or “minimal structures” refers to the set of controls (e.g., a few sets of working rules or irrevocable goals and milestones) that managers can employ to accomplish the synthesis of high levels of novelty and stability, autonomy and order (Kamoche & Cunha, 2001). Improvisation enables firms to build minimal plans that, instead of prescribing rigid courses of action, provide organizational members with the strategic direction and minimal structures necessary for coordination, yet still promote flexibility in the allocation of resources. Within the parameters established by the minimal structure through, for example, ownership of a few major outcomes, a few deadlines, the tracking of key operating variables, and well-defined priorities (Brown & Eisenhardt, 1997, 1998), individuals are free to operate in order to achieve the desired goals.

Eisenhardt and Sull (2001) capture the notion of minimal constraints in their “strategy as simple rules” approach to strategy in fast-paced environments. Strategy as simple rules is about picking a small number of strategically significant processes (e.g., product innovation, partnering, spinout creation, and new-market entry) and crafting a few simple rules to guide them (e.g., regarding priority, timing, and exit). Firms competing in fast-

changing or ambiguous environments know that “the greatest opportunities for competitive advantage lie in market confusion, so they jump into chaotic markets, probe for opportunities, build on successful forays, and shift flexibly among opportunities as circumstances dictate” (Eisenhardt & Sull, 2001: 108). Yahoo!, for example, initially focused its strategy on the branding and product innovation processes and lived by four product innovation rules: know the priority rank of each product in development, ensure that every engineer can work on every project, maintain the Yahoo! look in the user interface, and launch products quietly (Eisenhardt & Sull, 2001). These rules provided the basic guidelines and structure within which managers have the freedom to improvise and pursue opportunities. Improvisation helps firms to exploit current ways of doing things while providing room for experiments and controlled risks that open the possibility for exploration of unanticipated opportunities (Crossan & Hurst, 2006).

Minimal constraints can also be captured in the actual organizational structure leaders implement in their firms (Vera & Rodriguez-Lopez, 2007). For example, Whole Foods Market has implemented a community structure; its advantages are hard to imitate because they are based on a web of individual innovations spanning many management processes and practices (Hamel, 2006). At Whole Foods Market the basic organizational unit is not the store but small teams that manage departments such as fresh produce and seafood. Managers consult teams on all store-level decisions and grant them unparallel autonomy. Each team decides what to stock and can veto new hires. Team members have access to comprehensive financial data, including salary information; bonuses are paid to teams, not to individuals. What differentiates Whole Foods is not a single management process but a distinctive comprehensive management system (Hamel, 2006). Whole Food’s fluid community structure enables the coexistence of best practices, creative initiatives, expertise, and autonomy.

5.1.2 Experimental culture

In addition to minimal constraints, improvisation enables the coexistence of paradoxes through the implementation of an experimental culture at the team and organizational levels. An experimental culture provides room for experimentation and is tolerant of “competent” mistakes--those that result from novel ideas and not from flawed execution (Vera & Crossan, 2004, 2005). Experimental cultures are not associated with blind risk-taking and lack of discipline, but represent a culture that promotes action as opposed to reflection as a way to understand and deal with reality (Cunha, Cunha & Kamoche, 1999), and where boundaries and minimal constraints are defined within which experimentation can occur (Vera & Crossan, 2005).

Caldwell and O’Reilly (2003) found that support for risk taking and tolerance of mistakes were two cultural norms that promoted behaviors associated with innovation. When individuals perceive their environment as interpersonally non-threatening and tolerant of, or even supportive of, taking risks and trying new approaches, higher levels of psychological safety and engagement in innovative processes, such as improvisation, ensue (e.g., Edmondson, 1999; Gilson & Shalley, 2004). For example, a multi-million-dollar mistake by a Google vice president received this comment from one of the company’s founders: “I am so glad you made this mistake ... because I want to run a company where we are moving too quickly and doing too much, not being too cautious and doing too little” (Lashinky, 2006). This anecdote is consistent with Google and 3M encouraging their

employees to spend up to 20% and 15% of their time, respectively, to work on whatever projects they feel will benefit the company. This cultural norm and expectation provides the boundary that helps employees to balance the need to be creative and flexible, yet consistent and efficient in execution.

5.1.3 Information resources

Improvisation is nurtured by tacit and explicit knowledge in the form of four types of information: storytelling, expertise, real-time information, and memory. The former two are embodied in individuals and teams, while the latter two are embedded in organizational-level systems and repositories.

