



COMMENTARY

Absorptive capacity, socially enabling mechanisms, and the role of learning from trial and error experiments: A tribute to Dan Levinthal's contribution to international business research

Arie Y Lewin¹, Silvia Massini²
and Carine Peeters³

¹The Fuqua School of Business, Duke University, 100 Fuqua Drive, Box 90120, Durham, NC 27708, USA; ²Alliance Manchester Business School, The University of Manchester, Booth Street West, Manchester M15 6PB, UK; ³Vlerick Business School, Reep 1, 9000 Ghent, Belgium

Correspondence:

AY Lewin, The Fuqua School of Business, Duke University, 100 Fuqua Drive, Box 90120, Durham, NC 27708, USA
e-mail: ayl3@duke.edu

Abstract

The concept of absorptive capacity (AC) of firms (Cohen and Levinthal 1989 and 1990) is a foundational feature of organizational learning and adaptation that has had enormous influence in international business (IB), and innovation studies and management research in general. In this tribute to Dan Levinthal, we discuss the close connection between AC and learning – two areas central to Dan Levinthal's research – in relation to different contexts where AC comes into play in extant IB research. We discuss four specific aspects of the nexus of AC and learning in the context of IB: (1) bridging between intra- and inter-firm learning; (2) a routine-based framing of AC that emphasizes processes and capabilities underlying seeking, assimilating, and innovation in a global setting; (3) the role of socially enabling mechanisms, and (4) the logic of learning through trial and error experiments within firms and countries.

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INTRODUCTION

The significance of Dan Levinthal's research for international business (IB) scholarship stems from the direct role of organizational learning and adaptation in IB research. The Uppsala stage model (Johanson & Vahlne, 1977) presents internationalization fundamentally as a learning process whereby organizations gradually build presence in foreign markets. This model has been highly influential in IB research and revised over time to reflect changes in IB strategies, practices and institutional factors (e.g., Johanson & Vahlne, 2009). One of the areas where organizational learning and absorptive capacity (AC) (Cohen & Levinthal, 1989, 1990) play a particularly significant role involves knowledge management capabilities such as transfer between headquarters (HQ), foreign

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subsidiaries, and international joint venture partners of a multinational (MNE) (see, for instance, Koza & Lewin, 1999, and the 2006 *JIBS* decade award paper by Lyles & Salk, 1996). But learning also takes a central role in research on international entrepreneurship and born global firms (e.g., Zahra, Korri, & Yu, 2005), as well as in the recent research on MNEs from emerging economies (see Kedia, Gaffney, & Clampit, 2012; Kotabe, Jiang, & Murray, 2011; Luo & Tung, 2018; Witt & Lewin, 2007).

The role of learning in the internationalization process of firms manifests itself at two main levels. First, foreign firms suffer from the liability of foreignness and utilize learning strategies and processes to overcome knowledge gaps about the local context of the markets they enter (Petersen, Pedersen, & Lyles, 2008). Second, firms learn from their past internationalization efforts, which can be leveraged in subsequent international endeavors (e.g., Barkema, Shenkar, Vermeulen, & Bell, 1997). In other words, internationalization can be seen as a double-loop learning process whereby, over time, firms 'learn to learn' and adapt to new foreign markets.

Importantly, considering that firms operate under conditions of bounded rationality, the formal processes of mapping action–outcome linkages via cognitive forward-looking processes are at best incomplete (Gavetti & Levinthal, 2000). Experiential learning, therefore, plays a pivotal role in reducing (tacit) knowledge gaps of foreign firms (Petersen et al., 2008). However, learning itself is constrained by important limitations, not least because of myopia related to distant markets, time differences, and failures (Levinthal & March, 1993). Hence, as with most other strategic endeavors, intended rationality will not be sufficient for internationalizing firms to reach the global optimum that rationale theories suggest (Levinthal, 2011; Barnett & Levinthal, 2017).

