



COMMENTARY

Adaptive learning in international business

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Abstract

Building on Daniel Levinthal's seminal theories on learning, adaptation, and innovation, this article elucidates an adaptive view of organizational learning undertaken by multinational enterprises (MNEs). Levinthal's perspectives have tremendous implications for theorizing and examining processes, pathways, and mechanisms of dynamic learning for MNEs competing in a complex environment. This article extends these perspectives, considering unique organizational traits and environmental characteristics facing MNEs for a more nuanced understanding of contexts in which adaptive learning creates global competitive advantage. Discussion also includes Levinthal's perspectives that are not yet adequately extended to, but valuable for, IB research, such as learning mindfulness, cognitive search, organizational architecture for adaptation, and co-evolution with technological change. We offer additional research questions as well as possible solutions to adaptive learning for international business.

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INTRODUCTION

Daniel Levinthal, the recipient of the 2019 AIB Fellows' John Fayerweather Eminent Scholar Award, has a highly distinguished scholarly career with an impressive number of path-breaking works that bear strong implications for international business (IB) research. As his track record within management research attests to, he has made consistent efforts to sharpen the relevance of research for real-world solutions while pushing for internationally diversified research that deemphasizes a singular focus on the United States. The IB community, which values diversity and real-world relevance as its core mission, cherishes such an international perspective.

Levinthal, one of the pioneers on research regarding organizational learning, complex systems, and innovation search, has elevated the discourse within IB research through his superlative work on absorptive capacity, adaptation on rugged landscapes, and learning context. This article emphasizes Levinthal's three interconnected perspectives (*learning, adaptation, and innovation*), delineates how these perspectives operate within the context of IB, and explains more fully the implications for IB research, especially for MNE adaptive learning in a complex world.

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Adaptive learning serves as a shared theme in this article to synthesize Levinthal's contributions to learning, adaptation, and innovation for organizations in a dynamic environment. These three dimensions are unique in that learning creates a foundation for adaptation and innovation while adaptation is a pivotal mid-range process linking learning and innovation. Levinthal's contributions to organizational learning (e.g., absorptive capability and experiential learning), adaptation (e.g., adaptive search and co-evolution), and innovation (e.g., R&D, modularity and organizational architecture) are instrumental to a myriad of studies that build on his seminal works.

Literature establishes that the MNE exists as an efficient means through which knowledge is created and transferred within its internally integrated community (Kogut & Zander, 1993; Verbeke, 2003). However, this view generally holds only when the MNE has an effective adaptive learning system, with a continuous process of adaptive change that co-evolves with industrial and market changes in global competition. Spatially dispersed foreign markets where the MNE operates require constant adaptive learning (Ghoshal & Bartlett, 1988). Adaptive learning can be a source of competitive advantage if the MNE can sufficiently acquire, configure, and integrate its experience and knowledge. Adaptive learning is also vital for MNE evolutions, as the firm and its foreign subsidiaries are persistently under pressure for change and localization.

Levinthal's work can deepen our insights into how adaptive learning applies to MNEs. Adaptive learning can be defined as the ability of an organization to sense changes in its environment and adapt accordingly. While organizational learning is well known as a characteristic of adaptive organizations, Levinthal's studies integrate learning with continuous innovation and complex adaptation. Given increased complexity associated with uncertain geopolitics, supply chain interruptions, trade tensions, digital disruption, institutional complexity, and heightened localization, this integration becomes even more critical today. This article considers both organizational and environmental traits characteristic of MNEs and illustrates how Levinthal's fundamental views concerning learning mindfulness, cognitive search, organizational architecture, and adaptation might be applied in the IB context.

We first present an analysis of organizational learning foundations (absorptive capacity, learning

myopia, cognitive learning, and mindfulness), followed by a discourse on learning-driven adaptation (adaptation on rugged landscapes, process, and technological co-evolution), and finally a discussion on learning-based innovation (reinforcement for innovation, organizational architecture, and inter-organizational collaboration). In each of these three perspectives, we discuss Levinthal's key notions and contributions, then explain how such notions apply to IB, and conclude with our suggestions for future IB research. Figure 1 shows the three perspectives, key studies by Levinthal, and the interrelationships among these perspectives.

FOUNDATIONS OF ORGANIZATIONAL LEARNING

Absorptive Capacity

Levinthal has made a series of ground-breaking contributions that advances research on organizational learning, and most notably on absorptive capacity (Cohen & Levinthal, 1990), learning myopia (Levinthal & March, 1993), cognitive and experiential search (Herriott, Levinthal, & March, 1985), and mindfulness in organizational learning (Levinthal & Rerup, 2006). Absorptive capacity refers to the ability to recognize the value of new,

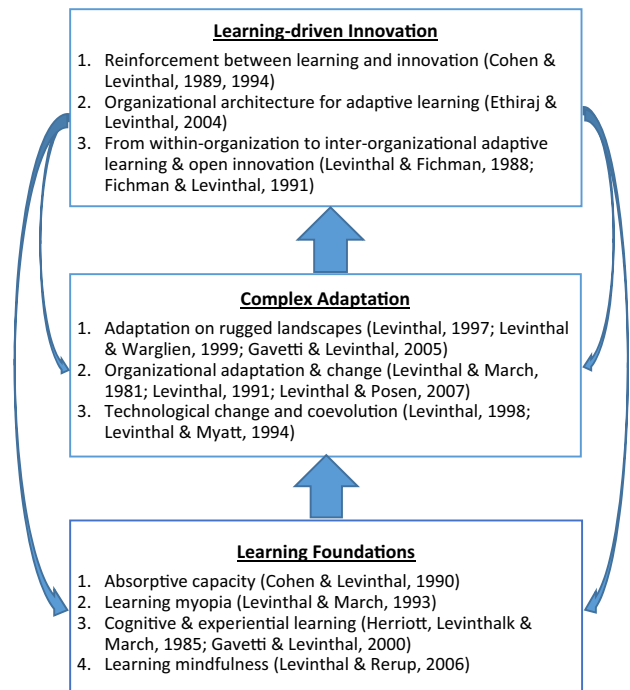


Figure 1 Levinthal's perspectives and contributions to adaptive learning.



external information, assimilate, and apply it to commercial ends (Cohen & Levinthal, 1990). Zahra and George (2002) further extend this definition, submitting that absorptive capacity has four dimensions – acquisition, assimilation, transformation, and exploitation – where the first two form *potential* absorptive capacity and the latter two, *realized* absorptive capacity. As a key notion, the development of this capacity and, in turn, innovative performance of the firm are path-dependent. That is, organizations need prior related knowledge to assimilate and use new knowledge, including a set of learning skills themselves. Progressive improvements in the performance of learning tasks is a form of knowledge transfer that has also been referred to as “learning to learn” – composed of problem-solving skills and learning capabilities. Cohen and Levinthal (1990) hold that to develop effective absorptive capacity, whether it be for general knowledge or problem-solving skills, it is insufficient merely to rely on relevant prior knowledge. Instead, one should rely on sustained efforts such as continuous R&D and constant learning and adaptation.

Cohen and Levinthal (1990) also make the critical point that an organization’s absorptive capacity depends not only on the absorptive capacities of its individual members but on the organizational skills to exploit these capacities. A firm’s absorptive capacity, beyond simply the sum of the absorptive capacities of its employees, encompasses the capacity that is distinctly organizational and effectively operating. Moreover, this capacity not only depends on the organization’s direct interface with the external environment but also on transfers of knowledge across and within subunits that may be remote from the original point of entry.

IB implications of absorptive capacity

The above views have inspired IB research. Studies indicate that one of the main competitive advantages of MNEs rests on the ability to create and transfer knowledge internally. The MNE is portrayed as a ‘differentiated network,’ where knowledge is created in various parts of the enterprise and transferred to several inter-related units (Bartlett & Ghoshal, 1989). Govindarajan and Gupta (2001) suggest that the absorptive capacity of the receiving foreign subunit forms a significant determinant of internal knowledge transfer within an MNE. Subsidiaries differ in their absorptive capacity, affecting the level of internal knowledge transfer from

corporate headquarters and other MNE units. Knowledge inflows into a foreign subsidiary strengthen the richness of transmission channels, the motivation to acquire knowledge, and the capacity to absorb incoming knowledge.