Storytelling is the sharing of “war stories” in communities of practice. At Xerox, stories are the real “expert systems” used by tech reps on the job; they are a tacit storehouse of past problems and diagnosis, a template for constructing a theory about the current problem, and the basis for making an educated stab at a solution (Brown, 2002). Stories communicate who did what, when, and why. Stories are also thought machines, by which individuals test out ideas and feelings about some thing and try to learn more about it (McLellan, 2006). War stories may often not coincide with standard procedures; they represent practice, how things are actually done. Stories inform improvisation when people recombine them in real time to come up with something new; simultaneously, successful improvisations are likely to result in new stories to be shared in the community of practice.

In addition to tacit practices, effective improvisation involves preparation, study, and expertise in diverse fields (Vera & Crossan, 2005). Expertise is defined as domain-relevant and task-related skills that depend on innate cognitive abilities, innate perceptual skills, experience, and formal and informal education (Amabile, 1996); it encompasses the specialized skills and knowledge that individuals bring to the team’s task (Faraj & Sproull, 2000). When discussing creative processes, Amabile (1996: 95) explains, “If the domain-relevant skills are already sufficiently rich to afford an ample set of possible pathways to explore during task engagement, the reactivation of this already-stored set of information and algorithms may be almost instantaneous, occupying little real time.” High levels of expertise are associated with highly developed intuition (Vera & Crossan, 2004). Experts no longer have to think consciously about action; they are able to recognize patterns in a new situation, recombine their experiences, and know, spontaneously, what to do (Crossan et al., 1999).

Moving to explicit information resources at the firm level, real-time information is defined as information about current operations and the current environment, which is reported with little or no time lag (Eisenhardt, 1989; Eisenhardt & Tabrizi, 1995). Real-time information and communication enable the coordination of improvisation. The continual tracking of real-time information allows managers to spot opportunities and problems as soon as they occur. It acts as a warning system that helps individuals to respond before situations become too problematic (Eisenhardt, 1999). When managers cannot know how things will evolve, the key is to monitor the outside world and remain flexible. When crises do arise, managers can get right to the problem. Like in the case of expertise, real-time information also contributes to the development of tacit knowledge. In fact, in Eisenhardt’s (1989) research on speed in strategic decision making, she finds that managers who attend to real-

time information are actually developing their intuition, which enables them to react quickly and accurately to changes in their environment.

Finally, effective improvisation is enriched by explicit institutionalized memory. Memory includes declarative and procedural knowledge stored in the systems, structure, strategy, culture, rules, and procedures (Crossan et al. 1999). The role of memory in improvising is paradoxical (Moorman & Miner, 1998b; Vera & Crossan, 2005). Memory may impede the incidence of improvisation when individuals deal with novel situations by simply replicating past routines. However, when teams actually engage in improvisation, memory becomes a helpful resource for them because improvisation is frequently the result of the creative recombination of previously successful routines of knowledge and action (Weick 1993; Moorman & Miner, 1998a). Access to diverse memory resources helps teams to improvise more effective and innovative solutions than they would with a lack of, or a limited pool of, institutionalized knowledge (Vera & Crossan, 2005).

5.1.4 Teamwork skills

In addition to information resources, collaboration between individuals is often taken for granted when describing collective improvisation. Team improvisation is not just a function of having the “right” expertise on the team. Expertise must be coordinated (Faraj & Sproull, 2000). Teamwork skills associated with quality improvisation include trust among players, a common goal, a shared responsibility, a common vocabulary, and the ability both to lead and to follow (Crossan, 1998).

The collaboration needed for innovative team improvisation is based on both cognitive and affective factors (Vera & Crossan, 2005). On the cognitive side, effective improvisers share mental models--shared representations of tasks, equipment, working relationships, and situations (Cannon-Bowers, Salas & Converse, 1993)--and the team’s transactive memory--awareness of who knows what in the team (Wegner, 1987). Shared expectations for team performance and knowledge of “who knows what” are instrumental when teams face new situations. As team members develop the ability to work together smoothly, they face less need for planning, greater cooperation, fewer misunderstandings, and lower confusion (Liang, Moreland & Argote, 1995). Effective improvisation also builds on affective factors such as trust, respect, and mutual support (Vera & Crossan, 2005). Although groups may improvise in the absence of trust and respect, improvisation thrives in their presence because team members know they can take risks and be supported by others. Nevertheless, healthy and close group relationships are not necessarily easy to develop in work teams, since competition, power, and status are often important factors affecting team dynamics (Vera & Crossan, 2005). Once developed, however, teamwork skills, coupled with organizational factors such as minimal constraints, experimental culture, and information resources, constitute a comprehensive and firm-specific improvisational capability that will be difficult for competitors to imitate.