Learning from experience implies that managers make inferences about new international contexts based on prior experience, decisions, and knowledge. As a result, firms may benefit more from broad rather than deep experience, as this will increase the chance that they will have relevant past experience to draw on (Gavetti, Levinthal, & Rikvin, 2005). The consequence of analogical reasoning has been discussed in a number of empirical studies in IB. Moreover, although the positive effect of a diverse experience basis materializes only over time (Casillas & Moreno-Menéndez, 2014), Luo and Peng (1999) found that it has a more lasting

positive effect on international performance than a deep experience basis. On the contrary, depth of international experience would accelerate the internationalization process in the short term (Casillas & Moreno-Menéndez, 2014), but its effect on international performance would diminish over time (Luo & Peng, 1999). Casillas and Moreno-Menéndez (2014) actually find that depth of international activities can restrain the potential for international development of firms in the long term, reflecting the well-known competency trap risk (Levitt & March, 1988) and loss of adaptability (Levinthal, 1991; Levinthal & March, 1993) that may come with experience.

Moreover, analogical reasoning is effective only to the extent that firms are able to accurately understand what is similar or different across learning contexts (Gavetti et al., 2005), and, therefore, can develop and apply routines mindfully (Levinthal & Rerup, 2006). Extant research has, however, shown that managers are prone to make false inferences about similarities between international markets – especially those that are geographically close – and hence apply known recipes from past internationalization efforts even when the new local context is different from the ones from which the past experience originates (e.g., O'Grady & Lane, 1996). It follows that past experience may best be seen as a double-edge sword for organizational learning. On the one hand, past experience allows for useful analogical reasoning (Gavetti et al., 2005), while, on the other hand, overconfidence that may come with experience leads to a false belief of a lower knowledge gap, which eventually may reduce learning (Petersen et al., 2008).

In that context, HQs are often too remote to correctly assess knowledge gaps and to draw appropriate inferences across international contexts. Instead of directly dictating individual behaviors and actions of local subsidiary managers and employees, HQ managers would thus best focus on designing a logic of appropriability and a logic of consequentiality (March & Olsen, 1989) for effective local, autonomous adaptation processes – a task that Levinthal and Warglien (1999) refer to as *landscape design*. This is another source of tension in the management of MNEs. On the one hand, increasing interdependencies among the entities of an MNE renders the landscape increasingly rugged (Levinthal & Warglien, 1999), and makes it more difficult for subsidiaries to explore further away from their current knowledge base (Barkema

& Drogendijk, 2007), and move the organization towards a local peak, which may – or may not – be a global optimum (see Levinthal, 1997). On the other hand, unconstrained autonomy may not be desirable, as MNEs would lose the ability of organizing and coordinating knowledge flows across local entities, which gives them an advantage for innovation (e.g., Bartlett & Ghoshal, 1990). MNEs seeking to facilitate both exploration and exploitation may thus benefit from balancing between autonomy and dependence vis a vis HQ over time (Siggelkow & Levinthal, 2003).

Among the many facets of learning discussed in IB research, the concept of organization AC (Cohen & Levinthal, 1989, 1990) has had enormous influence. Yet it remains largely a black box in terms of the configuration of internal routines and socially enabling mechanisms that facilitate requisite variety (Ashby, 1956) that underlies variation and innovation over time (Lewin, Massini, & Peeters, 2011), both within and across countries. Therefore, we dedicate the rest of our commentary to this particular aspect of Dan Levinthal's work. In the next section, we review different contexts where AC comes into play in IB research. We then discuss how firms (MNEs and local firms) as well as countries can develop AC. Finally, we direct attention to the role of local cultures and institutions and how they interact with firm-level factors in driving the development of AC. For that, we use the particular example of China, and we elaborate on learning from experiments as a particular mechanism of developing a country AC.

ABSORPTIVE CAPACITY (AC) IN THE CONTEXT OF IB

AC refers to the “ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” (Cohen & Levinthal, 1990: 128). In the context of innovation processes, AC has been contextualized with a firm's R&D strategies and investments, as well as organizational designs and managerial processes to develop technological innovations, with the idea that “R&D not only generates new knowledge, but also enhances the firm's ability to assimilate and exploit existing information” (Cohen & Levinthal, 1989: 569). Therefore, AC capabilities and learning are highly intertwined.