The notion of absorptive capacity has been extensively incorporated in the international joint venture (IJV) and alliance research. This capacity is a key attribute in selecting and collaborating with IJV partners. Complementarity creates an inter-partner fit, which is expected to generate synergistic gains for IJV partners. However, complementarity is unlikely to materialize unless the partners meet a certain threshold of learning ability (Luo, 1997; Parkhe, 1991). The success of IJV operations largely depends on local partners’ capacity to absorb advanced knowledge (technological, managerial and operational) contributed by MNEs. Lyles and Salk (1996) offer one of the first studies to apply absorptive capacity in IB. They investigate an IJV’s learning capacity as an independent variable to analyze knowledge acquisition from partner firms. They show that the capacity to learn and adapt is a significant indicator of knowledge acquisition from the foreign partner. Lane, Salk and Lyles (2001) validate the concept of relative or dyadic level of absorptive capacity to contextualize absorptive capacity in IJVs (one party’s superior absorptive or learning capacity relative to the other party’s capacity of this kind) as important to the former party’s success in achieving strategic goals behind the IJV, especially knowledge acquisition from the other party.

Absorptive capacity is also a beneficial angle to study the role of foreign subsidiaries in shaping an MNE’s overall organizational learning, knowledge transfer, and M&A success. Minbaeva, Pedersen, Bjorkman, Fey and Park (2003) extend this lens by emphasizing foreign subsidiary employees’ motivation and ability as important aspects of absorptive capacity. They demonstrate that absorptive capacity in these aspects facilitates knowledge transfer within an MNE. The global knowledge-based view (Kogut & Zander, 1993; 1995) also argues that absorptive capacity of foreign subunits receiving this knowledge not only limits these subunits’ knowledge upgrading but also affects the orchestration of an MNE’s global knowledge and capability development as a whole. Although foreign subsidiaries play varying strategic roles, each subsidiary’s absorptive capacity is a part of the MNE’s organizational learning system that comprises recognition, acquisition, assimilation, diffusion,

exploitation, and integration within a globally coordinated structure. Such absorptive capacity, as suggested by Bjorkman, Stahl and Vaara (2007), mediates the process of cultural differences influencing post-acquisition capability transfer between subunits and headquarters and among subunits in different countries. When an MNE has strength in social integration and operational integration over global activities, the mediating effect of absorptive capacity is even stronger (Bjorkman, et al., 2007).

New research directions of absorptive capacity in IB

One important area for future advancement lies in how corporate headquarters and subsidiaries work together to collectively strengthen the absorptive capacity of the focal MNE. Cohen and Levinthal (1990) state that absorptive capacity is a part of a firm's decision calculus in allocating resources for innovative activity, which needs collective efforts at multi-levels, such as parent firms, subunits, teams, and employees. With a few exceptions (Hutzachenreuter, Pedersen, & Volberda, 2007; Schleimer & Pedersen, 2014), IB research is generally insufficient in finding how corporate headquarters, regional offices, hubs, and subunits jointly cultivate and develop the absorptive capacity of the MNE for both internal (intraorganizational) and external (interorganizational) learning purposes. Future efforts can explore the interactive and iterative process of MNE headquarters, centers of excellence, and foreign subunits in bolstering collective absorptive capacity unilaterally (from parent to subunits), reversely (from subunits to parent) and multilaterally (among subunits).

Furthermore, global strategy plays an active role in stimulating the collective absorptive capacity of the MNE. MNEs need to have the ability to purposefully adopt structures and strategies that encourage learning. The IB field needs a more nuanced understanding of how an MNE practically executes a series of organizational efforts to fortify absorptive capacity for its organizational system as a whole. Understanding the mechanisms (e.g., structure, autonomy delegation, routines for learning, incentives for learning and sharing, and communication) that work for collective absorptive capacity is fundamental to continuous inquiries on organizational learning processes and outcomes for MNEs. In addition, future research can probe sources of generating absorptive capacity in a rich setting of MNEs. For instance, one can examine under what circumstances MNEs are more successful at improving absorptive capacity through R&D

investment, cross-regional or cross-functional job rotation (global assignment and mobility programs), or investment in capacity of absorption directly.

Learning Myopia

Through leveraging the experience and specializing adaptive responses, organizational learning can improve firm performance in general (March, 1991). However, organizational learning must ambidextrously balance competing goals (e.g., exploring new knowledge vs. exploiting current knowledge) (Levitt & March, 1988). In a path-breaking work, Levinthal and March (1993) explained three forms of learning myopia: (1) tendency to ignore the long-run (i.e., the short run is privileged by organizational learning and long run survival may be endangered); (2) tendency to ignore the larger picture (i.e., the near neighborhood is privileged by organizational learning and survival of more encompassing systems like MNEs is sometimes imperiled); and (3) tendency to overlook failures (i.e., the lessons gained from success are privileged by organizational learning and the risks of failure may be underestimated). As an organization becomes more complex through diversification and expansion, these myopias can be amplified. As an MNE grows, the costs associated with long-term uncertainties, spatially distant contingencies, and causes of localization failures unfolding overseas grow exponentially.

Organizations that learn effectively become well adapted to their environments, even as their environments become well adapted to them. When the world inevitably changes exogenously, the matches between previously well-adapted organizations and the new environments are at risk (Levinthal & March, 1993: 103). This notion applies particularly well to MNEs because these enterprises face immensely dissimilar new environments, and localized adaptation to such geographically dispersed and dissimilar markets is tough to coordinate centrally by headquarters (Bartlett & Ghoshal, 1989). It is also crucial to note that MNEs are prone to overlooking failure. Learning is likely to be misleading if the experiential record on which it draws is a biased representation of past reality, peculiar environment, or confined domain (Levinthal & March, 1993: 104). When firms generalize a competent experience to new or different domains, they are likely to considerably exaggerate the likelihood of success. As MNEs must deal with varying environments across nations and operate



in various business domains and industries, they are noticeably susceptible to misleading learning.

IB implications of learning myopia

The IB field has made significant progress in diagnosing various aspects of learning myopia, and most empirical conclusions are consistent with Levinthal and March (1993)'s suggestions. Luo and Peng (1999), for example, note that while the positive effect of the intensity of local experience on subunit performance diminishes over time, the impact of the diversity of experience on performance remains unchanged. Moreover, for MNEs experiencing greater environmental dynamism, complexity, and hostility, there is a stronger positive relationship between local experience and local performance. Petersen, Pedersen, and Lyles (2008) confirm the existence of learning myopia (overconfidence in particular) in Danish and Swedish MNEs, such that MNEs from country A are overconfident about the suitability of their knowledge pool in relation to country B and will not begin to realize the misconception until unexpected problems arise in country B. In other words, problems occur for entrant MNEs if inappropriate inferences are made regarding the causalities between behavior and outcome as a result of the uncritical transfer of experience from one market to another.

When expanding into dissimilar cultures, MNEs must establish mechanisms to mitigate incorrect learning and reexamine the correctness of inferences drawn from past experience before applying them. Zeng, Shenkar, Lee and Song (2013) corroborate this thought, finding a positive relationship between subsidiary mortality and experience when an MNE has a low level of experience in a dissimilar culture. This relationship is weaker if the MNE's prior FDI has been dispersed across different cultures. Elia, Larsen and Piscitello (2019) conclude that internalization theory (Buckley, 1988; Rugman & Verbeke, 2003; Verbeke, 2003) can benefit from incorporating important behavioral and cognitive perspectives in a study of how firms enter foreign markets, which includes learning myopia. This notion implies that, due to a representativeness bias, underperforming past ventures influence the decision to change the previous entry mode choice, which may result in an entry mode deviation.

New research directions of learning myopia in IB

Still, new opportunities for future research exist. First, a dearth of research occurs in finding what elements of organizational learning and global

experience are subject to greater myopia and which ones are subject to less. These elements can be defined or divided by substance of learning (e.g., technological, operational, and managerial), origin of learning (e.g., home country, host country or third country, or region), process of learning (e.g., recognition, acquisition, assimilation, diffusion, and integration), or transformation tools of learning (e.g., expatriates and employees, cross-cultural teams, information technologies, digital sharing, and routines). It is likely, for instance, that technological learning is less ascribed to myopia than managerial learning for MNEs. IB scholars can delve into these issues more by considering cross-border transferability as well as cross-border applicability of different learning elements (including elements vulnerable to myopia). For example, technological learning is deemed to be more transferable and applicable across borders than marketing learning. Understanding these aspects helps optimize MNE global learning system paths, processes, and efficacy.