6 CONCLUSIONS

This paper contributes to organizational learning research in three ways. First, our classification of learning tensions into two main categories helps to deepen the field’s understanding of the learning choices that managers face. While past research offered a fragmented view of tensions, the systematic review of the literature we conducted enabled

us to take an integrative approach to the dynamics of learning tensions. Our first category, the novelty-continuity paradox, encompasses tradeoffs such as adaptability and control, flexibility and efficiency, and radical and incremental change. All these tradeoffs have in common the need to efficiently take advantage of existing routines, while embracing continuous innovation. In the case of our second category, the transfer-imitation paradox, it encompasses tradeoffs such as tacit and explicit knowledge, knowledge stickiness and leakiness, and personalization and documentation approaches to learning. All these tradeoffs have in common the need to transfer learning within the firm, while impeding imitation from competitors. By emphasizing connections rather than disconnections, we hope this work invites more cross-fertilization among researchers interested in the learning dilemmas managers face.

Second, in the spirit of accepting, confronting, and transcending paradoxes, we acknowledge that our two categories of paradoxes are closely intertwined in organizational life and that by discussing them together we could achieve richer understand. Researchers tend to implicitly assume the role of tacit knowledge in exploration and that of explicit knowledge in exploitation. This paper challenges this conventional wisdom by highlighting the value of explicit knowledge in exploration and that of tacit knowledge in exploitation as well. Exploration builds on explicit knowledge because innovation frequently arises from the recombination of successful routines of knowledge and action. Similarly, exploitation builds on tacit knowledge because as routines are replicated in novel contexts, they are often internalized, interpreted, and adopted by individuals through intuition and trial and error. Tacit and explicit knowledge are also critical to exploration and exploitation because as the knowledge behind an innovation becomes explicit and replicated within the firm, it may be imitated by competitors unless it is embedded in firm-specific factors such as social interactions, culture, or structure.

Third, we contribute to the literature by proposing that improvisational processes highlight how the novelty-continuity and the transfer-imitation paradoxes come together in real time. Improvisation is dialectical in that it combines intuition with routines, freedom with structure, and spontaneity with coordination. Practices such as minimal constraints and experimental cultures bring order out of chaos by providing the boundaries within which individuals and teams can take initiative and let strategy emerge. The rich combination of information resources and teamwork dynamics in improvisation enables individuals to create something new by blending existing routines with creative action in the moment. In addition, improvisation is a mechanism of knowledge transfer from individuals to teams and organizations, and back from the organization to individuals and teams. Because effective improvisation requires a context that supports spontaneous creative action, it is a capability that is not easy to develop, but once developed, it is hard to imitate by competitors.

This paper also offers important managerial insights. We position improvisation as a critical capability for firms and a potential source of competitive advantage. In contrast to solutions suggesting the separation of exploitation and exploration, and personalization and codification approaches to knowledge management, in time and space, improvisation allows us to see how these processes can work together in real time. The value of improvisation is becoming particularly clear in highly-dynamic environments. In fact, a small set of modern firms, such as Semco S.A., Google, Inc., W.L. Gore and Associates, and Whole Foods Market, have been described as “designed chaos” and as competing “on

the edge of chaos” (Colvin, 2006). These companies have captured improvisation principles in their cultures, structures, or strategies; their success and uniqueness have attracted growing attention. Increasingly, senior managers are recognizing improvisation, rather than a late or satisfactory substitute to planning, a central feature of how people in firms go about creating and implementing strategies. Furthermore, while the ability to improvise well is not easy to develop, improvisational theater has shown that this skill can be learned by individuals and groups (Crossan, 1998; Crossan & Vera, 2005).

The next step is the development of testable hypotheses about the relationships between improvisational practices and specific organizational outcomes such as incremental and radical change, efficiency and innovation, and knowledge replication and imitation. The combination of qualitative and quantitative methods would enable researchers to delve deeply into the micro-processes behind the paradoxes and the mechanisms that improvisation uses to balance the tradeoffs and, at the same time, test the external validity of the hypotheses across different organizational contexts.

In conclusion, this paper emphasizes the need to move from either/or to both/and approaches to learning. Given the presence of multiple dichotomies in the learning literature, we may have lost sight of the fact that routines are created, renewed, and transferred on a daily basis. We hope this work motivates future research aimed at understanding the dynamic balance among learning processes rather than their isolation from each other.

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