Absorptive Capacity, Internationalization, and Innovation

In the context of IB, AC extends to other forms of knowledge beyond technological knowledge and innovation. For instance, AC capabilities play an important role in support of MNEs seeking and assimilating knowledge about host-country institutional settings and market context (local culture, consumer preferences and behavior, competitive environment, institutional and regulatory rules and constraints, etc.), as well as learning how to mitigate cultural differences and other forms of distance such as cognitive distance. Consequently, AC capabilities represent a fundamental pre-requisite for (knowledge seeking) internationalization strategies that has attracted growing attention in top IB journals.

Apriliyanti and Alon's (2017) wide-ranging bibliometric co-citation meta-literature review of AC identified five underlying research themes: (1) intra-organizational learning; (2) inter-organizational learning; (3) knowledge transfer; (4) dynamic capability; and (5) micro-foundations. However, the meta bibliometric analyses cannot inform the effect size of the hypothesized relationships. Xu, Arrieta, and Fey (2020) identified organizational dynamic capabilities underlying how management of innovation works (Wang & Ahmed, 2007). Building on Teece, Pisano, and Shuen's (1997) notion of dynamic capabilities, defined as “the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (p. 516), Xu et al. (2020) identify a set of higher order managerial capabilities that include knowledge capabilities, organizational culture, transformational leadership, and strategy. R&D resource allocation had the weakest effect. Knowledge management, which encompasses transformational capacity, AC, and inventive and innovative capacity had a weighted mean corrected correlation of 0.45, of which the AC factor accounted for 19%.

Overall, very few empirical studies discuss or report effect size of empirical findings. Meta-analysis papers could provide such analyses and substantive conclusions. For example, a recent meta-analysis of AC and innovation by Zou, Ertug and George (2018) reports important effect size findings which demonstrate a very high heterogeneity between AC and key factors of innovation. Of interest to IB research are the positive but weak correlation between AC and innovation, and between AC and knowledge transfer, and the not



significant association between the extent of external search, AC, and innovation. Social integration mechanisms, knowledge infrastructure, management support, and relational capability weakly moderate the relationship between AC and innovation. Zou et al. (2018) conclude that the large heterogeneity in accounting for firm AC might be due to the absence of research on organizational routines that facilitate variation, differences in selection regimes, sharing knowledge across the organization, and routines for updating and replacing longstanding practices.

With such a vast interest in the concept of AC by IB scholars, one may wonder how MNEs develop AC in practice. Although extant literature on the subject remains rather scarce, Lane, Koka, and Pathak (2006) point to useful contributions from authors who have adopted a capability-view of AC, as initially intended by Cohen and Levinthal (1989, 1990, 1994). Adopting a capability-view of AC requires shifting the analysis of learning and knowledge processes from individuals to organizations as collective repositories of knowledge (Nelson & Winter, 1982), as well as developing a body of qualitative case studies of learning and knowledge transfer between firms, with a focus on studying how firms operationalize such processes in practice.

Zahra and George (2002) define AC as a “set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge” (p. 186). As such, the authors offer a promising conceptualization of AC for IB scholars as it recognizes that R&D investments, often used as proxies for AC, are an important but not sufficient condition for a firm to possess strong AC. Relatedly, authors have shown that both inter-organizational collaborative processes (e.g., Dyer & Singh, 1998), as well as internal coordination and socialization mechanisms (Jansen, Van den Bosch, & Volberda, 2005), play an important role in the development and evolution of AC capabilities.

Building on this processual view of AC, Lewin et al. (2011) elaborate on the notion of AC as an organizational capability underlined by a set of specific routines. In line with the original conceptualization of AC, the authors distinguish between external AC routines, oriented towards identifying relevant external knowledge, and internal AC routines, directed at the firm's own knowledge creation processes, and the routines for assimilating external knowledge within these processes. Ultimately, it is the combination of internal and external

knowledge processes that enables exploitation of externally acquired knowledge. The framework builds on the three key evolutionary processes of variation, selection and retention, which are fundamental to experimental learning and enabling emergence (Cohen & Axelrod, 1984). This routine-based conceptualization of AC which identifies internal (intra-firm) routines and external (inter-firm) routines supports the relevance of Cohen and Levinthal's concept of AC for MNEs and IB research for theorizing about intra- and inter-firm as well as inter-country knowledge flows.