Second, it is worth studying MNEs' boundary-spanning learning. MNEs prevalently cross technological, geographical, and industrial boundaries, more so today than ever before. Per Levinthal and March (1993), the self-reinforcing nature of learning makes it attractive for an organization to sustain the current focus. Accentuated distinctive competence results, and organizations become specialized in niches, in which their competencies yield immediate advantage. Learners become increasingly removed from other bases of experience and knowledge and more vulnerable to change in their environments. Despite this rationality, new competitive conditions, such as disruptive innovation and heightened consumer needs for total solutions or extended offerings, prompt MNEs to engage more proactively in boundary-crossing activities. This tendency invites research on when and where MNEs should emphasize on external learning (learning from others) to accelerate boundary crossing and when and where they do more on internal or organic learning for growth in the niche and existing domains.

Third, MNEs need to reward global workforces for learning from failure. Without such incentives, no unit or individual will be willing to invest in such learning in pursuit of organizational improvement at the subunit or headquarters level. In fact, the logic of competence traps, as suggested by Levinthal and March (1993), reminds us that most organizations appear to reward learning from

success, not from failure. This trap occurs when favorable performance with an inferior procedure leads an organization to accumulate more experience with it, thus keeping experience with a superior procedure inadequate to make it rewarding to use. The IB field is essentially inaudible in unveiling working policies and incentives that motivate foreign subunits and their diverse workforce to voice, give feedback, and act in the process of enhancing learning from failure. MNEs have an advantage in utilizing their diverse workforce and sources of learning to fulfill this end when such working policies are in place and in action. It would be beneficial to address this myopia by a framework that unifies organizational learning (including myopia) with global talent management, organizational behavior and organizational justice in MNE's adaptive learning systems.

Cognitive and Experiential Learning

Organizational behavior comprises both cognitive and experiential logic (Cyert & March, 1963). Gavetti and Levinthal (2000) present a unified framework of the cognitive and experiential search for organizational learning. As bounded-rational actors, managers cannot envision the full set of alternatives available to them, nor can they completely specify causal linkages between possible alternative actions and possible outcomes. Attempts to do so are limited by both a number of potentially impactful policy variables and a complex set of interrelationships among these variables. Gavetti and Levinthal (2000) state that cognition occurs as a forward-looking form of intelligence that is premised on an actor's beliefs about the linkage between the choice of actions and the subsequent impact of those actions on outcomes. In contrast, experiential wisdom accumulates as a result of positive and negative reinforcement of prior choices (Huber, 1991; Levitt & March, 1988). Choices that have led to what is encoded as positive outcomes are reinforced, while the tendency to engage in actions that have led to negative outcomes diminishes. In this sense, experiential learning offers a form of backward-looking wisdom.

Cognitive representations play an important role in seeding and constraining the process of experiential learning. Cognition is useful in seeding the process of experiential search on a particular location in the fitness landscape and also in constraining the process of experiential search from wandering to less attractive regions of the

landscape (Levinthal & March, 1981). Cognitions and experience are also linked in ways that the cognitions are clearly an outcome of efforts at sense-making with respect to prior experiences. The organizational change prompted by a shift in cognitive representation is costly in that prior experiential wisdom may be largely negated. When there is a high degree of interdependence among actions, the wholesale shift in behavior driven by a new cognitive representation may result in a tremendous loss of experiential wisdom (Gavetti & Levinthal, 2000: 134).

IB implications of cognitive and experiential learning

The above notions bear strong repercussions in international business. While managerial cognition and international experience have been widely examined separately for MNEs, IB research has rarely touched an integration of cognitive and experiential search. Organizational learning pertains to encoding inferences from history into routines that guide behavior, the latter being partly influenced by managerial cognition. Experiential knowledge and managerial cognition work together to help frame the internationalization process. The Uppsala model (Johanson & Vahlne, 1977) assumes that a lack of knowledge about foreign markets is an obstacle to international expansion, but such knowledge can be acquired through experience abroad. Liability of foreignness and outsidership can be curtailed when host country-specific experience, as well as global experience in general, are accumulated and appropriated (Kogut & Chang, 1991; Zaheer, 1995). This accumulation of experiential knowledge often compels the MNE to undertake further comment and additional FDI (Chang, 1995). We should note, however, that experience, whether host country-specific or global, augments not only the MNE's ability to expand internationally but at the same time to enrich international executives' (at corporate headquarters and frontier subsidiaries) cognitive ability to sense, recognize, and harness foreign market opportunities.

One cannot separate cognition and experience in that a decision for evolving and continuous commitment to foreign markets is a joint product of multiple decision-makers' cognition, their individual vision and experience, and firm-level prior experience in dealing with the focal or similar markets. Maitland and Sammartino (2015) suggest that managerial cognition is underspecified in experiential learning theories such as the Uppsala



model and that this oversight contributes to weak empirical findings on experience, learning, internationalization strategy, and MNE performance. They contend that the IB community suffers from difficulties outlining the experience-performance linkage and in articulating the divergence between predicted and revealed internationalization choices. They further argue that such difficulties stem from the specification of knowledge and experience as firm-level drivers of heterogeneity in internationalization, without explicit modeling of their micro-foundations in individual-level cognition.

Probing how cognition and experience work together in launching, managing, and extending cross-border activities is feasible. Global experience should increase managers' abilities to make sense of both opportunities and constraints in international expansion. Both cognitive ability and experiential ability accumulate over time, further complementing each other along temporal and evolutionary dimensions. Maitland and Sammartino (2015) made a good start, exploring how international managers' cognitive capabilities complement these managers' international experience. They discover that the mental models of more internationally experienced decision-makers will be richer and more connected than those of less internationally experienced decision-makers.

New research directions of cognitive and experiential learning in IB

Following the above logic, future attempts can examine the joint effect of managerial cognition and firm-level experience on a series of consequences, including but not limited to location choice, entry mode, partner selection, vertical or horizontal linkage, and cross-border integration. Future attention may also emphasize how cognitive structures and processes work together with MNE experience at macro- (parent and subsidiaries) and micro- (teams and individuals) levels. Cognitive structures function both as knowledge and a filter for taking in new information (Gavetti & Levinthal, 2000; Simon, 1991). These structures enable decision-makers to deal with complexity, uncertainty and often novelty of the world by simplifying knowledge, placing information cues into a framework for understanding and action. Cognition processes, often comprising perception, attention, memory, thinking and problem solving, language, and human and cultural intelligence, are particularly intricate and subtle in a cross-cultural setting.

Research opportunity abounds to link these processes with cultural brokerage, team diversity, intra-MNE communication, knowledge flows, and organizational justice within the MNE. Our prior knowledge in global human resources management and cross-cultural management can also be intermingled with cognitive structures and processes. A convincing argument, for instance, may hold that MNEs with superior global talent management and acculturation policies will be more successful in benefiting from cognitive processes. Finally, the complexity and uncertainty of foreign markets' tasks and institutional environments can complicate the joint process of cognition and experience. This moderating effect may be more pronounced when the MNE is spatially diversified or lacks material control over the global supply chain and distribution channels.

Learning Mindfulness

In congruity with the complementarity between cognition and experience, Levinthal and Rerup (2006) maintain that routine-driven (less mindful) behavior complements rather than substitutes mindful behavior. Specifically, at a performative level, important elements of less-mindful processes are necessary elements underlying mindfulness. They particularly explicate the role of established action repertoires that facilitate the response to novel stimuli and how routines and established role structures enable sustained mindfulness across time and organization. The authors also caution about the opportunity costs of mindfulness in decision-making – a further step to advance organizational learning that links micro-foundations and macro-foundations.

The notion of mindfulness was initially developed in psychology literature at the individual level of analysis and introduced into organizational studies in discussions contrasting automatic and non-automatic information processing (e.g., Sims & Gioia 1986; Sandelands & Stablein 1987). Langer (1989) defines mindfulness as a state of active awareness characterized by the continual creation and refinement of categories, an openness to new information, and a willingness to view contexts from multiple perspectives. In contrast, when fewer cognitive processes are activated, the resulting state is one of mindlessness, characterized by reliance on past categories, acting on 'automatic pilot,' and fixation on a single perspective without awareness that things could be otherwise (Weick, Sutcliffe, & Obstfeld, 1999). The tendency to mindlessly or

automatically invoke familiar routines is well established in psychology literature.

According to Levinthal and Rerup (2006), organizational mindfulness mirrors a firm's ability to effectively carry out novel action in a flexible manner, and to maintain and sustain a high level of attention and sensitivity to errors and unexpected events, whereas less-mindful behavior can be attributed to a firm's routine/rule-driven environment. Mindfulness and less-mindful actions complement each other: the presence of a large set of well-rehearsed routines provides fodder for improvisation and novel action and allows procedures to sustain attentiveness to signals across time and span of a large organization. At the same time, mindfulness nurtures enactment of routines and encoding of ambiguous processes and outcomes. The mindful construction of outcome structures is a critical component of intelligent processes of reinforcement learning (Argyris & Schon, 1996; Crossan, Lane & White, 1999).

IB implications of learning mindfulness

While the importance of a global mindset has been well recognized in the IB field (e.g., see a review by Levy, Beechler, Taylor and Boyacigiller, 2007), learning mindfulness and its relationships with routines and rules have not received much attention. The global mindset generally refers to the cognitive capabilities of senior managers in MNEs in how they respond to cultural and national diversity as well as strategic complexity associated with the global environment. The global mindset is a highly complex individual-level cognitive structure characterized by openness, differentiated articulation of cultural and strategic dynamics on both local and global scales, and integration across these multiple domains (Levy, et al., 2007). Clearly, the notion of the global mindset can apply at the individual or team level, which creates an even greater need for research on organizational-level mindfulness in MNEs.

Organizational-level mindfulness and an individual-level mindset differ significantly in various ways. First, the former captures higher-order mindfulness and offers flexibility in competing in the global environment, mandating a joint requirement of effort on the part of both parent firms and subsidiaries. Flexibility results when organizational-level memory, experience, aspirations, fairness, and culture are created. Second, flexibility captures organizational actions that are novel in responding to new opportunities or threats. Organizational

mindfulness goes beyond attitudes or attention and does not emphasize on repeating prior actions. Third, the former captures firm sensitivity and ability to respond to errors and uncertainty, both typical in global competition. Mindful learning aims to improve a firm's ability to learn from ambiguous, uncertain and imperfect stimuli. An MNE's ability to foresee and address global supply chain breakdowns, geopolitical crises, trade wars and other significant risks, for instance, is part of organizational mindfulness.

New research directions of learning mindfulness in IB

There may exist a greater complementarity between organizational routines and organizational mindfulness for MNEs than for domestic firms, meriting future attention. Organizational mindfulness can be a steppingstone for organizational learning whose processes necessitate the aggregation of prior experience through channels of routines and rules (Fiol & Lyles, 1985). Training and socialization, for example, can enhance both learning mindfulness and learning routines for MNEs. Organizational members at multiple levels and locations must not only learn a set of explicit, codified rules and routines but also learn to become a part of subtle cognitive structures that consist of a broad range of critical values, norms, and practices that underpin the MNE's mindfulness. Global leadership programs can foster both individual- and organizational-level skillsets for members to execute novel actions to meet new challenges in global operations. However, power, tension, and politics within an MNE can complicate the efficacy of learning mindfulness. Levinthal and Rerup (2006: 509) state that both mindful and less-mindful approaches to cognition and action should be viewed as processes with no axiomatic connection to the efficacy of resulting outcomes. One interesting line of inquiry might be to study how power distribution and corporate politics within an MNE manifest themselves in organizational mindfulness.

Finally, IB research can incorporate organizational ambidexterity into learning mindfulness. IB literature has already addressed ambidexterity between global integration and local responsiveness (e.g., Bartlett & Ghoshal, 1989; Ghoshal & Bartlett, 1990), exploration and exploitation (e.g., Gibson & Birkinshaw, 2004), and competition and cooperation (e.g., Luo, 2004). Yet, ambidexterity logic applies here, too. Routines exist for stability and continuity whereas mindfulness creates room for openness, resilience and change. While learning



routines are a mechanism to preserve accumulated experience, learning mindfulness addresses the importance of novelty to respond to distinct and changing circumstances. Competing in increasingly complex and dynamic environments, MNEs become ambidextrous via multiple means, which compel them to pursue disparate goals, such as routines for stability and mindfulness for resilience, simultaneously. It is possible that MNEs well versed in ambidexterity can achieve higher returns from growth opportunities and strategic options while allowing them to maintain stability and learn from experience. Early IB research (Boyacigiller & Adler, 1991; Doz & Prahalad, 1991; Gibson & Birkinshaw, 2004; Govindarajan & Gupta, 2001) offers related explanations for this issue. This research suggests that MNEs can generate more global competitive advantages if they are equipped with a global mindset and resilient behaviors coupled with superior routines to deal with the complexity wrought by multiple organizational environments, structural indeterminacy, and cultural heterogeneity. Next, we explain how Levinthal's other key contribution – complex adaptation – is related to and underpinned by the above learning foundations.

COMPLEX ADAPTATION FOR ORGANIZATIONS

Complex Adaptation

Levinthal (1997) states that the ability of established organizations to respond to changing environments is conditioned by the extent to which elements of organizational form interact to achieve organizational fit. Tightly coupled organizations are subject to high rates of failure in changing environments. This occurs because the effect on organizational fitness of various attributes that constitute an organization form is interactive. As a result of these interaction effects, the fitness landscape is "rugged." Levinthal argues in several articles that firm-level adaptation and population-level selection are not contrasting forces but are fundamentally interrelated. To this end, it is important to find a mapping from a characterization of an organization's form to a statement of its relative fitness or likelihood of survival. Adaptation leads organizations to modify their existing form to enhance their fitness. Imprinting effects persist as a result of the path dependence of the search process (Lewin, Long & Carroll, 1999; Marquis & Tilcsik, 2013). Local search in a rugged landscape provides an essential source of diversity of organizational

forms apart from the external logic of ecological arguments or contingency theories (Levinthal, 1997: 935). Moreover, the degree of epistatic interactions within organizations has important implications for both understanding the persistence of organizations across time, as well as the diversity in a population of organizations at a point in time.

Levinthal (1997) also echoes the systems' logic in that adaptability is enhanced if there is a modest degree of interaction among the system's components. With more complex interactions, it becomes less likely for established organizations to respond effectively to changes in their environment because, in a fully joined system, a perturbation on one variable requires adjustment on all other variables in the system, making adaptation improbable (Glassman, 1973: 84). For a tightly coupled organization, efforts at search and experimentation tend to negate the advantages associated with established policies, and thereby place the organization at risk of failure. In contrast, more loosely coupled organizations can exploit the past findings while exploiting alternative bases of future viability.

Contextualizing complex adaptation in IB

Levinthal's views conform well with extant IB research by offering new insights on adaptive learning for international business. Kogut and Zander (1993) define MNEs as social communities that specialize in the creation and internal dissemination of knowledge. They arise out of their superior efficiency as an organizational vehicle, that is uniquely positioned to create and transfer knowledge across borders. In these social communities, firms use their relational structures and shared coding schemes to spur interactions within an MNE to enhance the transfer and communication of new skills and capabilities. Organizational learning is stimulated both by environmental change and internal factors in a complex, iterative manner (Benito & Gripsrud, 1992; Cantwell, Dunning, & Lundan, 2010; Shaver, Mitchell, & Yeung, 1997). Learning capabilities serve as efficient mechanisms for the creation and transformation of knowledge into economically rewarding products and services (Barkema, Bell, & Pennins, 1996). Such capabilities constitute a firm's ownership advantages that help mitigate the liabilities of foreignness in international expansion. Furthermore, the capacity to speed the internal transfer of a technological or production capability to new foreign markets is also of fundamental significance in a

competitive environment. Lord and Ranft (2000) demonstrate that both the nature of local market knowledge itself and differences in organizational structures significantly influence the extent of internal knowledge transfer among divisions.