Importantly, the internal and external AC meta-routines in the Lewin et al. (2011) model are enacted by firms in the form of practiced AC routines that are firm- and context-specific, and which have the potential to mutually reinforce each other. It follows that learning, adaptation, and innovation depend on firms' ability to discover complementarities between AC routines and to implement organizational configurations of AC routines that fit their particular innovation purposes (Peeters, Massini, & Lewin, 2014).

Lastly, an important aspect of the Lewin et al.'s (2011) conceptual model is the identification and role of socially-enabling mechanisms that enable the development and practice of appropriate AC routines by firms (see also Torodova & Durisin, 2007).

For MNEs, a routine-based model of AC capability highlights the need to develop and practice specific AC routines for learning about local foreign environments, transferring this knowledge into the organization, and assimilating it into the extant MNE knowledge base. The development of AC capabilities may, however, be particularly challenging in MNEs as the personal, frequent interaction between individuals that are critical to organizational learning are constrained by the global dispersion of activities and may need specific human resources practices to support knowledge flows within MNEs (e.g., Minbaeva, Pedersen, Bjorkman, Fey, & Park, 2003).

MNEs contend with many complexities, which result from heterogeneity in environments, heterogeneity in the nature and extent of absorptive capacities (and hence learning) across their various geographic locations, and the challenge of importing, integrating, and then sharing/transferring back and forth external foreign knowledge. For globalized MNEs, it is perhaps even more critical to develop and manage appropriate socio-enabling mechanisms of AC. Not only do they facilitate



learning between HQs and subsidiaries but also between subsidiaries (see, for instance, Peeters et al., 2014). In addition, social structures within MNEs influence the development of AC by foreign subsidiaries (Schleimer & Pedersen, 2014), which is critical in order to benefit from the knowledge residing in foreign subsidiaries, and has become increasingly important as Western country MNEs have moved up the value chain when making offshoring decisions, whether in the form of foreign direct investments, joint ventures, or by outsourcing manufacturing of advanced technologies and knowledge-intensive business services. Koza and Lewin (1999) observed that, in the case of research joint ventures, it is important to implement routines that keep pace with the partner learning to avoid the negative outcome of a learning race. For example, the 3M company indoctrinated managers to “not kill a new product idea”, and managers were expected to provide sufficient resources to make a little and sell a little as a way of receiving market signals.

INTERNATIONALIZATION, ORGANIZATIONAL LEARNING, AND KNOWLEDGE

In terms of theoretical underpinnings, over the past few decades, IB scholars have studied the relationship between internationalization and innovation drawing from different lenses: most notably the resource-based view (RBV), the knowledge-based view, and the organizational learning perspective. Other theoretical lenses include knowledge transfer, dynamic capabilities, and micro-foundations of innovation.

The RBV (Barney, 1991; Wernerfelt, 1984; Hitt, Hoskisson, & Kim, 1997) theorizes that internationalization offers firms opportunities to access resources not available in the home market, that may be more cost-effective, or of higher quality and, therefore, decrease the cost of innovation (Kafouros, Buckley, Sharp, & Wang, 2008). Internationalization can also contribute to greater economies of scale (Cantwell, 1989; Tallman & Li, 1996) and economies of scope (Tsao & Chen, 2012) by extending domestic innovative activities (Kostova & Zaheer, 1999; Zaheer, 1995).

The knowledge-based view (Grant, 1996; Kogut & Zander, 1992, 1993) considers that innovation is a function of a firm's ability to effectively coordinate and integrate a wide range of internal and external sources of knowledge (Kafouros et al., 2008). Similar to RBV, the knowledge-based view recognizes

the importance of a firm's existing knowledge and capabilities as resources. But equally important for the knowledge-based view is external knowledge. Internationalization “translates into a larger exposure to external sources of knowledge” and “the firm can take advantage of these different knowledge inputs to foster innovation” (Shearmur, Doloreux, & Laperrière, 2015: 458). Firms active in global markets innovate more than their competitors operating purely in home countries, not only because they utilize more internal resources but also because they have better access to diverse and new external stocks of knowledge and ideas from different markets and different cultures.