Additionally, Levinthal's perspective opens a critical question for MNE research: linking the type of MNE organizational structure with learning design or search. An MNE exemplifies a complex system, mandating an optimal level of adaptation at the corporate level and even higher differentiation of local adaptation by foreign subsidiaries. This new line of research allows IB scholars to study the imprinting effect of prior structures, routines, and cultures on optimal adaptation at the parent and subsidiary levels and to tackle which organizational elements (e.g., bureaucratic control, decision power delegation, and knowledge sharing) ought to be more tightly coupled and which ones loosened in responding to rugged and complex environmental change.

To further develop the logic of adaptation rugged landscapes, Levinthal and Warglien (1999) bring in consideration of within-organization interdependence into the local adaptation or landscape design (i.e., tuning of fitness landscapes on which actors adapt). Designs that highlight interdependencies, such as cross-functional teams, lead to greater exploration of possible configurations of actions, though at the possible cost of coordination difficulties. While traditional organizational design assumes that the underlying structure of interdependencies is always taken as a given, the notion of landscape design presumes a shift from designing based on a given set of interdependencies to designing by manipulating the set of interdependencies. Global integration and local responsiveness (I-R balance) views allude to this point, suggesting that MNEs need to manage and adjust within-organization interdependencies. Those interdependencies need to be managed in a manner that allows for the specialization of foreign subunits, which lets the MNE undertake complicated tasks to require an equally developed system of integration to bind them into an operational whole (Bartlett, & Ghoshal, 1989; Prahalad, & Doz, 1987).

It is well known that an MNE consists of a group of geographically dispersed, goal disparate entities that maintain differentiated interdependencies with the headquarters and with one another. Largely unknown, however, are the particular interdependencies that MNEs should calibrate and

how they should be accomplished. One possible direction is to differentiate task interdependencies from organizational interdependencies, enabling IB researchers to unpack more deeply the process of calibrating interdependences. Another direction consists of integrating the literature of a subsidiary's role with interdependence management. Levinthal's notion of adaption on rugged landscapes can also guide IB research to link this process that co-evolves with industrial and market changes in different host countries.

Organizational Adaptation and Change

Levinthal and March (1981) is a seminal work that presents a framework of organizational change through adaptation and technologies. The authors explore simultaneous organizational adaptation in search strategies, competencies, and aspirations under conditions of environmental instability and ambiguity. They also tell us the process by which search for new technologies through refinement and innovation occurs. The experience accumulated from developing new technologies results in the uncertain outcomes generated by search and organizational learning. This insight, along with Levinthal's subsequent works (Levinthal, 1991; Levinthal, & Posen, 2007), enlightens research on MNE adaptation as well. The need for MNEs to balance dynamic tensions between geographic, technological, market, competencies, and aspirations continues to compel the multinational enterprises to invest more in organizational adaptation and change.

Levinthal's view toward organizational adaptation complements dynamic capabilities in international business (Teece, 2014). Both articulate a dynamic process of organizational adaptation to address rapidly changing and complex environments. While dynamic capability theory focuses on the firm's ability to integrate, build, and reconfigure internal and external competences to address changing environments, Levinthal's perspective describes a behavioral process that makes successes serially correlated, nurtures adaptation and technological change to co-evolve, and develops experiential and explorative capabilities that underpin adaptation and change. Unifying these two complementary perspectives can add theoretical depth to MNE adaptation research. For instance, Levinthal's view of adaptation provides a behavioral foundation, especially regarding the intelligence of new learning and acquired experience, to support renewal, reconfiguration, and upgrading of



MNE capabilities, resources and routines to address shifting parameters of global environments.

The notion that organizations should adapt by generating new knowledge seems obvious and compelling. However, this notion overlooks the possibility that the reward for generating new knowledge may itself be eroded if a change is an ongoing property of the environment. Posen and Levinthal (2012) caution that environmental change is not a self-evident call for strategies of greater exploration. Under certain conditions, the appropriate response to environmental change is a renewed focus on exploiting existing knowledge and opportunities. This implies that adaptive learning is tantamount to chasing a moving target, necessitating recursive, continuous and evolving balance between exploitation and exploration.

Contextualizing organizational change in IB

Global competition needs the aforementioned caution even more desperately for two reasons. First, the nature and changes of environmental uncertainty, complexity, and hostility vary across countries where an MNE operates (Rosenzweig & Singh, 1991). MNEs require adaptive learning first at the country level, to then coordinate such adaptation at the region and global levels. The multiplicity of country-level environmental dynamism for MNEs accentuates exploration of new knowledge, while cross-country coordination and sharing fortify exploitation of existing knowledge on a global scale. Second, MNEs transfer new and existing knowledge across borders through internalization because the market system (e.g., licensing) fails to trade such knowledge openly (Hennart, 1982), or the MNE itself is a social community that creates and internally transfers such knowledge (Kogut & Zander, 1992). In this context, internalization becomes a means of fulfilling resource deployment and knowledge transfer within a globally integrated organizational system. The recent internalization logic stresses the importance of recombining or re-bundling existing firm-specific advantage (FSA) with country-specific advantages (CSA) for opportunities within an internally institutionalized MNE system (Verbeke, 2003). This means that MNEs can generate higher returns by an evolving fit between exploitation and exploration and between FSAs and CSAs through a dynamic internalization system.

Levinthal (1991) and Levinthal and Posen (2007) also caution about a potential negative effect of change. Environmental and population-level

selection processes can be inefficient in that organizations with potentially superior long-run performance may be selected out, and that adaptive change can result in fluctuations in current performance across time. Sensible learning or deliberate search strategies are key to the success of the adaptive change. Yet IB research is generally silent in these areas, leaving a great opportunity for future research. The intelligence or competence of adaptive learning depends on the planning horizon involved and on how false learning about search strategies or aspirations can lead to actions that tend to compound the error. Future research can show how MNEs undertake false learning or learning traps, and how false learning may become contagious, spreading over an MNE's entire global system. More importantly, corrective measures taken by MNEs to protect against false learning should be assessed. The intelligence of adaptive learning in conjunction with learning search strategies, developing search competencies, learning experience, and forming aspirations for search, can be fascinating subsets of organizational learning research for IB scholars.

To create a competitive advantage, adaptive MNEs should find activity configurations that are not only internally consistent but also appropriate given the firm's current environment. This challenge becomes particularly acute after firms have experienced considerable environmental change that has shifted the existing competitive landscape and created new activity choices. To answer how firms organize to explore altered performance landscapes, Siggelkow and Levinthal (2003) demonstrate that organizational structure affects such a balance. They find that if interactions among a firm's activities are pervasive, neither the centralized nor the permanently decentralized organizational structure leads to high performance. In this case, temporary decentralization – an organizational structure that starts out with a decentralized structure and later reintegrates – can yield higher long-term performance. This notion could be extended to IB research as more MNEs are moving toward a loosely (structurally decentralized) coupled (reintegrated in knowledge diffusion within the firm) system through connected nodes, namely global hubs (Kali & Reyes, 2007).

Co-evolution with Technological Change

Technological change can help MNEs build global scale with speed. However, such change shortens the life cycle of existing technologies, knowledge,

and products. Change also forces MNEs to make decisions and commit resources more quickly. Since many of these resources are not fungible, prior (and often irreversible) commitments become an obstacle to rapid adaptation and agile responsiveness. To tackle how organizations respond to or evolve with technological change, Levinthal (1998) presents an important perspective: rapid technological change is not merely a transformation of technology but involves speciation – the application of existing technology to a new domain of application. As a result of distinct selection criteria and the degree of resource abundance in the new domain, a new technological form may emerge. The new technological form may be able to penetrate other niches and, may precipitate a process of ‘creative destruction’ and out-compete prior technologies. The phenomenon of creative destruction is associated with the ‘invasion’ of the technological form that has evolved in the new domain of application into other domains (Levinthal, 1998: 221). Evidence shows that many successful MNEs build a new global competitive advantage by technological boundary-crossing – creatively applying available technologies from one industry or field to another (Schotter, Mudambi, Doz, & Gaur, 2017). Given their extended geographic and business diversity around the world, these MNEs have more opportunities than domestic counterparts to conduct such technological boundary-crossing and to reap the benefits from it. This view attributes a firm’s competitive advantage to its ability to identify a set of existing technologies available in other fields and to combine, re-bundle and reconfigure them with the firm’s critical technologies in its core business in a way that is creative and adaptive to market requirements.

However, boundary-crossing in technological exploitation is a deliberate, distinct, and innovative process. That is, firms become savvy in how they distinctively select, develop, and re-bundle technologies across boundaries in ways that create specific advantages. “Cross” is not the same as diversity. “Cross” entails deliberate interactions between multiple sources to achieve new creativity. Thus, theoretic properties of and organizational actions for boundary crossing include deliberation (vision, planning, intelligence, and design), diversity (breadth of boundaries), interaction (combining, composing, and reconfiguration), and complementarity (integration, conflict solving, synergy creation). Boundary crossing is a special skill for organizations, subunits, teams and

individuals. This tenet has strong implications for IB because cross boundary in this context is manifested not merely in cross cultures and nations but also in cross industries, technologies, and businesses. Under global connectivity and linkage economy that connects companies, teams, and individuals all over the world through fast flows of ideas, data, information and people, boundary-spanning access, sharing, and appropriation of global resources (technologies in particular) becomes both critical and viable.

The above view is also an important advancement from traditional learning conceptualizations, which suggests that an established firm may have more incentive to invest in incremental changes in a current technology than in exploring more radical innovations. As Levinthal’s research shows, in highly unstable industries or rugged landscapes, the feedforward logic overwhelms feedback logic in dynamic organizational learning especially in fast-changing industries. In making a choice about which markets to serve, a firm is making a bet on a co-evolutionary process.

Contextualizing technological coevolution in IB

Crossing, spanning, and organizing multifaceted (technological, industrial, geographic, and organizational) boundaries constitute a vital issues for MNEs. The dual pressure on an MNE’s spatially dispersed units to maintain intrafirm consistency while bolstering local isomorphism has been the subject of much discussion (e.g., Bartlett & Ghoshal, 1989; Doz & Prahalad, 1991). This dual pressure and associated complexities create complex and often implicit boundaries. In addition, the contextual and operational diversity that affects the boundaries in global organizations is continually changing. Hence managing and coordinating across different inter- and intra-organizational boundaries emerge as an important capability for the success of global organizations (Schotter, et al., 2017). Levinthal’s (1998) point on technological boundary-crossing and co-evolution with technological change, as stated above, opens new avenues for IB research. For instance, global platforms may become a catalyst for these new crossing and co-evolution processes, and lead innovators of such platforms may be placed in a better position to influence the scale, processes and profit-sharing of these activities. The logic of global co-opetition (Luo, 2004) can be combined with crossing and co-evolution processes because global players tend to compete in one area (e.g., technology, location,



value chain activity) while collaborating in other areas to capitalize on greater complementary opportunities and cross synergies.

Finally, a good opportunity in IB research lies in examining the role of global market demand in the above process. The demand-side of technological change affects the breadth and depth of crossing and co-evolution activities as well as competitive and financial outcomes of these activities. Adner and Levinthal (2001) demonstrate that demand heterogeneity offers an alternative to supply-side explanations of the technology life cycle. This heterogeneity captures heterogeneous customer groups in various countries with diverse preferences toward products or services. It provokes MNEs to sharpen their adaptive learning that accounts for both global integration and local responsiveness. Research shows firms are much better off when they integrate similarities in customer preferences across countries to build global competencies while deploying resources to adapt products and services based on differences in customer preference in each foreign market. With increases in global demand heterogeneity, firms are compelled to sense market changes, understand and interpret when markets are likely to diverge, and adjust in each market. Moreover, increased heterogeneous demand provides opportunities for firms to learn and potentially combine diverse knowledge flows to precipitate a potential renewal and upgrading of their internal capabilities (Zhang, Xie, Li, & Cheng, 2020). Below we present how adaptation and learning drive and reinforce innovation.

LEARNING-DRIVEN INNOVATION

Learning-Innovation Reinforcement

Cohen and Levinthal's (1989) article on innovation and learning has been cited over 10,000 times according to Google Scholar, suggesting that R&D not only generates new knowledge but also enhances the firm's ability to assimilate and exploit existing knowledge. The cost of learning is borne via the development of a stock of prior knowledge that constitutes the firm's absorptive capacity. Thus, incentives to learn will influence R&D spending and innovation. Those incentives are shaped by the quantity of knowledge to be assimilated and the ease with which learning occurs. The ease of learning, in turn, depends upon the characteristics of the underlying technological and scientific knowledge upon which innovation rests in a given

industry (Cohen & Levinthal, 1989: 570). Indeed, firms invest in R&D not only to pursue new process and product innovation, but also to develop and maintain their broader capabilities to assimilate and exploit externally available knowledge.

Probing learning-innovation reinforcement in IB

This mutual reinforcement between learning and innovation has strong implications for MNE research. First, understanding the nature by which reinforcement occurs between learning and innovation can save product development costs, improve market responsiveness, and nurture a virtuous cycle of product and process innovation. Second, mutual reinforcement, underpinned by absorptive capacity, balances the requirement for stability (assimilating and exploiting internal and external knowledge) and growth (exploring new technologies and R&D). Third, as knowledge acquisition from external sources becomes more available due to improved global technologies (Cano-Kollmann, et al., 2016; Tallman, Luo, & Buckley, 2018) and boundary-crossing complementarity of knowledge connectivity noted above, MNEs with an effective reinforcement mechanism in place will outperform others in the race for learning via cross-border interorganizational collaboration and in building and deploying dynamic capabilities in global competition (Zollo & Winter, 2002; Teece, 2014). These predictions, nonetheless, need to be substantiated in future IB research.

One particular area worth further inquiry lies in the orchestration of learning and innovation for mutual reinforcement. Learning and innovation work bidirectionally (from parent to subunits and from subunits to parent), involve both feedback and feedforward processes, and require knowledge sharing by numerous hubs and subunits in different locations. Phene's and Almeida's (2008) study confirms that frontier subsidiaries play an important role in the globalization of innovation such that knowledge absorbed from the parent firm is useful to subsidiary innovation, and that both sourcing and combinative capabilities of subsidiaries have a significant influence on the scale and quality of an MNE's overall innovation. Similarly, Frost and Zhou (2005) show that "reverse" (subsidiary to headquarters) knowledge integration is an important facilitator of global innovation strategy for MNEs. They also document that R&D co-practice (joint technical activities between units) increases levels of absorptive capacity and social capital among participating units, thus increasing

the likelihood that they will share knowledge at future time periods. Reflecting on this orchestration process, we can conceive of MNEs as social entities (wherein social capital and corporate values of learning and innovation matter) as well as technical entities (wherein operating policies and systems for knowledge building and diffusion matter) in the process of producing knowledge acquisition both within an MNE and from outside partners.

Linking knowledge characteristics with the process of reinforcement between learning and innovation serves as another viable expression of the knowledge acquisition process. Several IB studies have explored in depth how knowledge characteristics are interrelated with global innovation carried out by MNE subunits. These units undertake different tasks in the processes through which innovations are created and institutionalized (Singh, 2007). First, they can develop and adopt new products, processes, or administrative systems locally (creation). Second, these units may be required to adopt innovations developed by the parent company, or a central R&D (adoption). Third, they may be required to diffuse their local innovations to the parent company or other subsidiaries (diffusion). Thus, the primary advantage that an MNE brings to foreign markets lies in its possession of superior knowledge and its efficiency in cross-border knowledge transformation and diffusion.

Kogut and Zander (1993, 1995) document that knowledge attributes, including knowledge codifiability, teachability, and complexity, affect an MNE's choice of transfer, the structure of their global R&D system, and processes of global knowledge integration. Going forward, researchers should examine what type of knowledge reinforces the relationship between learning and innovation, and what mechanisms detract from this relationship. As Cohen and Levinthal (1989) point out, key to this reinforcing process is a firm's ability to harness and transform R&D into broader capabilities to assimilate and exploit externally available knowledge, including that from other sectors or subsectors. One may posit, for instance, that knowledge complexity favors mutual reinforcement of organizational learning and in-house technological innovation whereas knowledge codifiability may favor the co-development of learning and externally sourced new knowledge. Phene and Almeida (2008) have echoed the importance of this issue, though they focus more on unique sources of

knowledge most useful to the MNC subsidiary innovation. Most importantly, transforming R&D into broader capabilities of assimilating and exploiting available knowledge forms an intricate task that every MNE encounters, warranting further exploration of the underlying antecedents and consequences of this transformation process.