Organizational learning theory (McKee, 1992; Mezas & Glynn, 1993) considers the firm as an experiential learning system and innovation as an experiential learning process. Internationalization exposes firms to new and diverse ideas and knowledge and different cultures from different markets. This not only provides a broader learning opportunity, leading to a more extensive knowledge base and stronger innovative capabilities, but also facilitates system openness, which further promotes learning (Hitt, Hoskisson, & Kim, 1997; Kim, Hwang, & Burgers, 1993; Zahra, Ireland, & Hitt, 2000). Learning opportunities associated with internationalization provide firms with cumulative resources for successful innovation. Additionally, learning different ways of doing things fosters innovation.

Although the RBV, the knowledge-based view, and the organizational learning perspective all advocate that internationalization can improve a firm's innovation performance, internationalization can result in high levels of uncertainties, risks, and complexities for firms (Saarenketo, Puumalainen, Kyläheiko, & Kuivalainen, 2008), which may diminish their capacity and capabilities to engage in innovation. International expansion can increase a firm's exposure to financial risks, such as exchange rate fluctuations and inflation (Lee & Kwok, 1988), and to political uncertainties (Reeb, Kwok, & Baek, 1998), such as constraints of trade laws (Brewer, 1993), boycotts, fund remittance control, and expropriation (Boddewyn, 1988), which lower the efficacy of using resources, acquiring novel knowledge and ideas, absorbing and transferring advanced technologies and know-how between headquarters and subsidiaries and across subsidiaries, and weakening organizational learning. Internationalization exacerbates transaction costs and agency costs that stem from information



asymmetry and costs that are related to information collection, information processes, and information dissemination (Hitt, Hoskisson, & Ireland, 1994). Ultimately, the extra costs associated with internationalization could reduce a firm's resources available for innovation.

Moreover, internationalization can increase the costs of innovation (Roper, Du, & Love, 2008). Foreign market expansion requires dealing with the liability of foreignness, such as cultural differences and perceived illegitimacy due to unfamiliarity with local environments, and with political and economic regulation in the host country, which often results in increased complexity of information and knowledge management. Internationalization can also demand greater allocations of resources for R&D investments and more complex coordination efforts relating to managing and controlling innovative activities of joint venture partners (Koza & Lewin 1999; Berchicci, 2013). Doing business in multiple countries also increases the risk of knowledge spillovers to competitors (Sanna-Randaccio & Veugelers, 2007), and firms that deploy R&D activities in nations with weak intellectual property regimes must contend with greater risks of opportunism and uncertainty (Hsu, Lien, & Chen, 2015).

Consequently, internationalization may have a negative effect on the pace, speed, and rate of innovation. In turn, this implies a heightened need for effective AC routines for MNEs.

TOWARDS COUNTRY-LEVEL AC

Whilst the concept of AC has been developed at the level of the firm, and in some ways at a more micro-level, such as the role of the individuals, the notion of country-level AC has remained under-researched, at least in IB scholarship. Tracking early discussions on this, we find indications of extending the concept of AC to the country level mainly in the neighboring academic fields of economics of innovation and economic development and at the interface between innovation studies and IB research (e.g., Abramowitz, 1986; Nelson, 1993; Criscuolo & Narula, 2008; Filippetti, Frenz, & Ietto-Gillies, 2017). In the United States, The National Institute of Health, National Science Foundation, the Defense Advanced Research Projects Agency, the Center for Disease Control, NASA, and other research agencies and Institutes have had an important role in building the national AC of the US economy. Many of the research projects

supported by such institutions direct attention to scientific or technological research priorities, and essentially support trial and error science and technological experiments (proposals) that deepen the US science and technology AC. This proactive view of nurturing scientific and technology country-level AC is reflected in the extant literature on national systems of innovation, a concept developed by, among others, Nelson (1995), and applied to a number of developed and developing countries (see also Freeman, 1987; Furman, Porter, & Stern, 2002).