Organizational Architecture for Innovation

The idea of fit and coherence among organizational elements creates the bedrock of organization design theory (Lewin, et al., 1999; Nadler & Tushman, 1997). Fit and coherence become even more critical for MNEs because these multinational enterprises present a more complex adaptive system and face greater uncertainty than other firms. To most MNEs, organizational architecture, which generally refers to the structure and form by which a business operates, is characterized by greater autonomy at every level of the organization, thus ensuring appropriate localized adaptation. Meanwhile, elevated cohesiveness of all components of the organization strive to achieve the firm's strategic goals as a whole, thereby ensuring seamless mobilization of global resources. This process involves the creation of self-contained units, which account for a wide range of strategic objectives and structural designs that can quickly adapt to rapid changes in the business environment (Soda & Zaheer, 2012). Cohesiveness shatters the rigid boundaries that in the past separated one division from another, or even one company from its suppliers and competitors, and provides more flexible relationships. The concept brings an architecture keenly sensitive to both technical and social aspects of the organization (Nadler & Tushman, 1997).

A key point in organizational architecture literature asserts that first-order adaptation (incremental, local adaptation within a given structure) may yield diminishing returns as the space of possibilities within an existing organizational architecture is exhausted. Similarly, a major shift in the organizational form via second-order adaptation (changes of the underlying structure itself) may enhance the effectiveness of first-order adaptation by creating new configurations for experimentation (Ethiraj & Levinthal, 2004; Levinthal, 1997), much as breakthrough innovations set the stage for subsequent refinements (Nelson & Winter, 1982). However, the complementarity between these two levels of adaptation cannot be taken for granted, necessitating a deliberate design and execution procedure that



aligns properly structural change with environmental change. Ethiraj and Levinthal (2004) show that the relative efficacy of adaptive efforts in hierarchical structures persists with moderate levels of environmental change, but as the rate of environmental change increases or organizations get larger, the capacity to adapt effectively recedes. The appropriate design of non-hierarchic structures requires decision-makers to have a sophisticated global sense of the interdependencies among units of the firm. The authors suggest that the level of complementarity between first- and second-order adaptation is higher in loosely coupled structures and significantly lower when the underlying structure is tightly coupled.

Probing organizational architecture for innovation in IB

Despite its salience, organizational architecture for MNEs in general and for adaptive learning of these firms has received little attention in research. This architecture comprises not only organizational structure, which has already been researched in IB, but the interfaces between structure and other elements of organizational architecture, namely strategic intent, global strategy, organizational capabilities, knowledge flows, and MNE culture and values. According to Ethiraj and Levinthal (2004), first-order adaptation occurs within the parameters of existing architecture, whereas second-order adaptation involves a change in the existing architecture itself. Thus, fundamental shifts in strategy or structure would fall within the scope of second-order adaptation.

It has been long established that mechanisms used to achieve organizational architecture play a central role in shaping the organizational learning process and determining its outcome (Levinthal, 1997). OMNE structure including flatness, centralization, and interdependence of MNE subunits, defines how these processes interact. Thus, the previous discussed levels of adaptation open a new door to IB research concerning requirements for architecture and orchestration for global operations.

First, the I-R balance perspective should be integrated with these two-order adaptations, offering a more nuanced understanding of actionable processes within the I-R balance construct. In principle, second-order adaptation complements global integration while first-order adaptation is more in-line with localization. IB research should contextualize the complementarity processes

suggested by Ethiraj and Levinthal (2004) in light of unique conditions confronting MNEs. For instance, changes in organizational structure must not only consider ongoing concurrent learning and adaptation capabilities of the MNE's parent firm but also foreign subunits' abilities to adjust and adapt to these changes.

Second, mid-range mechanisms that MNEs employ to coordinate global operations, including autonomy delegation, formalization, planning, output control, and behavioral control, are important actions through which the I-R balance is operationalized via the previously noted two-order adaptations. Future research should endeavor to study more closely these mid-range mechanisms in the transformation process of two levels of adaptations.

Third, an MNE is a loosely (autonomous and adaptive) coupled (coordinated and integrated) system, in which all units are interdependent. And yet, these units play differentiated roles in globally coordinated operations. The architecture literature (Nadler & Tushman, 1997; Levinthal, 1997) offers key insights concerning organizational and environmental contingencies that determine the degree of looseness and coupling, which scholars in IB research should extend to probe similar contingencies facing MNEs.

From Within-Organization to Inter-Organization Adaptive Learning

An organization can be viewed as a nexus of relationships, including those among individuals within the organization, between individuals and the organization, and those which cross organizational boundaries. Survival properties of organizations are influenced by the duration and pattern of interorganizational relationships (Gulati, 1995). Since the late 1980s, Levinthal and his associates have extended these preeminent perspectives of within-organization adaptive learning to inter-organizational adaptive learning and open innovation. A key notion in these works considers that interorganizational collaboration is an evolutionary and mutual learning process by two exchanging organizations. Mutual learning creates inter-party attachment, which subsequently fosters the success of inter-firm exchanges. Levinthal and Fichman (1988) suggest that the dynamics of relation-specific assets are particularly clear when skills and expertise are developed through learning-by-doing. While some of these assets reside with individuals, others are institutionalized within the two

organizations. However, as this relationship progresses, relational-specific investments by both parties result in more effective mutual operations and the further cumulative development of relational specific assets over time.

Levinthal's subsequent research (Fichman & Levinthal, 1991; Seabright, Levinthal, & Fichman, 1992) offers additional insights into the evolutions of inter-organizational links. This work suggests that the hazard rate of the relationship ending increases for an initial period and then declines (i.e., liability of adolescence). However, if a relationship between two parties starts with an initial stock of relation-specific assets, the risk of relationship-dissolution at inception is reduced, even if initial outcomes of the relationship are unfavorable (i.e., the honeymoon period). The underlying logic that supports this suggests that commitments to relationships, whether the result of goodwill, prior favorable beliefs, initial investments, or psychological forces, imply some continuity in behaviors across time. If an actor is committed to a relationship, a greater degree of resistance to change will occur in the relationship. This dynamic in turn places greater constraints on future behavior, which shields the relationship from negative outcomes.

Probing inter-organizational adaptive learning in IB

Promoting interorganizational exchange, including mitigating opportunism and facilitating cooperation, is central to the success and evolution of cross-border inter-organizational collaboration and open innovation. Levinthal's works continue to enlighten our understanding of inter-organizational attachment and have guided IB research in areas of international joint ventures (IJVs), alliances, and other partnerships (see for instance, Inkpen & Beamish, 1997; Luo, 2008; Lyles & Salk, 1996; Parkhe, 1991). The dynamics of interorganizational learning become even more fundamental in cross-cultural settings, where international partnerships create more opportunities for mutual learning and knowledge transfer, but also generate greater challenges than domestic ones. These challenges include but are not limited to institutional volatility, cultural barriers, and property rights protection among others. According to Levinthal and Fichman (1988), interparty attachment is a binding force between exchange partners that can promote the maintenance of an existing relationship. Over time, this attachment grows due to the accumulation of trust that accrues through

continuous interactions and investments that both exchange partners make in the relationship over time. This interparty attachment occurs in personal relationships (personal attachment) or ties between exchange partners at the organizational level (structural attachment). Both attachments counter pressures for dissolution created by resource misfit and reduce the need to explore alternatives. Luo (2001, 2008) confirms that both personal and structural attachments exert a strong positive influence on IJV performance. This positive influence, however, tends to gradually decline as attachments continue to increase.

To further illuminate the adaptive view of interorganizational attachments, Seabright, et al. (1992) document that the greater the resource misfit over time between exchanging parties, the greater the likelihood the relationship will dissolve. This likelihood, however, is buffered by an individual or structural attachment between exchange partners. The finding implies resource dependence theory (Pfeffer & Salancik, 1978) alone cannot fully explain or predict the dynamics of inter-firm links, and we should further explore the attachment-based view in future research. IB research has long established that in the long-term developmental process of global alliances or joint ventures, interorganizational relations evolve from knowledge exchange to more institutionalized relationships. Similarly, if interparty attachment (individual or structural) is established through reciprocal learning, this attachment becomes relationship-specific social capital, which creates economic value for these partnerships (Gulati, 1995; Luo, 2008). Furthermore, goal congruity between exchange partners can spur interparty attachment, whereas cultural distance can impede interparty attachment (Luo, 2001).