At the macro-level, in the context of economic development, Abramovitz (1986) studied the productivity growth of countries and identified the role of social capabilities, as measured by education levels and the institutional context, in explaining the catching up rate of different countries, thus pointing to the role of country-level socially enabling mechanisms, and highlighting the ability of countries to absorb and internalize knowledge in their quest to catching up technologically and economically. However, in reality, only Hong Kong, Taiwan, Singapore, and South Korea have been successful in escaping the middle income trap (Lewin & Kenney, 2016), suggesting that country AC remains to be explored within development economics, IB, and political science.

More research is also needed about how host countries integrate foreign knowledge and enhance domestic/indigenous technological and innovation capabilities. The more a country is distant from the technological frontier, the greater the challenge to absorb and assimilate external/foreign knowledge, thus requiring investments in developing high levels of domestic R&D, education, and institutional and physical infrastructure which supports knowledge sharing, absorption, and integration – in other words, country AC (Criscuolo & Narula, 2008; Filippetti et al., 2017, Lewin & Kenney, 2016).

Therefore, whilst crucial to develop indigenous knowledge and to tap into foreign knowledge through their own AC, MNEs alone can only play a limited role in developing a country's AC, as a firm's AC also depends on the availability of educated and skilled workers as well as other institutions and infrastructures to build scientific and technological knowledge (Freeman, 1987; Nelson, 1995).



ROLE OF TRIAL AND ERROR EXPERIMENTS IN BUILDING NATIONAL AC: THE CASE OF CHINA

Cohen and Levinthal (1989) stated that AC cannot be enhanced through learning-by-doing (LBD) processes but requires dedicated efforts in the form of R&D investments. Although not stated explicitly, we assume that Cohen and Levinthal regarded learning by doing as a direct consequence of firms' increasing process efficiency through repeated applications and incremental innovations resulting from "problemistic search" (Cyert & March, 1963). In this section, we discuss whether and how AC can be enhanced through trial and error experiments, and how these processes give rise specifically to variety of innovative ideas and thus contribute to the variation aspect of a nation's AC (Lewin et al., 2011).

LBD is documented in an extensive literature on learning or experience curves in manufacturing improvement and technological innovation domains (Epple, Argote, & Devadas, 1991; Macher & Mowery, 2003; Pisano, 1996; Von Hippel & Tyre, 1995), and is rooted in the basic assumption that performance is explained by knowledge accumulation from historic experience (Barrios & Strobl, 2004). Generally, LBD is identified as a dynamic process for accumulating experience, knowledge, or know-how as a by-product of repeated processes – such as manufacturing – that improve process efficiency and consistency. At the firm level, LBD involves distinct internal processes, such as integration and co-ordination of firms' external knowledge sources, repetition, and incremental extension (Rui, Cuervo-Cazurra, & Un, 2016), with the idea that, by leveraging existing routines as well as greater efficiency in dealing with process deviations (Balasubramanian & Lieberman, 2010; Ittner, Nagar, & Rajan, 2001; Levitt & March, 1988), firms are able to achieve lower costs, higher productivity, and greater quality (Bahk & Gort, 1993; Dosi, Grazzi, & Mathew, 2017; Morrison, 2008; Zollo & Winter, 2002). However, an under-explored aspect of LBD involves the enabling, and utilization, of trial and error experiments and the potential emergence of more radical discoveries and innovation, eventually leading to enhanced national AC. The case of China offers an insightful example of this.

Heilemann (2018) discusses the distinctive role of unleashing policy experiments in China as a means

of discovering and adopting solutions to national policy initiatives. For example, the famous speech by paramount leader Deng Xiao-Ping in 1978, which declared the opening of the Chinese economy, concluded with the sentence "... moving forward will be like crossing a river and feeling the rocks on which to cross". The Chinese Communist Party central committee had no specific ideas on how to open the Chinese economy. The state council was counting on the provinces and autonomous cities and regions to initiate experiments, such as the first free economic zone in Shenzhen, to attract private and state-owned enterprises to experiment with independent enterprises that attracted workers from the rural economy. These migrants flocked to the new economic zones to staff manufacturing and other jobs, in spite of not having resident registration rights that control the buying of apartments, receiving social services, or enrolling their children in public schools. As Heilemann (2018) recounts, unleashing trial and error experiments in response to national initiatives that direct attention underlines China's national (absorptive) capacity to innovate, evolve, and shape national policy solutions. It is a form of creating the requisite variety which frames the iterative process of discovering alternative partial solutions (consistent with Ashby's Law of Requisite Variety; Ashby, 1956) on the basis of which national policies are framed. The Economist (2018) also noted the effectiveness of China's implementation of policy initiatives through multiple parallel experiments. Other Chinese policy examples include the highly successful 985 national initiative to upgrade the STEM capabilities of the top 30 universities (see Zhang, Patton, & Kenney 2013) and the following 211 initiatives which extended the 985 initiative to 211 additional universities. However, there is also a dark side to how China has built up its innovative capacity. Petricevic and Teece (2019) discuss the global negative spillovers of China's knowledge absorption approach, associated with forcing companies investing in China to take on partners and sharing intellectual policy with the joint venture. The authors suggest that, for all practical purposes, China is unilaterally practicing "rule-of-rulers" policies, in contradiction of WTO understandings embodied in "rule-of-law" practices with potential long-term negative consequences for its national ecosystem innovative capacity.

Lewin, Xing and Liu (2019) deconstruct the experiments that were unleashed with the national



technological upgrading initiative announced in 2001 (10th Five Year Plan; FYP). The paper provides the underlying philosophies that frame the socially enabling mechanisms underlying AC for trial and learning experiments, and details the role of provinces and autonomous regions which began introducing policy initiatives intended to encourage and support technological acquisitions. The 10th FYP technological upgrading initiative resulted in 469 technological acquisitions spanning the 10th, 11th, and 12th FYPs. At the conclusion of each year, Lewin et al. (2019) illustrate the process of summarizing the lessons learned, highlighting new experiments as well as issuing more specific guidelines that support or redirect the next wave of experiments.

Mirroring the ambiguity associated with announcing and evolving national policy initiatives in China, the specific term “technological upgrading” was not explicitly mentioned in the Tenth FYP. The intellectual underpinning underlying the initiative is attributed to the writings and speeches of the influential economist, Justin Yifu Lin, who outlined the economic rationale for a national imperative of technological upgrading (Lin, 2016). In Section 4 of the Tenth FYP, he literally exhorts companies “*that have comparative advantages* to invest abroad and expand the fields, ways, and means of international economic and technological cooperation, support overseas cooperation to alleviate domestic shortage resources, and promote domestic industrial restructuring and resource replacement.”

The absence of specific technological upgrading cases during the Tenth FYP is especially striking. Of the 26 acquisitions (19 by state-owned enterprises, SOEs, and 7 by privately owned enterprises, POEs) recorded for the Tenth FYP, none were technological acquisitions. For the 11th FYP, the “foreign investment” policies were tweaked, and, in 2006, the central government specifically directed attention to foreign mergers and acquisitions that promote industrial upgrading. It involved 122 technological acquisitions of which 53 were acquired by State-Owned Enterprises (SOEs). By the start of the 12th FYP, the central government guidance is much more detailed and specific, specifically emphasizing acquisition of foreign technology (especially so-called crown jewels) and investment in R&D cooperation, and encouraging enterprises with all types of ownership to engage in foreign direct technology-related R&D investments. A total of 347 technological acquisitions

were completed, of which 107 were by SOEs and 240 by POEs.

Interestingly, a similar bottom-up experimental approach can be found in the case of the Chinese company, Haier. Lewin et al. (2017) describe in detail the bottom-up emergence of six radical product innovations adopted by Haier between 2009 and 2012. The management philosophy of Chairman Zhang Ruimin, a deep believer in Dao philosophy, which underlines a view that the world is ambiguous, emphasizes that long-term survival depends on honing and continuously renewing the capabilities of flexibility and adaptability necessary to achieve periodic major strategic reorientations. By the time of the Lewin et al. (2017) study, the company had undergone five strategic reorientations: quality, lean manufacturing and building brand (1984–1991); diversification (1991–1998); internationalization (1998–2008); open innovation (2009–2012); and micro-enterprises and networking (2012). Following the successful adoption and implementation of total quality management and lean manufacturing systems, and consistent with the branding initiative, the company adopted a new name. Chen (2016) commented that the Chinese characters of “Haier” are quite symbolic: Hai (海) er (尔) literally means “you are the sea”. The adoption of the new name marked the beginning of the Haier brand. However, it also served to reconnect the people of Haier to a foundational 1994 speech – “Haier is the Sea” by Chairman Zhang Ruimin. The 1994 speech to Haier employees, “Haier is the Sea” (reprinted and deconstructed by four commentators in *Management and Organization Review* (https://www.cambridge.org/core/journals/management-and-organization-review/listing?q=Haier+is+the+sea&_csrf=01enYZHp-3E5-sIomPDG73j6WLBKagfz9s0U&searchWithinIds=BF7AA05373EDA8377D8F112BE4D440B4), established Chairman Zhang Ruimin’s expectation of bottom-up initiatives and self-organizing experiments in response to realizing each new strategic reorientation, and as a way of learning how to do this.