Therefore, research should dive more deeply into the antecedents and consequences of inter-organizational adaptive learning in cross-cultural settings. One important issue remains regarding the restructuring of IJVs or alliances using an adaptive learning lens. This restructuring is generally reflected in strategic, structural, and ownership changes. Some IJVs, for instance, are restructured due to an MNE's reduced strategic need for learning from foreign partners (Inkpen & Beamish, 1997). In other cases, however, local partners fail to deliver their commitment to reciprocal learning and knowledge generation or lack absorptive capabilities to assimilate and learn the knowledge provided by MNEs (Puck, Holtbrugge, & Mohr, 2009). Future studies



Table 1 Adaptive learning of organizations in international business

	Learning foundations	Complex adaptation	Learning-driven innovation
Levinthal's perspectives	<ol style="list-style-type: none"> 1. Absorptive capacity, learning myopia, cognitive and experiential learning, and learning mindfulness are critical learning foundations 2. Learning is path dependent, requiring prior related knowledge to assimilate and use new knowledge 3. Myopia exists due to overlook of long-term, of larger picture and of failures 4. Cognition is important in seeding and constraining the process of experiential learning 5. Mindfulness mirrors a firm's ability to carry out novel action flexibly and maintain high attention to unexpected events 	<ol style="list-style-type: none"> 1. A firm's ability to respond to changing environments is conditioned by the extent to which elements of organizational form interact in their effect on organizational fitness; fitness landscape is rugged 2. Adaptability is enhanced if there is a modest degree of interaction among the system's components 3. Environmental change is not a self-evident call for strategies of greater exploration; a renewed focus on exploiting existing knowledge matters too 4. Rapid technological change is not just a transformation of the technology but applying existing technology to new domains 5. Boundary crossing in technological exploitation is a deliberate, distinct and creative process 	<ol style="list-style-type: none"> 1. R&D not only generates new knowledge but enhances the firm's broader ability to assimilate and exploit externally available knowledge; learning impetus influences R&D investment and innovation 2. Learning-driven innovation requires organizational architecture that supports it 3. Non-hierarchical structure design requires a global sense of interdependencies among units of the firm 4. Inter-organizational collaboration is essential to open innovation and learning 5. Mutual learning fosters inter-firm attachment, in turn promoting inter-firm exchanges; liability of adolescence and honeymoon period exist as attachment changes
IB implications	<ol style="list-style-type: none"> 1. Absorptive capacity of foreign subsidiaries and JIV partners significantly affects the outcome of knowledge transfer within and from an MNE 2. Subunits' absorptive capacity mediates an MNE's global integration over various activities 3. The value of global and local experience can decline over time or if environments drastically change 4. Managerial cognition and experiential learning work together in deciding the internationalization process 5. MNEs need not only global mindset (individual and team level) but also organization-level mindfulness of learning, resilience and adaptation 	<ol style="list-style-type: none"> 1. Adaptation is an MNE's firm-specific advantage (FSA) that helps mitigate the liability of foreignness; Good internalization works toward adaptation 2. MNEs need to maneuver adaptive learning first at the country level, then coordinate such adaptation at the regional and global levels 3. MNEs need to re-bundling and recombining FSAs with country-specific advantages to leverage adaptation advantages and opportunities 4. Dual pressure (integration and localization) prompts MNEs to treat complex adaptation as an optimal decision; such adaptation varies across subunits 5. MNEs can use platforms and ecosystems to benefit from co-evolutions with technological change 	<ol style="list-style-type: none"> 1. Mutual reinforcement of learning and innovation stimulates MNE performance in global race for learning and for knowledge building and sharing 2. Characteristics of knowledge, environment, and task interdependence significantly shape the process of learning-driven innovation and diffusion 3. Organizational architecture for MNEs entails not merely structure but its interactions with global strategy, FSA, knowledge flows, and culture 4. Levinthal's first-order (change within existing structure) and second-order (change of the structure itself) notion of adaptation enriches I-R balance 5. Inter-party structural attachment counters the pressure for instability, dissolution and opportunism for international strategic alliances
New research directions for IB	<ol style="list-style-type: none"> 1. How headquarters, hubs and subunits work together to collectively augment the MNE's absorptive capacity as a whole 2. What elements of learning and experience are subject to stronger myopia, and how MNEs learn and improve from past failure 3. What it takes to link cognitive processes with cultural brokerage, team diversity, intra-MNE communication, knowledge flows and justice 4. How routines and mindfulness complements in advancing an MNE's global success 5. Can ambidexterity and mindfulness work together in strengthening an MNE's resilience and I-R balance 	<ol style="list-style-type: none"> 1. The notion of adaptation on a rugged landscape can guide IB research on dynamic processes of managing internal and external interdependencies with other units or firms 2. Unifying Levinthal's complex adaptation with dynamic capability theory in IB can enrich MNE adaptation research, with the former offering a behavioral foundation for change 3. It is important but understudied to examine a negative effect of change and fluctuations 4. Opportunities abound in studying eco-system level of co-evolution with technological and market changes 5. It is merited to study the role of global market demand in the process of technological co-evolution and co-opetition with ecosystem partners 	<ol style="list-style-type: none"> 1. Unpacking the black box of learning and innovation reinforcement process and linking it with dynamic capability, technological changes and CFAs 2. Pathways and solutions of transforming R&D into an MNE's broader competence in assimilating and exploiting externally available and often boundary-crossing technologies and knowhow 3. Combining loose coupling logic of organizational architecture with parent-subsidiary links and I-R balance 4. Constituents and mechanisms of organizational architecture needed for MNEs' cross-border orchestration 5. Restructuring and reorganizing JIVs and alliances from an adaptive learning and innovation lens

should investigate both offensive and defensive reasons underlying IJV restructuring triggered by learning changes, linking changes in mutual learning with changes in bargaining power, strategic needs, and resource dependence of individual parties or both parties. Fluctuations in the market can also shape adaptive learning changes within IJVs or alliances, as global platforms and ecosystems become increasingly prevalent in the digital age (Nambisan, Zahra, & Luo, 2019). As a result, multi-party (three or more) evolutionary learning that occurs in a cross-cultural setting constitutes another avenue to explore. This type of learning is increasingly deemed to involve more complex, open, and asymmetric learning processes for all involved organizations possessing disparate motives and positions in loosely coupled partnerships.

Table 1 summarizes constituent processes involved in adaptive learning of organizations, including Levinthal's perspectives for how such views are applied and extended to IB, and what can be done to continuously push these boundary conditions forward in IB research.

CONCLUSION

Levinthal's prolific and profound contributions to management and organization research extend beyond what a single article can cover. This article chose to emphasize his contributions to adaptive learning not only because of his path-breaking impact on this area of study, but also because of a profound need to extend adaptive learning thinking to IB. From global geopolitics and trade tensions to technological upheaval and digital connections, an even greater need exists for IB scholars to delve more fully into adaptation-oriented organizational learning. The need to balance

dynamic tensions between multiple forces, including global deployment, localized adaptation, exploitation of existing capabilities, and developing new capabilities, has prompted MNEs to be more proactive in marshaling globally coordinated yet locally autonomous adaptive learning mechanisms.

Levinthal's contributions to adaptive learning hold multiple opportunities for continued IB research especially in regard to the learning process. Areas for additional research opportunities include the implications of absorptive capacity, myopia of learning, cognitive and experiential search (mindfulness in learning), complex adaptation (rugged adaptation, adaptation approaches, and coevolution with technological change), and learning for innovation (R&D, demand heterogeneity, organizational architecture, and inter-organizational attachment). In illustrating each of these perspectives, this article intends to apply and extend these views to the specific context of international business with the hope of offering additional research questions and directions for future IB research that can advance our understanding of adaptive learning in global environments. Above all, adaptive learning interacts with the dynamic context to create knowledge for firm growth (Argote & Miron-Spektor, 2011). MNEs are no exception to the rule that adaptation holds great power.

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