Both examples demonstrate the influence of the Chinese culture on the way AC for innovation is being fostered, by giving organizations and individual decision-makers a general frame within which variety can be created via emergent experiments. The question of the replicability and effectiveness of similar approaches in other cultural contexts remains an open question that we trust should spark valuable debates in IB circles.



CONCLUSIONS

As a behavioral and evolutionary scholar, Dan Levinthal's work on learning and adaptation is of utmost relevance to IB, and has had a tremendous impact on IB scholarship. In this tribute, we have zoomed into his seminal concept of AC (Cohen & Levinthal, 1989, 1990). We have discussed specific contexts and levels at which AC has been found to play a role in IB, and have elaborated on how firms and countries can develop AC capability. We have specifically discussed the implications of leadership directing attention to long-term survival, the role of socially enabling mechanisms that reinforce requisite variety, and the role of trial and error experiments.

First, Lewin et al.'s (2011) routine-based model of AC capability development that we have summarized offers a useful framework to guide future research on specific AC-practiced routines that MNEs use to learn about foreign country environments, as well as to absorb and make use of globally dispersed knowledge. Discovering configurations of such routines would advance our understanding of how MNEs are able to leverage global learning and innovation processes to overcome challenges spanning from the reintegration of interdependent, but

geographically dispersed, learning and knowledge processes to dealing with the liability of foreignness that they face.

Second, we have highlighted that, although the relevance of knowledge and knowledge absorption at the country level has been well established, research on country-level AC remains sparse. This opens a huge opportunity for research on integrating multi-level analysis of AC in MNEs as well as at the country level, and on the role of national policies and national socially enabling mechanisms in driving the development of AC capability at the country level as a way to foster innovation and economic prosperity.

Finally, we have pointed to LBD from trial and error experiments as a way to discover AC routines conducive to, and in particular enabling, the requisite variety dimension of AC capabilities. This paves the way to a novel perspective for research on the origins and underlying processes of AC at both firm and country levels. Especially relevant to IB research is the question of whether a similar emergent approach exists, or would be possible, beyond the particular Chinese context we have discussed here.

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ABOUT THE AUTHORS

Arie Y. Lewin Professor Emeritus Strategy and International Business, Duke University; Distinguished Visiting Professor, Fudan University, Shanghai Jiao Tong and Management Tsinghua University. Founding Editor in Chief of *Organization Science*, past Editor in Chief of *Journal of International Business Studies* and currently Editor in Chief of *Management and Organization Review*, which focuses on management research in context of transforming economies. Professor Lewin's research and consulting focus on organization adaptation and change, directed co-evolution of



innovation, sustaining open innovation organizations, and de-globalization. His book “China’s Innovation Challenge: Overcoming the Middle Income Trap”, was published by Cambridge University Press in 2016. The Chinese translation was published by Peking University Press.

Silvia Massini Professor of Economics and Management of Innovation at Alliance Manchester Business School, The University of Manchester. Her research interests span the areas of managing innovation and knowledge creation processes within and across firms, strategies of

externalization and internationalization of innovation processes, and innovation and skills in the digital economy.

Carine Peeters Professor of Strategy at Vlerick Business School and Visiting Professor at Ghent University, Belgium. The study of innovation processes and organizational capabilities lies at the core of Professor Peeters’s work, and led to her current research interest in strategic flexibility, adaptation, and the impact of environmental dynamism on firm performance.

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